

# How infants and toddlers react to antisocial others

J. Kiley Hamlin<sup>a,1</sup>, Karen Wynn<sup>b</sup>, Paul Bloom<sup>b</sup>, and Neha Mahajan<sup>b</sup>

<sup>a</sup>Department of Psychology, University of British Columbia, Vancouver, BC, Canada V6T 1Z4; and <sup>b</sup>Department of Psychology, Yale University, New Haven, CT 06511

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**Although adults generally prefer helpful behaviors and those who perform them, there are situations (in particular, when the target of an action is disliked) in which overt antisocial acts are seen as appropriate, and those who perform them are viewed positively. The current studies explore the developmental origins of this capacity for selective social evaluation. We find that although 5-mo-old infants uniformly prefer individuals who act positively toward others regardless of the status of the target, 8-mo-old infants selectively prefer characters who act positively toward prosocial individuals and characters who act negatively toward antisocial individuals. Additionally, young toddlers direct positive behaviors toward prosocial others and negative behaviors toward antisocial others. These findings constitute evidence that the nuanced social judgments and actions readily observable in human adults have their foundations in early developing cognitive mechanisms.**

cooperation | infancy

Our intensely social nature provides both opportunity and risk. By entering into cooperative alliances with others, individuals can achieve successes they could never reach on their own. However, they are also vulnerable to being cheated and exploited. It would be highly beneficial, then, to be able to remember the past behaviors of other individuals and to be motivated to interact differently with these individuals based on these behaviors (1, 2).

As a minimal proposal, this capacity might be expressed in terms of fairly simple heuristics, of the form “If X has been helpful in the past, approach X” and “If Y has been uncooperative or dangerous in the past, avoid Y.” Prior research, building from initial studies by Kuhlmeier et al. (3), suggest that such tendencies emerge early in development. Infants in their first year of life will approach individuals who have acted positively toward others and avoid those who have acted negatively (4–6). Infants also expect others to respond in this manner—to approach those who have helped them and avoid those who have harmed them (3, 4, 7).

Infants’ understanding might extend beyond these simple heuristics, however. For one thing, the intentions of an agent may inform even our earliest judgments. Both preverbal infants and nonhuman primates distinguish someone who tries but is unable to give them a treat from one who intentionally withholds a treat—and they prefer the former (8–12). One might expand the heuristics, then, to “If X has been intentionally helpful in the past, approach X” and “If Y has been intentionally uncooperative or dangerous in the past, avoid Y.”

Adults, however, are not limited even to these expanded heuristics. Under at least some circumstances, people are motivated to approach individuals who have been intentionally harmful in the past—to punish them (13–15). The urge to punish others’ antisocial acts is sufficiently strong that adults will sometimes do so anonymously and at personal cost (so-called altruistic punishment), even when they themselves are unaffected by the antisocial act and have nothing to gain by their costly action (16–19). Neurological reward systems are activated during punishment, suggesting it is individually reinforcing (20).

In other instances, however, adults approach harmful individuals not to punish them, but because the harmful acts and individuals have been positively evaluated. Such positivity toward harmful individuals may reflect several underlying evaluative processes. First, harms directed toward those who are themselves

wrongdoers may be evaluated positively, as deserved acts of punishment. Humans show increased trust toward punishers and institutions that punish wrongdoers (21–27). Alternatively, attraction toward those who harm others might be based on social alliances. If the target of a harmful act is disliked, adults may be drawn to someone who harms that target because the harmful behavior reflects a shared (negative) attitude that, in turn, suggests the potential for mutual liking and affiliation (as illustrated by the common phrase “the enemy of my enemy is my friend”; refs. 28–30). For adults then, social evaluation often goes beyond analyzing the immediate, local valence of a behavior enacted toward another. We consider our previous evaluations of a target to determine the overall, what we might call the global valence of the action\*.

The capacity for such nuanced social evaluations—in which the meaning of an act is influenced not solely by its own value but also by that of its target—may arise solely through cultural learning achieved during individual development. However, it may stem, at least in part, from processes of natural selection that shaped an evolved system of social judgment that supports the stable existence of cooperation in our species (31–34). Here, we examine the developmental origins of the capacity for nuanced social evaluations in preverbal infants and in just-verbal toddlers. Evidence for such evaluations in these populations would be consistent with an adaptationist theory of their origin.

