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The Development of Fairness Expectations and Prosocial Behavior in the Second Year of Life

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Recent work provides evidence that expectations regarding a fair (i.e., equal) distribution of goods and resources arise sometime in the second year of life. To investigate the developmental trajectory of fairness expectations, and their potential relation to prosocial behavior, infants participated in a violation-of-expectancy (VOE) paradigm designed to assess expectations regarding how resources are typically distributed, and in a sharing task, an informational helping task, and an instrumental helping task. Infants' expectations regarding resource distribution showed age-related changes between 12 and 15 months, with only 15-month-old infants showing greater attention to unfair (unequal) over fair (equal) outcomes in the VOE. Individual differences in infants' sensitivity to unfair outcomes were related to infants' willingness to share a preferred toy. In contrast, helping behavior was unrelated to infants' sensitivity to unfair outcomes and did

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not vary according to whether infants shared a preferred or non-preferred toy during the sharing task. Our findings suggest a developmental transition in expectations regarding how resources are distributed from 12 to 15 months of age, linked to infants' sharing behavior, suggesting that such expectations are learned through experience. Our results also contribute to the ongoing discussion regarding how best to assess the construct of prosociality in infancy.

The acquisition and maintenance of social and moral norms that govern one's own and others' behavior is fundamental to social harmony and cohesion. One prominent norm that guides adults' actions and evaluations of events is the norm of a fair distribution of goods based on the "principle of equality" (Deutsch, 1975): that, all other things considered, goods should be divided equally to recipients. Research suggests that when given the opportunity to divide resources between oneself and an anonymous social partner, many adults split resources equally (Fehr & Fischbacher, 2003; Henrich et al., 2005). Moreover, adults punish individuals who do not act fairly and act to redistribute goods equally when norms of fairness have been violated (Dawes, Fowler, Johnson, McElreath, & Smirnov, 2007; Johnson, Dawes, Fowler, McElreath, & Smirnov, 2009). Distributing goods equally between oneself and a recipient also appears to be intrinsically rewarding: value-related neural structures are activated when an individual allocates goods equally, whereas unequal allocations engage regions typically associated with negative or aversive emotional states, such as disgust and pain (e.g., anterior insula; Zaki & Mitchell, 2011).

Recent work has focused on the development of sensitivity to norms of fairness. Initial studies on this topic, stemming primarily from the experimental economics literature, suggested that children's willingness and ability to distribute goods in a fair and equal manner did not arise until mid-childhood (Arsenio & Gold, 2006; Blake & Rand, 2010; Fehr, Bernhard, & Rockenbach, 2008; Lane & Coon, 1972). For example, in one recent study (Fehr et al., 2008), children received a candy and were able to choose whether their anonymous partner received zero candies or one candy. Under these conditions, children younger than 7–8 years of age did not reliably prefer the egalitarian allocation (1:1). These findings suggest that the ability to enact norms regarding the fair (equal) distribution of goods and resources follows a protracted developmental timetable.

Emerging evidence suggests that these paradigms, however, may have underestimated young children's abilities, given limitations in inhibitory control and limitations in the ecological validity of these experiments (e.g., resource distribution devoid of social context). To directly address whether young children possess awareness of norms of the fair (equal) distribution of

goods, Olson and Spelke (2008) developed a third-party task. Three-and-a-half-year-old children were asked to help a doll distribute toys to recipient dolls. Under conditions in which the number of recipients matched the number of resources, the majority of children chose to distribute the toys equally among the recipients. Subsequent studies have revealed that preschool-age children are sensitive to equality in other types of tasks: 3- to 5-year-olds notice and react negatively when stickers are distributed unequally between themselves and another child (LoBue, Nishida, Chiong, DeLoache, & Haidt, 2011), and 3-year-old children tend to share equally with another child following the completion of a collaborative task (Warneken, Lohse, Melis, & Tomasello, 2011).

