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Young infants prefer prosocial to antisocial others

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ABSTRACT

The current study replicates and extends the finding (Hamlin, Wynn & Bloom, 2007) that infants prefer individuals who act prosocially toward unrelated third parties over those who act antisocially. Using different stimuli from those used by Hamlin et al. (2007), somewhat younger subjects, and 2 additional social scenarios, we replicated the findings that (a) infants prefer those who behave prosocially versus antisocially, and (b) these preferences are based on the social nature of the actions. The generality of infants' responses across multiple examples of prosocial and antisocial actions supports the claim that social evaluation is fundamental to perceiving the world.

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The human tendency toward cooperation is present from very early in ontogeny. From early in the second year of life, young toddlers direct prosocial cooperative behaviors toward both adults (Warneken & Tomasello, 2006, 2007) and peers (Brownell, Ramani, & Zerwas, 2006). For successful existence within the social world, it is essential to be able to distinguish those who may help you from those who may harm you. One way to determine how a potential social partner may treat you is through the observation of how he or she treats others. Recent research has suggested that young infants can identify and discriminate prosocial and antisocial behaviors between third parties. Twelve-month-olds categorize social actions in terms of their valence (Premack & Premack, 1997); 9- and 12-month-olds expect one who is helped by one individual, but hindered by another, to behave differently toward the two individuals in future interactions (Kuhlmeier, Wynn, & Bloom, 2003; Kuhlmeier, Wynn, & Bloom, submitted for publication; Wynn, 2008); and 6- and 10-month-old infants themselves approach those who have helped another and avoid those who have hindered another (Hamlin, Wynn, & Bloom, 2007).

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In this latter study, Hamlin et al. (2007) presented infants with a social scenario (adapted from Kuhlmeier et al., 2003, and Kuhlmeier et al., submitted for publication) in which a character, attempting to reach the top of a steep hill, was alternately pushed up the hill by a "Helper" and pushed down the hill by a "Hinderer." Following habituation to this presentation, infants were presented with Helper and Hinderer and allowed to reach for the character of their choice. Infants robustly preferred the Helper, suggesting that they had evaluated the characters involved in the third-party interaction. In contrast, infants showed no preference for a Pusher-upper over a Pusher-downer in a control condition in which an inanimate object was alternately pushed up and down the hill, suggesting that infants' evaluations in the first condition rested specifically on the *social* nature of the characters' interactions. A later study revealed that this preference for helpers over hinderers is present in infants' visual attention by 3 months of age (Hamlin, Wynn, & Bloom, in press).

In proposing that infants evaluate others based on their social behavior toward third parties, it is important to demonstrate that infants' preference for those who behave prosocially versus antisocially applies across a range of social interactions and is not specific to a single social scenario (such as helping up a hill) or to a single kind of goal (such as moving from one place to another). Adult humans evaluate others across countless social interactions that include many kinds of goals. The present study addresses the generality of infants' social preferences by asking whether infants in the first year of life evaluate those who behave prosocially and antisocially in two object-oriented goal scenarios: opening a box (Experiment 1) and retrieving a dropped object (Experiment 2).

1. Experiment 1: Opening a box to get a toy

In a Social condition, infants saw a plush animal hand puppet (the "Protagonist") trying, with difficulty, to open the lid of a clear plastic box with a brightly colored rattle inside. The Protagonist was alternately aided by a prosocial puppet (the "Opener"), who helped to open the box, and thwarted by an antisocial puppet (the "Closer"), who slammed the box lid closed. Infants were then presented with the Opener and Closer characters and encouraged to reach for one of them.