## Experiments, Results, and Discussion

In experiment 1, we examine whether infants positively evaluate an individual who behaves negatively toward another who has acted antisocially. Our methodology builds on previous research showing that preverbal infants distinguish between prosocial and antisocial actions directed toward third parties (3, 35) and prefer prosocial over antisocial actors (4–6). Here, 5- and 8-mo-old infants saw a character (an animal hand puppet) repeatedly trying unsuccessfully to lift the lid of a clear box containing a rattle. On two separate trials, infants saw the character (*i*) helped by a prosocial puppet who aided in opening the box, enabling the character to grasp the rattle; and (*ii*) hindered by an antisocial puppet who jumped on top of the box lid, slamming it shut. Previous studies from our laboratory have found that, given a choice between the prosocial and antisocial puppets from this scenario, infants significantly prefer (as reflected by whom they choose to reach for) the prosocial one (6). In the current study we asked how, after observing these interactions, young infants evaluate new actors who, in their turn, direct helpful or harmful actions toward the prosocial and antisocial individuals.

To address this question, subjects were placed into one of two conditions immediately after observing the above interactions. Subjects in the Prosocial Target condition saw new interactions in which the formerly prosocial puppet was now playing with a ball,

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<sup>1</sup>To whom correspondence should be addressed. E-mail: kiley.hamlin@psych.ubc.ca.

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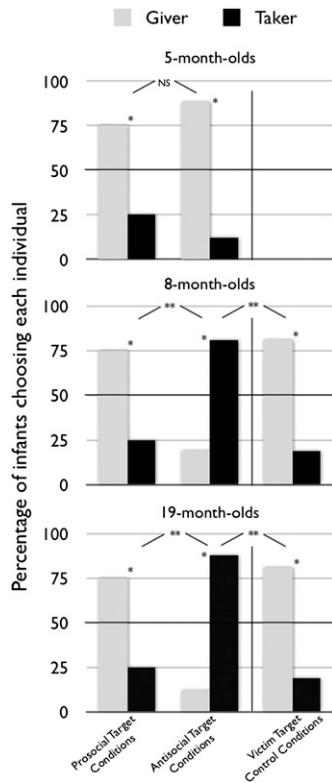
\*Heider (1958) referred to this distinction as “local relevance” vs. “total relevance” (42).

which he then dropped. On separate trials, his ball was (i) given back by a Giver, and (ii) taken away by a Taker. Subjects in the Antisocial Target condition saw the Giver and Taker direct the same acts toward the formerly antisocial puppet. Subjects in both conditions were then presented with the Giver and the Taker and encouraged to select one of them. The question of interest was whether infants' preference for Givers versus Takers would be influenced by the previous behavior of the Target.

When the target was the previously prosocial puppet, both 5- and 8-mo-old infants preferred the Giver (12 of 16 5-mo-olds; 12 of 16 8-mo-olds, one-tailed binomial probability tests,  $P < 0.05$ ; Fig. 1), replicating our previous finding that infants of these ages prefer helpful individuals in this scenario (6). Infants' preference in the Antisocial Target condition, however, differed by age (Fisher's Exact test,  $P < 0.005$ ). Five-month-olds continued to prefer the Giver (14 of 16 infants,  $P < 0.005$ ), whereas 8-mo-olds preferred the Taker (13 of 16 infants,  $P < 0.05$ ) (see *SI Materials and Methods* and *Table S1* for secondary data and discussion).

Thus, by 8 mo of age, our subjects preferred individuals who acted positively toward prosocial others and preferred those who acted negatively toward antisocial others. These results suggest that by this age, the value of a social act is not determined solely by its positive or negative effect upon a recipient, but also on that recipient's own status as a positive or negative individual. In contrast, 5-mo-olds evaluated actors solely on the basis of the local valence of their actions.

A possible alternative explanation for the 8-mo-olds' performance is that infants matched the negative local valence of the Taker's act to the negative valence of the social interaction previously associated with the Antisocial Target and preferred the Taker solely because the valences of action and target agreed.



**Fig. 1.** Results in experiments 1–3. Percentage of infants choosing the Giver versus the Taker when the Target of giving/taking was previously Prosocial, Antisocial, or a Victim is shown. Asterisk, Binomial test, one-tailed  $P < 0.05$ ; double asterisk, Fisher's Exact test,  $P < 0.05$ .

Similarly, in the Prosocial Target condition, infants may have preferred the Giver because the positive valence of the Giver's act matched the positive valence associated with the previous interaction in which the Prosocial Target was engaged. Such a preference would be sufficient to account for our results.