FAIRNESS EXPECTATIONS IN INFANCY?

The aforementioned findings suggest that under more supportive, and perhaps ecologically valid, circumstances, children appreciate and abide by the principles of equality in the distribution of resources. Three recent studies, emerging from different laboratories, suggest that the expectation that goods and resources will be distributed equally may emerge in infancy (Geraci & Surian, 2011; Schmidt & Sommerville, 2011; Sloane, Baillargeon, & Premack, 2012). Each of these studies presented infants with third-party tasks, in which infants watched an interaction between a distributor and two recipients, in the context of a violation-of-expectancy (VOE) paradigm.

In one study (Schmidt & Sommerville, 2011), 15-month-old infants saw a movie in which an adult actor (the distributor) sat at a table with two recipients, each of whom had a plate or glass in front of her. The distributor possessed a bowl of crackers (in one movie) or a pitcher of milk (in a second movie). The recipients asked for some of the crackers or milk simultaneously and pushed their plates or glasses toward the distributor. Next, a black occluding screen appeared, which covered the actors' plates and the contents of the bowl or pitcher. The distributor proceeded to distribute the crackers or milk to each recipient; the black occluding screen concealed the exact amount distributed. On test trials, infants saw static outcomes with the black screen removed: on equal outcomes, each actor had equal amounts of crackers (or milk); on unequal outcomes, one actor had more crackers (or milk) than the other. On control trials, only the outcomes were depicted, devoid of the social context (no distributor or recipients present), to ensure infants did not have a preexisting preference for an equal, or symmetrical, distribution of goods disregarding issues of fairness. Infants saw both experimental and control trials for each movie.

In addition, infants took part in a sharing task. During the first part of the task, infants were given the opportunity to select between two toys, and their toy preference was noted. Then, infants were given both toys, and an unfamiliar experimenter approached the infant and requested a toy (“Can I have one?”). The toy that infants gave the experimenter (preferred vs. non-preferred vs. none) was recorded. The question was whether infants would choose to share a toy, and if they did, whether they would share more altruistically (giving their preferred toy) or more selfishly (giving their non-preferred toy). The motivation for including the sharing task was twofold. First, Schmidt and Sommerville (2011) sought to validate the VOE paradigm. Longer looking to the unequal vs. equal outcome in the experimental condition could merely indicate learning of statistical regularities that govern how individuals distribute resources to recipients. However, if this were the case, there would be no reason to expect a relation between infants’ prosocial behavior and their expectations in the VOE. Second, the authors sought to investigate a potential relation between fairness and altruism, as both have been hypothesized to rely on a more general regard or concern for others (Boehm, 1999; Fehr & Fischbacher, 2003).

Infants showed a significant preference for the unequal outcome over the equal outcome in the experimental condition, providing evidence that 15-month-old infants expected resources to be distributed equally to the recipients. In contrast, looking times to the control outcomes did not differ, suggesting that infants’ longer looking times to the unequal outcome in the experimental condition did not result from a general preference for asymmetrical over symmetrical outcomes, or unequal over equal amounts of food. Thus, by 15 months of age, infants appear to expect resources to be distributed equally in a resource distribution task (see Sloane et al., 2012, for similar results with 19-month-old infants). Critically, infants’ performance on the VOE was systematically related to their performance on the sharing task: infants who shared their preferred toy looked longer to the unequal outcome than the equal outcome in the experimental condition, whereas infants who shared their non-preferred toy showed the reverse pattern of findings (performance on the sharing task was unrelated to infants’ attention to the control outcomes). In addition to documenting a tight interconnection between fairness expectations and altruistic sharing behavior from early in development, these results suggest that it is unlikely that infants were responding to the test events as violations of general statistical expectations (e.g., that goods are usually divided into equal amounts); if there were, there would be no relation between attention to the outcomes and their prosocial behavior.