To ensure that infants' preferences were based on the social, rather than merely physical, aspects of the characters' behavior, a second group of infants saw a matched "Inanimate Control" condition, in which an inanimate mechanical pincer performed the same physical actions on the box as the Protagonist, with Opener and Closer puppets alternately enabling and blocking the opening of the box respectively, as in the Social condition. Infants were then encouraged to reach for one of them. Much previous research (Hamlin, Newman, & Wynn, 2009; Johnson, Booth, & O'Hearn, 2001; Legerstee & Markova, 2008; Meltzoff, 1995; Woodward, 1998) has shown that an inanimate pincer or rod, acting upon an object in a manner similar to a human's or stuffed animal's hand, does not engage infants' intentional reasoning – infants do not view such objects as social or intentional entities. Thus, in this Inanimate Control condition, the actions of Opener and Closer, while identical to those in the Social condition, should not be seen by infants as facilitating or blocking the goal of an intentional agent. Neither event in this condition is a social interaction, so infants have no *social* reason to prefer one character over the other.

1.1. Method

1.1.1. Participants

Healthy, full-term 5- and 9-month-old infants participated. Sixteen 9-month-olds were assigned to the Social condition (9 boys; mean age 8 months, 27 days; range 8;17–9;12) and 16 to the Inanimate Control condition (8 boys; mean age 9 months, 1 day; range 8;18–9;15). Eighteen *5-month-olds* were assigned to the Social condition (10 boys; mean age 5 months, 4 days; range 4;23–5;22) and 18 to the Inanimate Control condition (11 boys; mean age 5 months, 1 day; range 4;19–5;17). Three additional 9-month-olds and four additional 5-month-olds participated but were excluded from analyses because of fussiness (1 infant), procedural error (3 infants), parental interference (1 infant), or failing to choose either puppet (2 infants). Infants were recruited through mailings and follow-up phone calls, and were given a token gift for participation.

1.1.2. Procedure

1.1.2.1. Box familiarization. Infants sat on their parent's lap and were presented with a clear plastic box containing a rattle that would be presented during the puppet show. An experimenter held the box in front of the infant, said "Look!" (shaking box), "Look!" (grabbing edge of the box), "Look!" (opening box), and "Ooh!" (lifting the rattle out of box and shaking it). She then said, "Should we put it in again? Look!" (putting rattle back in box), "Look!" (closing lid), "It's in there again!" (shaking box). She then said, "Should we take it out again?" and repeated the familiarization once more.

1.1.2.2. Habituation events. Infants were then taken to a testing room in which they sat on their parent's lap at the end of a black table surrounded on three sides by black curtains. Approximately 165 cm from the infant, a black curtain could be raised and lowered to reveal a puppet stage. During habituation trials, two puppets (grey and orange cats) sat at the back corners of the stage. The familiar box containing the rattle sat in the center of the stage, equidistant from each puppet. An experimenter performed the puppet show out of sight of the infants, by placing her hands through a black curtain at the back of the stage. Parents were instructed to sit quietly with their infants and not to attempt to direct their attention in any way.

1.1.2.3. Social condition. At the start of each trial, the Protagonist puppet (dog) entered from the center of the back of the stage and moved to one side of the box.[1] He leaned down to look inside the box twice, then jumped on the front corner of the box. He attempted to open the box four times. On the first two attempts he pulled up, lifted the edge of the box a few inches, and dropped it back down. On the third and fourth attempt, he lifted the edge of the lid and lowered it while continuously holding onto the lid, as if the lid was too heavy for him to open. On the fifth attempt, the cat puppet on the opposite side of the stage from the Protagonist (the Protagonist came in on alternating sides each trial) intervened.

During *Opening* events, the Opener puppet moved forward, grabbed the other corner of the box lid, and opened the box together with the Protagonist. Once the lid was open, the Protagonist dove down into the box, grabbing the rattle. The Opener then ran off-stage, and the Protagonist lifted the rattle out of the box.

During *Closing* events, the Closer puppet moved forward and jumped on the lid of the box, slamming it shut, and the Protagonist dove down next to the box. The Closer then ran off-stage, and the Protagonist sat up. After the Protagonist sat up during each trial (holding rattle during Prosocial events, not holding rattle during Antisocial events), all action paused. Both Opening and Closing events lasted approximately 15 s; looking time was measured from the point at which the action paused until the infants looked away for 2 consecutive seconds, or until 60 s had elapsed.