If a simple valence-matching preference underlies our 8-mo-olds' responses, then infants of this age should prefer individuals who treat anyone associated with a negative interaction negatively. To assess this possibility, we conducted a second experiment with 8-mo-olds. As in the Antisocial Target condition of experiment 1, infants saw giving and taking directed toward an individual who had been involved in a negative interaction. In this case, however, the target had been the victim of the negative action, not the perpetrator. Specifically, infants saw a puppet (the Victim) attempting to open a box, which was slammed shut by another puppet. The Victim was then presented in a new show, playing with a toy ball which was, as in experiment 1, alternately stolen by a Taker Puppet, and given back by a Giver.

If valence-matching, not nuanced social evaluations, drove 8-mo-olds' responses in Experiment 1, infants in Experiment 2 should also prefer the Taker to the Giver, even though mature observers would not see the former victim as deserving of negative treatment. Importantly, results showed that 13 of 16 infants preferred the Giver to the Taker (binomial test,  $P < 0.05$ ). This pattern of choice differs significantly from 8-mo-olds' choices in the Antisocial Target condition of experiment 1 (Fisher's Exact Test,  $P < 0.005$ ).

Taken together, results from experiments 1 and 2 suggest that by 8 mo of age, infants are capable of evaluating third-party social behaviors in a manner that goes beyond simple "prosocial = good; antisocial = bad" judgments. They positively view not only those who behave positively toward prosocial individuals, but also those who mete out negative treatment to antisocial individuals.

The question remains whether infants are themselves inclined to treat antisocial characters negatively. Our next experiments addressed this question, examining the behaviors that young toddlers (under 2 y of age) themselves enact toward prosocial and antisocial characters.

In experiment 3, we first replicated experiments 1 and 2 with 19-mo-old toddlers, to ensure that they, like 8-mo-old infants, prefer those who act positively toward prosocial individuals, and those who act negatively toward antisocial individuals. All effects were significant in the expected directions (Fig. 1; Prosocial Target, 12/16 chose Giver; Antisocial Target, 14/16 chose Taker; Valence-matching Victim Control, 13/16 chose Giver,  $P < 0.05$  by one-tailed binomial tests).

To examine toddlers' tendencies to engage in valenced actions toward prosocial and antisocial individuals themselves, 19- to 23-mo-olds in experiment 4 first played a warm-up game in which they were trained to give "treats" (small foam blocks) to several stuffed animals by placing a treat into each animal's bowl. The experimenter mimed the animals eating the treats as they received them; the animals acted as if they enjoyed the treats very much.

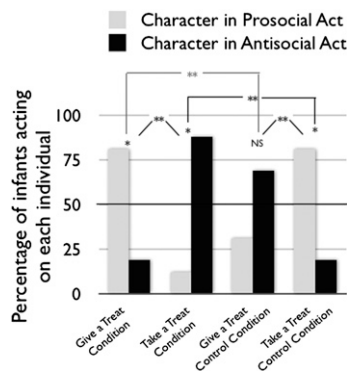
After the warm-up, toddlers were shown either the box-opening or ball-playing puppet scenario from experiments 1 and 2, with new puppets. In each show, subjects witnessed three prosocial and three antisocial acts occurring in alternation for a total of six events. Participants were then randomly assigned to a Giving a Treat condition or a Taking a Treat condition. All participants were reintroduced to the treat-giving game, now with the Prosocial and Antisocial Puppets as potential treat recipients. Subjects in the Giving-a-Treat condition were told that there was "only one treat left" and that they needed to choose which of the two puppets to give it to; they were then given the treat to distribute to the recipient of their choice. Subjects in the Taking-a-Treat condition were shown a new animal "who didn't get a treat" and asked to take a treat away from either the Prosocial or Antisocial puppet (their choice) so that this animal could have one.

Toddlers in the Giving-a-Treat condition gave the treat significantly more often to the Prosocial puppet (13 of 16 subjects,  $P < 0.05$ ). Conversely, in the Taking-a-Treat condition, toddlers took the treat significantly more often from the Antisocial puppet, (14 of 16 subjects,  $P < 0.005$ ). Toddlers' choice of puppet differed significantly between the two conditions (Fig. 2; Fisher's Exact Test,  $P < 0.0005$ ). Performance did not differ as a function of the social scenario ("box-opening" versus "playing-with-ball") shown ( $P > 0.99$ ). To sum up, toddlers asked to perform a positive action preferentially chose the Prosocial character as their target, whereas those asked to perform a negative action preferentially chose the Antisocial character as their target.