Another study by Geraci and Surian (2011) provides evidence that infants may also use information about how an agent distributes resources to guide

their expectations of subsequent social interactions involving distributors and recipients, as well as their own preferences for different kinds of distributors. In this study, infants watched video clips in which one animal distributed toys to two recipients while another animal (a chicken) looked on. In one video, the animal (e.g., a lion) distributed the goods equally to the recipients (fair distributor); in another video, a different animal (e.g., a bear) distributed the goods unequally to the recipients, giving one recipient more than the other (unfair distributor). On test trials, infants saw the chicken approach either the fair or unfair distributor. Sixteen-month-old infants, but not 10-month-olds, looked longer when the agent approached the fair distributor. In addition, when given a manual choice task, 16-month-old, but not 10-month-old infants, selected the fair over the unfair distributor. A follow-up experiment established that the results hinged on the social context of the distribution; when the recipients were replaced with inanimate objects, infants showed no preference for the fair distributor either in their looking times or in their manual choices.

Finally, a third study (Sloane et al., 2012) established that infants' expectations regarding how resources are typically distributed are contextually malleable. Twenty-one-month-old infants' looking times to events in which each of two actors received a single sticker varied according to the recipients' prior work history. Infants in one condition (both-works condition) saw both recipients clean up a pile of toys and subsequently each recipient received a single sticker. Infants in another condition (one-works condition) saw one recipient clean up all of the toys, while the second recipient merely played. Infants looked longer to a 1:1 distribution of stickers when one recipient had cleaned up all of the toys than when both recipients had done an equivalent amount of work.

Taken together, the results of the above studies suggest that during the second year of life infants expect goods and resources to be allocated equally to recipients, prefer agents that perform fair (equal) distributions, and expect other agents to affiliate with or approach fair over unfair distributors. Infants' expectations do not appear to be reducible to perceptual biases (e.g., preferences for asymmetry) and are flexible based on the social context. These expectations appear to be at least somewhat abstract—spanning different types of goods (crackers, milk, toys), live and televised displays, looking time paradigms and manual choice tasks, different types of agents (humans and animated objects), different amounts of resources (distribution of 4 vs. 2 items), different ratios of inequality (2 vs. 0 vs. 3 vs. 1), extending across continuous and categorical quantities (crackers vs. milk)—and are tightly linked to certain aspects of infants' own prosocial behavior (e.g., their willingness to share a preferred toy).

THE DEVELOPMENT OF FAIRNESS EXPECTATIONS

The aforementioned findings have begun to paint a detailed picture of the nature of infants' expectations about resource distribution. A critical question remains concerning whether and how such expectations develop.

One possibility is that infants possess innate principles that guide their expectations regarding how goods and resources are distributed and that were selected for throughout the course of evolution (cf. Geraci & Surian, 2011). From this perspective, one would expect continuity across the course of development; that is, expectations should emerge early and be relatively consistent across development. An additional, although not mutually exclusive, possibility is that learning shapes the acquisition and/or developmental trajectory of infants' expectations regarding how goods and resources are distributed. Current evidence suggests that norms regarding how resources should be distributed are, at least to a certain degree, shaped by culture and socialization: research has documented considerable cross-cultural variability regarding the extent to which individuals distribute resources equally in economic games (Henrich et al., 2005). Moreover, recent empirical work suggests that there may be a developmental shift between 10 and 16 months in infants' expectations regarding (a) whether a bystander would approach a fair over an unfair distributor and (b) infants' own selection of a fair over an unfair distributor (Geraci & Surian, 2011). Although this work did not directly investigate infants' expectations regarding how goods are distributed per se, Geraci and Surian's (2011) findings raise the possibility that developmental changes exist in infants' expectations during the second year of life.

THIS STUDY

The first goal of this study was to investigate the development of expectations regarding how resources are typically distributed in the second year of life. Investigating whether developmental change vs. continuity exists in such expectations informs the issue of whether infants' expectations reflect the operation of innate, abstract principles guiding resource distribution, or whether infants' performance reflects the learning and acquisition of expectations regarding an equal distribution of goods.