1.1.2.4. Inanimate Control condition. Inanimate Control events were identical to Social events, except that the Protagonist puppet was replaced with an inanimate plastic pincer covered in green duct tape. At the start of each trial, the pincer entered from the center of the back of the stage and moved to one side of the box as the Protagonist had done. As when the Protagonist had 'looked' inside the box, the pincer moved slightly toward the rattle inside the box twice and then grasped the front corner of the box, lifting and dropping the edge twice, then lifting and lowering the edge twice. On the fifth lift, the cat puppet on the opposite side of the box from the pincer moved forward toward the front of the box. During *Opening* events (identical to Opening events in the Social condition), the Opener grabbed the corner of the box and opened the box lid with the pincer. The pincer then reached into the box and grasped the rattle. The Opener ran off-stage, and the pincer lifted the rattle out of the box. During *Closing* events (identical to Closing events in the Social condition), the Closer jumped on the lid of the box, slamming it shut. The pincer then touched the stage surface next to the box. The Closer ran off-stage, and the pincer lifted up off the stage. Once the pincer lifted (holding the rattle in Opening events; not holding the rattle in Closing events), all action paused and the infant's looking time was measured. As in the Social condition, both Opening and Closing events lasted approximately 15 s.

To determine exactly which aspects of the display infants were relying on in the Social condition, we modified the procedure slightly for the 5-month-olds. Specifically, we asked whether infants would still positively evaluate the Box-Opener in a case in which the Protagonist did not lift the rattle from

the box. Thus, during Opening events, action paused once the Protagonist (claw) reached into the box, and the Opener puppet left the stage; during Closing events, action paused once Protagonist (claw) touched down on the stage and the Closer left the stage. Importantly, for each age group, the final location of the rattle was identical in both the Social and Inanimate Control conditions and thus cannot account for differences in results between conditions.

Infants in both the Social and Inanimate Control conditions were habituated to Opening and Closing events in alternation, using as a criterion for habituation that either (a) their looking time on three consecutive trials was less than half of their looking time on the first three trials, or (b) they had seen 14 habituation trials, whichever occurred first.

1.1.2.5. Choice Test event. Parents were instructed to then turn their chairs 90° to the right, so that they were no longer facing the puppet stage, and to close their eyes. An experimenter blind to the identity of the Opener and Closer puppets presented them to the infant, holding one in each hand, initially out of the infant's reach. The infant was required to look at both puppets and back to the experimenter. Once the infant had seen both puppets and the experimenter, the puppets were moved within reach of the infant, and the infant's choice was coded, by the blinded experimenter, as the first puppet the infant intentionally touched, that is, touched while concurrently looking at.

An independent coder, blind to the identity of the puppets as well as to, recoded a randomly chosen 25% of infants' choices and agreed with the original experimenter on 100% of cases.

The following were counterbalanced across infants within all conditions and in each age group: experimental condition (Social or Inanimate Control), identity of Opener (grey or orange cat), order of Opening and Closing events during habituation (Opening First or Second), side of Opener (Left or Right) during habituation, and side of Opener (Left or Right) during choice.

1.2. Results

1.2.1. Habituation

Rate of habituation did not differ across condition (infants habituated in an average of 9 trials in the Social condition and 10 trials in the Inanimate Control condition, $t(66) = -1.28$; $p > .20$), or across age (9-month-olds habituated in an average of 9 trials, 5-month-olds in an average of 10 trials, $t(66) = 1.2$, $p > .23$), and there were no differences across condition or age in the proportion of infants who reached the habituation criterion within 14 trials (all p's > .24).