Our favored interpretation is that toddlers directed a positive behavior toward the Prosocial puppet and a negative behavior toward the Antisocial puppet because these responses are thought to be appropriate counteractions to the previous behaviors of these puppets. However, as with experiment 1, it is important to explore the alternative that toddlers' choices resulted from a form of valence-matching in which they simply acted positively toward a character associated with a positive interaction and negatively toward a character associated with a negative interaction.

We explored this valence-matching alternative in experiment 5, in which new groups of toddlers were trained to give treats to animals, and then chose which of two characters to give or take a treat from. As in experiment 2, instead of choosing between two characters who had performed a positive and a negative action, respectively, they chose between two characters who had each been the target of, respectively, a positive and a negative action by a third individual. Toddlers were shown a scenario in which a character helped one puppet (the Helpee) to open a box and hindered another (the Hinderee) from opening the box. Then, toddlers were presented with both Helpee and Hinderee and were asked either to Give, or to Take, a treat from one of them as in experiment 4.

Contrary to what a valence-matching account would predict, toddlers in the Giving-a-Treat condition chose randomly between the two targets (11 of 16 gave to the Hinderee,  $P > 0.10$  by a binomial test), whereas toddlers in the Taking-a-Treat condition significantly took from the Helpee (13 of 16 toddlers,  $P < 0.05$ ). In neither case did toddlers significantly direct their Giving or Taking act toward the puppet who had been involved in an interaction that matched the act's valence; responses were significantly different from those of experiment 4 in each condition (Fisher's Exact;  $P < 0.05$  and  $P < 0.0005$ , respectively, for Giving and Taking conditions). Interestingly, toddlers in the Taking condition systematically avoided taking from the individual who had already suffered



**Fig. 2.** Results in experiments 4 and 5. Percentage of toddlers directing Giving or Taking actions toward characters, who performed a Prosocial or an Antisocial act, or toward characters who received a Prosocial or an Antisocial act is shown. Asterisk, Binomial test, one-tailed  $P < 0.05$ ; double asterisk, Fisher's Exact test,  $P < 0.05$ .

antisocial treatment from a third party. This response is the opposite of that predicted by a valence-matching account and is consistent with previous findings that young toddlers engage in empathetic behaviors (36); it is possible that our subjects avoided taking from the previously harmed individual because they felt sympathetic toward it.

## General Discussion

The findings reported here are consistent with other research on early emerging social and moral capacities. Previous research has established that toddlers engage in helpful behaviors toward adults (37) and peers (38), and that young children engage in prosocial behaviors toward victims of others' antisocial acts (39), may protest during/tattle after these acts (40), and selectively confer rewards on prosocial over antisocial individuals (41). Additionally, research with preverbal infants suggests that they positively evaluate those who treat third parties prosocially (4–6) as well as fairly (42).

Our findings add to this growing literature and suggest that in the second half of the first year, infants' social evaluations, like those of adults, become based on more than rigid and simplistic rules of "if helpful, then positive; if unhelpful, then negative," but rather depend crucially on the contexts in which such behaviors are performed. Our 5-mo-old subjects preferred an individual who acted positively toward another regardless of the target's previous behavior, suggesting that they apprehended the local valence of the action witnessed but did not compute its global valence in the broader context. In contrast, our 8-mo-old infants assessed the global value of an action—their patterns of choice suggest that, in particular, they viewed a locally negative action as bad when directed toward a prosocial individual, but good when directed toward an antisocial individual. Our toddlers were willing to approach (rather than avoid) individuals who had behaved antisocially, overcoming their aversion to antisocial others (4–6, 42) to direct a negative behavior toward them.

Our valence-matching controls confirm that infants did not endorse, and toddlers did not engage in, taking from victims of antisocial acts. Although adults and schoolchildren are sometimes subject to a "blame the victim" effect (43, 44) this does not appear to be the case for babies and toddlers, at least in the situations we explored.

Results from our experiments 4 and 5 suggest that toddlers have intuitions that correspond to adult notions of reward and punishment—they tend to act positively toward characters seen to behave prosocially and negatively toward those seen to behave antisocially. It is possible that the choices made by our younger subjects in experiments 1–3 reflect similar intuitions of reward and punishment—in particular, that infants prefer an individual who harms a wrongdoer over one who helps, because they view the wrongdoer as deserving punishment. Although infants had no evidence that the Taker knew of the Target's previous behavior, and their evaluation may not have stemmed from viewing the Taker as punishing intentionally, they may still have positively evaluated the performer of a deserved act. Alternatively, infants may affiliate themselves with prosocial but not antisocial individuals, and, for this reason, prefer those who are positive to the former and negative to the latter. Future research will be needed to distinguish between these possibilities.