In this study, 12-month-old infants were tested in a VOE paradigm similar to that previously administered to 15-month-old infants (Schmidt & Sommerville, 2011). We selected 12-month-old infants given prior work suggesting a transition in infants' expectations regarding resource distribution between 10 and 16 months of age (Geraci & Surian, 2011), and given emerg-

ing evidence suggesting that infants may begin to understand conventional acts at about this age (Sootsman-Buresh & Woodward, 2007). Infants took part in both an experimental and a control condition. In the experimental condition, infants saw an occluded distribution event in which an actor distributed crackers to two recipients, resulting in either equal or unequal portions. The control condition was identical except that no recipients were present. As in prior work (Schmidt & Sommerville, 2011), we expected longer looking to the unequal outcomes than the equal outcomes in the experimental condition, but not in the control condition, if infants at this age expected goods to be distributed equally to recipients. To investigate developmental change, we compared 12-month-old infants' performance on the VOE to a prior sample of 15-month-old infants tested in a similar paradigm as part of a larger study (Schmidt & Sommerville, 2011).

The second goal was to investigate interrelations between infants' fairness expectations and their prosocial behavior. Twelve-month-old infants took part in a sharing task that was similar to Schmidt and Sommerville (2011): infants were first allowed to select between two toys, then an unfamiliar experimenter produced an ambiguous request for one of the toys ("Can I have one?"), and the toy that infants chose to share (none, preferred, or non-preferred) was recorded. We sought to determine whether infants' sharing behavior was related to their sensitivity to the experimental outcomes in the VOE. Schmidt and Sommerville (2011) found that 15-month-old infants who willingly shared a preferred toy with an unfamiliar experimenter looked longer to the unequal vs. equal outcomes in the experimental condition of the VOE, whereas infants who shared a non-preferred toy showed the reverse pattern of findings. This study investigated whether the developmental trajectory of the relation between infants' fairness expectations and sharing behavior varied from 12 to 15 months of age. By comparing infants who produced a target behavior (sharing a toy) but differed in terms of how they chose to share (sharing either a preferred or non-preferred toy), we sought to isolate the relation between infants' prosocial *motivation* (as opposed to other factors that might contribute to infants' task performance, such as their understanding of task demands, stranger anxiety, etc.), and infants' expectations regarding how resources are typically distributed.

Twelve-month-old infants also took part in two additional tasks that have previously been used to measure prosocial behavior in infants during the second year of life: an informational helping task (adapted from Liskowski, Carpenter, Striano, & Tomasello, 2006) and an instrumental helping task (adapted from Warneken & Tomasello, 2006). In the informational helping task, a toy that the actor was playing with dropped out of sight, and the actor subsequently searched for the toy. Infants could help the actor by pointing to the toy, to inform him or her of the toy's location.

In the instrumental helping task, the actor inadvertently dropped a ball that she was playing with so that it was out of her reach. Infants could help the actor by retrieving the ball and handing it to her. Past work suggests that 12- to 14-month-old infants show evidence of helping behavior under these circumstances (Liszkowski et al., 2006; Warneken & Tomasello, 2007, 2009b).

Our goal in giving infants these additional tasks was to (a) investigate potential interrelations in performance on tasks designed to measure prosocial behavior, and (b) investigate potential interrelations between helping behavior and expectations regarding the distribution of resources. There is currently debate regarding whether performance across prosocial tasks converge (e.g., Hay, 1979) or diverge (e.g., Dunfield, Kuhlmeier, O'Connell, & Kelley, 2011) in infancy. Resolving this debate is critical to assessing the validity of the construct of prosocial behavior within infancy. Thus, we investigated whether infants' performance on the sharing and helping tasks were interrelated. We also investigated whether infants' performance on the helping task was related to their performance on the VOE to determine whether infants' expectations regarding the distribution of resources is uniquely associated with infants' sharing behavior or also extends to infants' helping behavior.