1.2.2. Choice Test

Patterns of choice differed significantly across the Social and Inanimate Control conditions (Fischer's Exact Test, $p < .005$), but did not differ by age ($p > .99$). (see Fig. 1). Infants in the Social condition significantly preferred the Opener over the Closer puppet (25 of 34 infants chose the Opener, binomial test, $p < .01$; 12 of 16 nine-month-olds, one-tailed $p < .05$; 13 of 18 five-month-olds, one-tailed $p < .05$). In contrast, infants in the Inanimate Control condition showed a marginal preference for the Closer

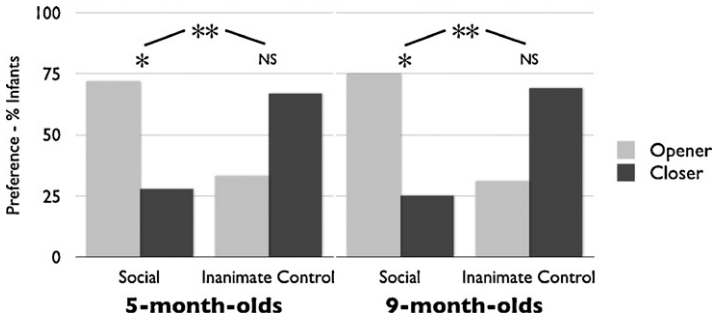

Fig. 1. Percent of 9-month-olds and 5-month-olds who chose the Opener and Closer puppet in each condition in Experiment 1. One-tailed $^{*}p < .05$; $^{**}p < .05$.

(only 11 of 34 infants in the Inanimate Control condition chose the Opener, binomial test, two-tailed $p = .058$), although neither age group did so on its own (5 of 16 nine-month-olds, $p = .105$; 6 of 18 five-month-olds, $p = .119$). There was no effect of order of events, color of puppet, or side of puppet on any comparison.

The marginal preference for the *Closer* in our Inanimate Control condition, while significantly different from the preference for *Opener* in the Social condition, is of note. It is possible that in this non-social version of the events, infants found the jumping/slamming behavior of the Closer to be perceptually more interesting than the opening behavior of the Opener. (Indeed, infants' emotional reactions to the closing events across conditions suggest that this is the case.)

1.3. Discussion

When shown an animate agent (puppet) trying but failing to open a box containing a rattle, infants preferred a puppet that helped the agent open the box to one that prevented the agent from opening the box. This result replicates previous findings (Hamlin et al., 2007, in press) that infants prefer those who help versus hinder an agent to achieve its location-directed goal and suggests that infants' social evaluative capacities generalize beyond a single social scenario or goal type. Additionally, the present study's use of an inanimate pincer in the control condition allowed us to show infants exactly the same physical actions carried out on the box by all characters involved – only the social identity of the central actor differed – and yet infants' preferences suggested they interpreted the box-opening and box-closing characters' actions quite differently across conditions. Experiment 2 replicates this finding with a different type of object-directed goal, retrieving a dropped ball. Experiment 2 assessed 5-month-olds using a reaching procedure, and 3-month-olds using a preferential looking procedure (as in Hamlin et al., in press).

2. Experiment 2: Retrieving a dropped ball

Five- and 3-month-olds were presented with a Protagonist who played with a ball at the middle of a puppet stage, repeatedly jumping up and down and tossing and catching the ball. The Protagonist then lost its ball to one side of the stage, which was retrieved by one of two puppets that rested at the back corners of the stage area. One puppet (the "Giver") gave the ball back to the Protagonist, while another puppet (the "Taker") took the ball off-stage. In a matched Inanimate Control condition, a mechanical pincer dropped a ball, and Giver and Taker puppets gave or took the ball, respectively.