In sum, our studies find evidence that infants are making relatively complex and sophisticated social judgments in the first year of life. They not only evaluate others based on the local valence of their behavior, they are also sensitive to the global context in which these behaviors occur. During the second year, young toddlers direct their own valenced acts toward appropriate targets. These findings are consistent with the theoretical stance that systems for nuanced third-party evaluation are basic components of a system that supports intraspecies cooperation (16, 18–21, 31–34).

## Materials and Methods

**Experiment 1: Evaluating Those Who Give to vs. Take from Previously Prosocial or Antisocial Targets.** Subjects were 32 5-mo-olds (16 girls; mean age 5;0; range 4;15–5;15) and 32 8-mo-olds (14 girls; mean age 8;0; range 7;14–8;14). An additional two 5-mo-olds and three 8-mo-olds were excluded because of fussiness (1), procedure error (3), or failure to choose either puppet (1). Subjects in all experiments were full-term infants.

Subjects sat on their parents' laps; in this and all experiments, parents were instructed to sit quietly with their infants and not to attempt to direct their attention in any way. Parents and infants sat before a table surrounded on three sides with black curtains, with an additional curtain near the far end (165 cm from the infant), which was lowered to occlude the puppet characters between events. An experimenter performed the puppet show live by placing her hands through the curtain at the back of the stage. Characters were five animal hand puppets, ≈23 cm high: one yellow duck, two elephants in a yellow and a red shirt, and two moose puppets in an orange and a green shirt.

During phase 1, the curtain raised to reveal a clear plastic box, 35 cm wide × 26 cm deep × 10 cm high, containing a brightly colored rattle. Two elephants sat on either side of the box at the rear of the stage. Infants saw two events: one Prosocial and one Antisocial (Movies S1 and S2). At the start of each event, the duck puppet approached one side of the box. It leaned down and "looked" inside twice, then jumped on the front corner of the box. It attempted to open the box four times: On the first two attempts it lifted the box edge a few inches and dropped it back down. On the third and fourth attempt, it lifted and lowered the lid while continuously holding it. On the fifth attempt, the elephant puppet on the opposite side of the stage from the duck (who approached alternate sides of the box on each trial) intervened.

During Prosocial events (Movie S1), the Prosocial elephant moved forward, grasped the other front corner of the box lid, and opened the box with the duck. The duck dove into the box, grabbing the rattle; the Prosocial elephant ran off-stage. During Antisocial events (Movie S2), the Antisocial elephant moved forward and jumped on the lid of the box, slamming it shut. The duck dove down next to the box; the Antisocial elephant ran off-stage.

After the duck dove down in both events, action paused. Events lasted ≈15 s; looking time was measured from the point at which action paused until subjects looked away for 2 consecutive seconds, or until 30 s elapsed, as determined by an online coder who peeked through a hole in the curtain on the infants' right side and the computer program JHab.

After phase 1, subjects in each age group were split into two conditions for phase 2: Prosocial Target and Antisocial Target. Each subject saw two additional events, one Give and one Take (Movies S3 and S4), for a total of four events in the entire experiment. The puppeteer for phase 1 was different from that of phase 2 and, therefore, blind to condition.

During Give events, the curtain raised to reveal a small yellow ball at the center of the stage; two moose puppets sat at each back corner. An elephant (either the Prosocial or Antisocial puppet from phase 1) entered and grabbed the ball. It jumped up and down twice; on its third jump, it dropped and retrieved the ball. The jump-drop-retrieve action repeated three times; on the fourth, the ball was dropped toward the Giver, who grabbed the ball. The elephant turned toward the Giver and opened its arms, as if "asking" for the ball back. The Giver turned toward the elephant, and then the two puppets faced forward simultaneously. The elephant then turned and opened its arms a second time, the Giver turned, and both faced forward again. On the elephant's third turn, the Giver rolled the ball to the elephant. The Giver ran offstage, and the elephant faced forward with the ball.

During Take events, the ball dropped to the Taker, who (after identical turning and being asked for the ball back as in the Give event) ran offstage with the ball. The elephant faced forward without the ball.

Events lasted ≈15 s. Looking time was measured from the time the elephant turned forward, as in Prosocial and Antisocial events in phase 1.

Subjects were then given the choice measure. Parents turned their chairs away from the puppet stage and were reminded to close their eyes. The puppeteer from phase 1 (blind to the identities of the puppets from phase 2) presented the Giver and Taker by holding them in front of the subjects, ≈30 cm apart and out of reach. Subjects were required to look at both puppets and back to the experimenter. Puppets were moved within reach; choice was coded by the blind experimenter as the first puppet touched with a visually guided reach. A second coder independently coded a random 25% of subjects in each age group in each condition from videotape; coders reached 100% agreement.

The following were counterbalanced across subjects in each age group: phase 1: (i) Prosocial/Antisocial puppet shirt color; (ii) Prosocial/Antisocial event order; (iii) Prosocial/Antisocial puppet position (left/right of stage). Phase 2: (i) Prosocial/Antisocial Target condition; (ii) Giver/Taker shirt color;

(iii) Give/Take event order; (iv) Giver/Taker position during events; (v) Giver/Taker position during choice.

**Experiment 2: Valence Matching Victim Control.** Subjects were 16 8-mo-olds (9 girls; mean age 8;1, range 7;19–8;15).

Stimuli were identical to experiment 1, except during phase 1: Instead of seeing events in which one character attempted to open a box, subjects were shown events in which the duck helped one elephant open the box and prevented the other elephant from opening it. That is, the elephants were the targets, rather than the performers, of prosocial and antisocial behaviors, all performed by the duck.

During the Helpee event (Movie S5), the duck entered the stage and paused. The Helpee elephant moved toward the front edge of the box and attempted to open it (all attempt actions identical to in experiment 1). The duck then moved around the box to its opposite front corner and opened the box lid with the Helpee, who dove into the box (actions identical to Prosocial actions in experiment 1). The duck ran offstage and action paused.

During the Hinderee event (Movie S6), the curtain raised and the duck entered as in the Helpee event. The Hinderee moved forward and attempted to open the box. The duck then moved around the box to its opposite corner and jumped on the box, slamming it shut (actions identical to Antisocial actions in experiment 1); the Hinderee dove down next to the box. The duck ran offstage and all action paused.

Phase 2 had only one condition. All subjects were shown Give and Take events identical to those in experiment 1; the target of these events was always the Hinderee elephant. Subjects then chose between the Giver and Taker as in experiment 1. An independent experimenter coded an additional 25% of subjects' choices; coders reached 100% agreement.

The following were counterbalanced across subjects in each age group: phase 1: (i) Helpee/Hinderee shirt color; (ii) Helpee/Hinderee event order; (iii) Helpee/Hinderee position during events. Phase 2: (i) Giver/Taker shirt color; (ii) Give/Take event order; (iii) Giver/Taker position during events; (iv) Giver/Taker position during choice. Looking time to all trials was measured as in experiment 1.

**Experiment 3: 19-mo-Old Replication.** Subjects were 48 19-mo-olds (16 infants each in Prosocial Target, Antisocial Target, and Valence-Matching Control conditions; 22 girls; mean age 19;15; range 18;17–20;13). An additional nine subjects were excluded owing to procedure error (2), fussiness (3), and failure to choose either puppet (4). All procedures were identical to experiments 1 and 2.

**Experiment 4: Giving-a-Treat vs. Taking-a-Treat Actions.** Subjects were 32 19- to 24-mo-olds (16 girls; mean age 20;27 d; range 19;3–23;29). An additional six subjects were excluded owing to procedure error (2), fussiness (2), and failure to perform the test act (2).

Parents and subjects sat before the table/puppet stage of experiments 1 and 2. The experiment proceeded in three phases: phase 1 consisted of a warm-up exercise in which subjects were asked to give treats to various dog stuffed-animals. Phase 2 consisted of a live Prosocial/Antisocial puppet show in which two dog puppets (one wearing a blue T-shirt, the other a yellow T-shirt, both ≈30 cm tall) either helped or hindered a third party (a white and black striped tiger puppet, ≈30 cm tall) in its goal. During phase 3, subjects were asked to choose which of the dog puppets to give a treat to (Giving-a-Treat condition) or to take a treat from (Taking-a-Treat condition).

During phase 1, for all subjects, an experimenter appeared from behind the curtain on subjects' right holding five dog stuffed-animals. She asked the subjects whether they would like to meet her "puppy friends." She then said "OK, we're going to line them up," and marched each of the five dogs out in turn, pointing out something about each one (i.e., "Here's a puppy friend! He has big floppy ears," or, "He has long fur."). Each dog (voiced by the experimenter) greeted the subjects and made a barking sound. The subjects were allowed to touch the dogs if they chose. The dogs were lined up next to each other one by one, from the subjects' left to their right (farthest to closest to the experimenter). After the dogs were lined up, the experimenter said "OK, now I'm going to go get some bowls so we can give these puppies some treats. Will you help me give them some treats? OK! You wait there while I get their bowls." She ducked back behind the curtain and returned with five plastic bowls in assorted colors. She said "These are their bowls! We can give each puppy a bowl, and later he can eat out of it!" The experimenter demonstrated this by putting a bowl in front of the farthest dog to the subjects' left, sticking the dog's head in the bowl and making eating sounds. She then said "And we can give this puppy a bowl," [next dog in row received bowl], "and this puppy," [third dog], "and him," [fourth dog], "and him!" [fifth dog]. After each dog had a bowl in front of it, the experimenter