2.1. Method

2.1.1. Participants

Twenty-four 5-month-olds participated, 12 in the Social condition (7 boys; mean age 4;27; range 4;14–5;26) and 12 in the Inanimate Control condition (7 boys; mean age 5;0; range 4;18–5;20). One additional 5-month-old was excluded from analyses due to failure to reach for either puppet. Twenty-four 3-month-olds participated, 12 in the Social condition (7 boys, mean age = 3;19; range = 3;0–4;5) and 12 in the Inanimate Control condition (5 boys, mean age = 3;15; range = 3;2–4;3).

2.1.2. Procedure

The testing room, puppet stage, puppets, and general experimental procedures were identical to Experiment 1 for 5-month-olds. Three-month-olds saw different puppets – two rabbits wearing orange and green shirts portrayed the giver and taker; the protagonist was a white and black cat. During Experiment 2, maximum looking on each habituation trial was 30s.

2.1.2.1. Social condition. At the start of each trial, the curtain raised to reveal a yellow ball resting at the center of the stage, approximately 2 feet from the back curtain.[2] The Protagonist puppet entered from the center of the back of the stage, and picked up the ball. It jumped up and down twice; on its third jump it dropped and retrieved the ball. The jump-toss-retrieve action repeated three times; on

the fourth jump the ball went toward one side or the other of the puppet stage, and the puppet on that side intervened.

During *Giving* events, the Giver moved forward and grabbed the ball. The Protagonist turned toward the Giver and opened its arms, apparently 'asking' for the ball back. The Giver turned toward the Protagonist, and then the two puppets faced forward simultaneously. The Protagonist then turned and opened its arms a second time; the Giver turned, and both faced forward again. On the Protagonist's third turn, the Giver rolled the ball toward the Protagonist, who caught it. The Giver ran off-stage, and the Protagonist faced forward holding the ball.

During *Taking* events, the Taker puppet grabbed the ball, and the Protagonist 'asked' for the ball back twice, as during Giving events. On the Protagonist's third turn, the Taker ran off-stage with the ball. The Protagonist faced forward without the ball. At the point at which the Protagonist faced forward, all action paused, and the infant's looking time was recorded beginning from this point as in Experiment 1.

2.1.2.2. Inanimate Control condition. As in Experiment 1, the Protagonist was replaced with an inanimate plastic pincer (covered in white duct tape). At the start of each trial, the curtain was raised to reveal the pincer holding the yellow ball. The pincer then raised and lowered the ball three times; on the fourth raise it dropped the ball to one side of the stage or the other. During *Giving* events, the Giver puppet ran forward and grabbed the ball. It then turned toward the pincer and turned back to face forward twice; the pincer remained motionless. The Giver then rolled the ball back toward the pincer, which picked up the ball. The Giver then ran off-stage. During *Taking* events, the Taker puppet grabbed the ball and turned toward and away from the pincer twice. The Taker then ran off-stage with the ball. At the point at which the Giver/Taker ran off-stage, all action paused and the infant's looking time was recorded as in Experiment 1.

The pincer of the control condition in Experiment 2 did not do exactly the same physical motions as the Protagonist. Practice revealed that it was simply impossible for our puppeteers to reliably drop and pick up a ball with the pincer at the end of a rod during live puppet shows and that the opening and closing of the pincer, and the contingent response of the Giver/Taker puppet to it, looked quite animate to adult observers (Johnson, Slaughter, & Carey, 2002). Thus, while the Giver/Taker puppets behaved identically across the Social and Inanimate conditions, there were slight variations in the actions of the pincer. These changes do not change the theoretical importance of our control condition, as the actions of the Giver and Taker (ball given versus ball taken) are the same, as are the overall physical relationships between all parties involved.