said "OK! Now that everyone has a bowl, I'm going to get their treats. Will you help me give them some treats?" She then ducked back behind the curtain and came up holding five foam blocks. She held out the blocks toward the subjects and said "These are their treats. They love these treats! Can you help me give a treat to a puppy?" At this point, some subjects grabbed a treat from the experimenter's hand and put it in a bowl. If subjects did not do so, the experimenter would take one treat and say "See, we can put a treat in a puppy's bowl, and then he can eat it!" She put a treat in the dog's bowl farthest to the subjects' left, stuck the dog's head near the treat and made eating sounds. She then made the dog say "Mmm! Yum! Thank you!" After the first dog was fed, the experimenter held out another treat and said "Can you give a treat to another puppy? Who else needs a treat?" Most subjects took a treat and placed it in a bowl; once they did so, the experimenter mimed the puppy eating the treat and saying "yum, thank you." If the subject did not take a treat, they would be encouraged in a variety of ways, including placing the treat on the table in front of the subject or pointing to an empty bowl. If the subject did take and give a treat, but gave it to a dog that already had a treat, they were corrected by the experimenter by taking the extra treat out of the bowl and saying "That puppy already has a treat. Who else needs a treat?" This procedure continued until all of the dogs had treats. Once all of the dogs had treats in their bowls, the experimenter said "That was so great! You gave all these puppies a treat! Now, I'm going to take these puppies to the back so they can finish their treats, and we're going to watch a show with some more puppies." She then gathered up the dogs and the treat bowls and mimed the dogs saying "Yum! Thank you!" once again to the subjects before taking them away.

During phase 2 of experiment 4, subjects were shown one of two possible Prosocial/Antisocial live puppet shows: either the box-opening or the ball-playing show from Experiment 1. There were two minor differences in the puppet shows between Experiments 1 and 4. First, Experiment 4 used different puppets (tiger and two dogs) to act out the Prosocial and Antisocial events, and second, during the box show in Experiment 4, the puppet that attempted to open the box sat up at the end of each event, holding the rattle during Prosocial events and not holding the rattle during Antisocial events. All subjects saw three Helper and three Hinderer events in alternation for a total of six events; puppet shows were performed by an independent experimenter who had not done the warm-up in phase 1. Looking times were recorded as in experiment 1.

The following were counterbalanced during phase 2: (i) box/ball scenario; (ii) Prosocial/Antisocial color shirt; (iii) Prosocial/Antisocial event order; and (iv) Prosocial/Antisocial event position.

During phase 3, subjects were split into two conditions that were balanced in sex and age: a Giving-a-Treat and a Taking-a-Treat condition. For all subjects, the experimenter who had performed the warm-up in phase 1 (who had not seen the puppet show during phase 2 and was therefore blind to the identities of the puppets) brought the Prosocial and Antisocial puppets from behind the curtain, greeted the subject, and said "Do you remember these guys from the show?" She then centered the puppets on the table in front of the subjects,  $\approx 30$  cm apart and slightly out of reach. She said (as in the warm-up) "I'm going to get these guys some bowls so we can give them some treats. Can you help me give them some treats?" She ducked behind the curtain and came up with two bowls. She placed one bowl in front of each puppet, starting with the puppet on the subjects' left, and said "he gets a bowl, and he gets a bowl."

For subjects in the Giving-a-Treat condition, the experimenter then said "now I'm going to get their treats," and ducked behind the curtain again. From behind the curtain, she exclaimed "Oh no! Look!" She came out holding only one treat (foam block). She said "Look! There's only one treat left! There's only one treat! I think we need to decide who to give it to." She looked to the puppets and said "We can give the treat to this puppy [touching the head of the puppet on the subjects' left] or this puppy [touching the puppet on subjects' right]. We can give it to him [touching left] or him [right]." She then said "can you help me decide who to give it to?" and held the treat out to the subjects for them to distribute as they chose.