After the habituation criterion was reached, infants were given a Choice (5 months) or a Preferential Looking (3 months) test measure. The choice procedure was identical to that in Experiment 1. The Preferential Looking procedure is reported by Hamlin et al. (in press) and consisted of an experimenter, blind to experimental condition, holding up the two puppets 30 cm from the infants' face for 30 s. An independent coder subsequently coded from videotape the amount of time the infant spent looking at each character. A second independent coder blind to the identity of the puppets as well as to the experimental condition of the infant recoded a randomly chosen 33% of infants' responses in each age group, agreeing with the original experimenter on 100% of trials for 5-month-olds and reaching 99.7% agreement for 3-month-olds. The following were counterbalanced across infants within each condition and age group: experimental condition (Social or Inanimate Control), identity of Giver (grey or orange cat for 5-month-olds, green or orange bunny for 3-month-olds), order of Giving and Taking events during habituation (Giving First or Second), side of Giver (Left or Right) during habituation, and side of Giver (Left or Right) during choice/preferential looking.

2.2. Results

2.2.1. Habituation

Rate of habituation did not differ across conditions for either age group. Five-month-olds habituated in an average of 7 trials in the Social condition, 9 trials in the Inanimate Control condition, $t(22) = -1.34$; $p > .19$). Three-month-olds habituated in an average of 9 trials in the Social condition, 8 trials in the Inanimate Control condition, $t(22) = 1.32$, $p > .19$. Infants were no more likely to habituate

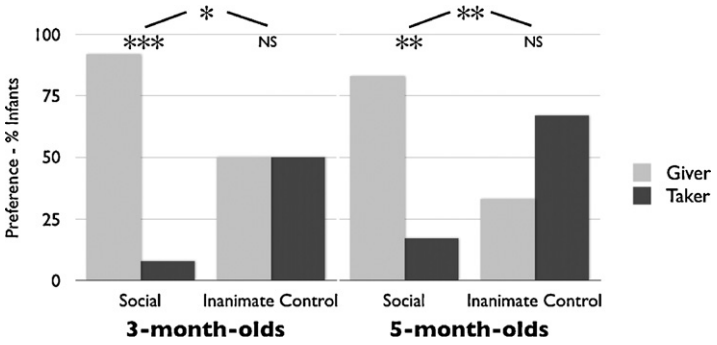

Fig. 2. Percent of 5-month-olds and 3-month-olds who chose the Giver and Taker puppet in each condition in Experiment 2. One-tailed $^{*}p < .05$; $^{**}p < .05$; $^{***}p < .01$.

in either condition in either age group (5-month-olds in the Social condition, 11 of 12 infants and in the Inanimate Control condition, 9 of 12 infants; $p > .59$ by a Fischer's Exact Test; 3-month-olds in the Social condition, 11 of 12 infants, and in the Inanimate Control 10 of 12 infants; $p > .99$).

2.2.2. Choice Test

Five-month-olds' pattern of choice differed significantly across the Social and Inanimate Control conditions (Fischer's Exact Test, $p < .05$) (see Fig. 2). Infants in the Social condition significantly preferred the Giver over the Taker (10 of 12 infants chose the Opener, binomial Test, $p < .05$). In contrast, 5-month-olds in the Inanimate Control condition did not prefer either puppet (4 of 12 chose the Giver, $p < .40$). There was no effect of order of events, color of puppet, or side of puppet on any comparison.

2.2.3. Preferential Looking test

An omnibus analysis of variance (ANOVA) on infants' looking times to the two characters (Giver versus Taker) with Mean Color (orange or green), Mean Order in Habituation (first or second), Mean Side in Habituation (left or right), and Mean Side during Preferential Looking (left or right) as between-subjects factors revealed no significant effects or interactions. These variables are collapsed for further analyses (see Fig. 3). An ANOVA on looking times to the Giver versus Taker with condition (Social versus Inanimate Control) as a between-subjects factor revealed a significant interaction between character and condition, $F(1, 22) = 8.21$, $p < .01$. Planned contrasts revealed that infants in the Social condition looked longer to the prosocial Giver (14.29s, standard error = 2.61) than to the antisocial Taker (2.91s,

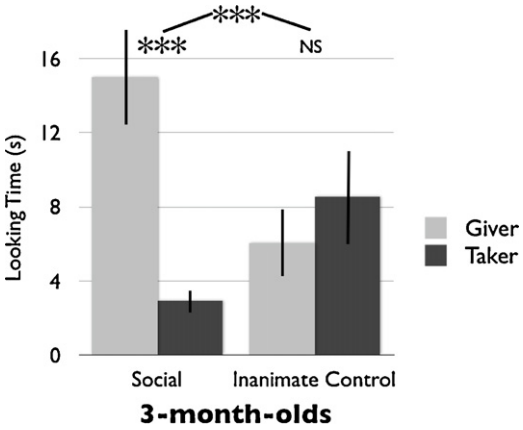

Fig. 3. Three-month-olds' looking time (in seconds) to Giver and Taker puppet in each condition in Experiment 2. $^{***}p < .01$.

SE = .60), $t(11) = 4.06$, $p < .005$. In contrast, infants in the inanimate control condition had no preference (mean looking to Giver = 6.05s, SE = 1.80; to Taker = 8.55s, SE = 2.53), $t(11) = -.63$, $p < .54$). This pattern was also present in infants' individual patterns of response: 11 of 12 infants looked longer to the Giver than the Taker in the Social condition ($p < .01$), whereas only 6 of 12 infants looked longer to the Giver than the Taker in the Inanimate condition ($p > .99$). This interaction is significant by a one-tailed Fischer's Exact Test, $p < .05$.

2.2.4. Results, collapsed across age

Twenty-one of 24 infants preferred the Giver to the Taker in the Social condition (binomial test, $p < .0005$), but only 10 of 24 did so in the Inanimate Control condition ($p < .55$). This interaction is significant by a Fischer's Exact Test, $p < .005$); there was no effect of age.

3. General discussion

Previous research has demonstrated that by 3 months of age, infants prefer those who behave prosocially to those who behave antisocially, in a social situation in which a character attempted but failed to climb a hill and was helped and hindered in that goal (Hamlin et al., 2007). This research suggested that infants positively assess those who aid others in their goals to *reach a particular location* or *move along a given trajectory*, as well as negatively assess those who block such goals. The present study adds to the claim that infants broadly evaluate prosocial and antisocial others, by providing evidence that they evaluate those who help or hinder another's object-oriented actions.

The current studies used stuffed animal hand puppets, rather than the wooden shapes previously used to examine infants' social evaluations (Hamlin et al., 2007). The choice of hand puppets in this study was largely based on their ability to perform biological motion (directed by human puppeteers) such as turning their heads, using their hands, etc.; without these abilities we could not have presented the goals of box-opening and ball-playing. Of course, the ultimate test of infants' social evaluations would be to use actual conspecifics – that is, human actors – but there are a variety of reasons why the use of puppets in the current studies was preferable. First, it allowed for our stimuli to be presented live, rather than on video, as would have been necessary if using human actors in order to strictly control the kinds of motion presented across conditions. Second, while our puppets had salient faces that attracted babies' attention, they did not have distinct, changing facial expressions as humans do, the presence of which might influence infants' interpretations of an actor's behaviors in unknown ways. Other studies have used stuffed animal puppets as stand-ins for human agents and have found that infants consider the behaviors of stuffed animals to be goal-directed, suggesting that results of experiments using puppets as social stimuli may be comparable to those using humans (Johnson et al., 2001; Legerstee & Markova, 2008). Thus, while it will be important for future work to replicate these studies with human actors, the use of puppets was ideal for the present studies.

Our Inanimate Control conditions present a particularly strong test of the claim that infants' evaluations are essentially social in nature, as the physical behaviors of the puppets were identical to those in the Social conditions – they were simply directed toward an inanimate entity. Thus, our effects cannot be attributed to infants' simply preferring characters that engage in some particular kind of behavior, such as those who open boxes as opposed to closing them, or who leave balls on a stage as opposed to taking them away. Nor can they be due to infants preferring those who bring about particular end-states. These results add to the literature suggesting that infants are selective in their goal interpretations of animate versus inanimate actions (Hamlin et al., 2009; Legerstee & Markova, 2008; Meltzoff, 1995; Woodward, 1998), and further suggest that infants do not evaluate intentional agents on the basis of their actions toward inanimate entities.