For subjects in the Taking-a-Treat condition, after giving each puppet a bowl, the experimenter also gave each puppet a treat. She said "alright! Now everyone has a... [ducking behind the curtain]... Oh no! Look!" She came from behind the curtain, holding an empty bowl and a new dog stuffed animal, who had not been given a treat during the warm-up game. "Look what I found! I found a puppy who didn't get a treat! Look! His bowl is empty! [turning his bowl upside-down]." She looked toward the puppets and said "I think we need to take one of these guys' treats and give it to him." She placed the treatless

dog and its bowl down in between the puppets, right in front of the subjects, and said "We can take a treat from this puppy [touching the puppet on the subjects' left] or this puppy [touching the puppet on the subjects' right], and give it to him [touching the treatless puppy's empty bowl]. We can take it from him [touching left puppet] or him [right puppet] and give it to him [empty bowl]." She then turned over the bowls in front of the puppets, so that their treats were right in front of them, and pushed the puppets and treats toward the subjects, saying "Can you help me decide who to take a treat from?"

Choices in the Giving-a-Treat condition were coded online by the (blind) experimenter as the bowl the subjects placed the treat into. Choices in the Taking-a-Treat condition were coded as the puppet whose treat was given to the treatless puppet. If the subjects needed encouragement in the Giving-a-Treat condition, the experimenter might point at the treat in the subjects' hands and say "who would you like to give that to?" or tap both puppets' heads simultaneously and say "who should get the treat?" If the subjects needed encouragement in the Taking-a-Treat condition, the experimenter might point to the empty bowl of the treatless dog and say "whose treat would you like to give him?" or tap both puppets' heads simultaneously and say "whose treat should we take?" The only correction of subjects' behavior that was possible was in the Taking-a-Treat condition, where some subjects first took both puppets' treats at the same time. When this occurred (by seven subjects), the experimenter took the treats out of the subjects' hands, reset the treats in front of the two puppets, and encouraged the subjects to take from only one puppet. (See *SI Materials and Methods* for more detailed information on any additional condition differences in subjects' willingness to participate.) A second coder independently coded an additional 25% of subjects in each condition; coders reached 100% agreement.

The following were counterbalanced across subjects during phase 3: (i) Giving-a-Treat/Taking-a-Treat condition; and (ii) Prosocial/Antisocial puppet position during giving or taking.

**Experiment 5: Valence Matching Giving-a-Treat/Taking-a-Treat Control.** Subjects were 32 21-mo-olds (14 girls; mean age 21;11 d; range 19;20–22;29).

All procedures and puppets in experiment 5 were identical to experiment 4, except for during phase 2, in which (as in experiment 2, phase 1) instead of the puppets being either Prosocial or Antisocial, they were Helpees and Hinderees. As in experiment 3, target events occurred in either the box-opening or ball-playing scenarios (counterbalanced across subjects). Helpee-Box events were identical to Helpee events from experiment 2, except the Helpee lifted the rattle from the box at the end of the event. Hinderee-Box events were identical to Hinderee events from experiment 2, except the Hinderee sat up at the end of the event.

During Helpee-Ball events (*Movie S7*), the curtain raised to reveal the two dog puppets at each back corner of the stage. A small yellow ball rested in front of one of the puppets. The tiger entered from the back of the stage, and paused. The dog on the side with the ball ran forward, grabbed the ball, and performed a jump-toss-retrieve action three times. On the fourth toss, the ball went toward the center of the stage, and the tiger ran forward and picked it up. The dog who dropped the ball then turned and asked for the ball back twice; on its third turn, the tiger rolled the ball to the dog and ran offstage.

During Helpee-Ball events (*Movie S8*), the ball rested in front of the dog puppet on the opposite side. As in Helpee Ball events, the tiger entered and the dog played with the ball and dropped it toward the tiger. The dog asked for the ball back; the tiger ran offstage with the ball.

The Giving-a-Treat and Taking-a-Treat conditions of experiment 5's phase 3 were identical to those of experiment 4, except that subjects were asked to choose between the Helpee and Hinderee, rather than a Helper and Hinderer. A second coder independently coded an additional 25% of subjects' choices; the two coders reached 100% agreement. In experiment 5, four subjects in the Taking-a-Treat condition initially reached for both treats and the treats were reset.

The following were counterbalanced in experiment 5: During phase 2: (i) box/ball scenario; (ii) Helpee/Hinderee shirt color; (iii) Helpee/Hinderee event order; and (iv) Helpee/Hinderee position. During phase 3: (i) Giving-a-Treat/Taking-a-Treat condition; and (ii) Helpee/Hinderee position during giving or taking.

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