Infants *can* attribute goal-directedness to inanimate objects, when sufficient cues to agency are present (Biro & Leslie, 2007; Csibra, 2008; Johnson et al., 2002; Luo & Baillargeon, 2005; Shimizu & Johnson, 2004). These cues include equifinal variations in motion, self-propelledness, action effects, contingency, and being seen to choose amongst alternatives, among others. Infants under 12 months of age appear to require multiple cues to agency to attribute goal-directedness to inanimate objects, with younger infants requiring the presence of more cues to do so (Biro & Leslie, 2007). Our pincer exhibited only one of these cues – namely, its actions caused observable effects (upon the box lid

or the ball) – insufficient on its own to enable infants to perceive it as goal-directed (indeed, we intentionally designed the control conditions in this way). Future studies might test whether the presence of additional agency cues would lead infants to interpret the behavior of the pincer as goal-directed (Biro & Leslie, 2007) and to positively evaluate those who helped the pincer in its goals.

While these results are striking, it is difficult to know exactly which aspects of our social scenarios infants were responding to in each experiment. For instance, when observing the box-directed behavior of the Protagonist in Experiment 1, infants may have interpreted this behavior as being directed toward the rattle inside the box (a second-order goal in which the box is opened in order to obtain the rattle; Sommerville, Hildebrand, & Crane, 2008), or as reflecting the first-order goal to open the box, unrelated to the rattle inside. Similarly, in Experiment 2, the Protagonist's behavior might have been interpreted as directed toward the abstract goal of playing (with the ball or with the ball and the other puppets) or simply toward obtaining the ball for himself. Thus, while infants presumably had to recognize that the Protagonist had some kind of goal that was then facilitated or hindered, it is unclear from the present design exactly what infants understood that goal to be.

Relatedly, the present results do not allow us to determine whether infants infer that the characters hold *enduring goals* or *dispositions* to help or hinder others. Infants' preferences suggest that they evaluated the puppets as having behaved well or badly in the specific social interactions observed. If they had not done so, there would have been no basis for their approach/avoidance behaviors. Yet, it is unclear whether infants' evaluations reflect judgments of the enduring relationships between the puppets or of the puppets' underlying personality traits (or both). Indeed, much work suggests that children do not reliably link others' behaviors to their enduring dispositions until at least kindergarten age (Heller & Berndt, 1981; Rholes & Ruble, 1984; see Yuill, 1993, for a review); however, some have theorized that the domain of sociomoral goodness may be conceptualized in this way particularly early (Cain, Heyman, & Walker, 2006; Dweck, 1991; Heyman, Dweck, & Cain, 1992). Thus, whether infants attribute enduring sociomoral traits to others is a question for future study.

Our results show that infants' early preferences for prosocial over antisocial others apply across multiple social scenarios involving different kinds of goal event structures. They support the claim that evaluating third parties based on their treatment of social others is fundamental to perceiving the social world. It is unlikely that infants have been sufficiently socialized, by 3, 5, or even 9 months of age, to distinguish between the positive and negative intentions of social others to an extent that would explain our results, yet infants take this difference into account when choosing whom to interact with, based on their reaching and looking behavior. The ability to distinguish positive from negative potential social partners has been documented in older children and adults and has been theorized to be a necessary cognitive mechanism supporting the evolution of our cooperative tendencies (Axelrod, 1984; Trivers, 1971). The present research adds to the evidence that third-party social evaluation is present in the first year of life, and it suggests that infants' social evaluations, like those of adults, generalize to a variety of social scenarios and goal types.

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