METHOD

Participants

Forty-eight 12-month-old infants participated in the experiment (24 boys, 24 girls; mean age, 12 months 14 days; range, 11 months 28 days–12 months 27 days). Of these infants, 69% were Caucasian, 2% were Asian/Pacific Islander, and 4% were Hispanic. In addition, 17% reported more than one ethnicity, 4% selected “other” (among a list that included the former as well as Black/African-American and Native American), and 4% did not report an ethnicity. All infants were full-term and typically developing. Participants were recruited from a database of parents who had volunteered to participate in experimental studies. Data from 14 additional infants was excluded because of fussiness ($n = 6$), experimental error ($n = 6$), and parental interference ($n = 2$).

For the VOE paradigm and the sharing task, data from the above sample of 12-month-old infants were compared to 34 15-month-old infants (16 boys, 18 girls; mean age, 15 months 4 days; range, 14 months 20 days–15 months 28 days) who received a similar VOE paradigm as part of a larger study on the development of fairness expectations (Schmidt & Sommerville, 2011). All infants were full-term and typically developing.

Procedure

The infant was seated on a caregiver's lap for the duration of the procedure. The caregiver was instructed to gaze neutrally at the top of their infant's head and not interact with their infant during the procedure. Twelve-month-old infants took part in a VOE paradigm, followed by three prosocial tasks: a sharing task, an informational helping task, and an instrumental helping task; 15-month-old infants received only the VOE followed by the sharing task. These tasks were administered in a fixed order, to optimize investigation of the relation in performance across the paradigms (see Carlson & Moses, 2001 for a discussion of the relative merits of fixing, vs. counterbalancing, the order of experimental tasks when investigating individual differences).

Violation-of-expectancy paradigm: 15-month-olds

Fifteen-month-old infants took part in the VOE paradigm as part of a larger study on infants' fairness expectations (Schmidt & Sommerville, 2011). This VOE paradigm was identical to the VOE paradigm used with 12-month-old infants, with the exception that the control outcomes occurred in a fixed order, always directly following the experimental outcomes, because pilot work revealed that when infants were shown the control outcomes prior to the experimental outcomes attrition increased significantly because of boredom. As with 12-month-old infants, the order of experimental outcomes (equal vs. unequal), order of the control outcomes (equal vs. unequal), and the side to which the actor first distributed (left or right), as well as the outcome location (e.g., equal event on left or right) were counterbalanced.

Violation-of-expectancy paradigm: 12-month-olds

Infants were seated in front of a 24-inch monitor at a distance of 80 cm and each infant was shown two videos: one experimental video and one control video (order counterbalanced).

Experimental video. In the experimental video (see Schmidt & Sommerville, 2011, for a schematic overview), three female adults were seated at a table (one distributor and two recipients). The distributor had a transparent bowl, containing four crackers. The recipients were seated on either side of the distributor, and each had a single plate on the table in front of her.

Distribution phase. At the beginning of the distribution phase, the distributor greeted each recipient and lifted the bowl up with a positive vocal

expression (“Yummy!”). Both recipients then pushed their plates toward the distributor and said, “Please.” At this point a black occluding screen appeared on the monitor, occluding the area containing the crackers, bowl, and plates. Then, the distributor grasped a number of crackers and placed them on each of the recipients’ plates, saying “Here” to each recipient. The distributor used her right hand to distribute to both the right- and left-hand plate; the distribution featured a single movement to each side (order counterbalanced). The black occluding screen served to hide the number of crackers given to each recipient during the distribution. After the distribution, the distributor lifted the now-empty bowl above the occluder and said “All gone,” ending the event. The distribution phase lasted 47 sec.

Outcome events. Infants were shown outcome events (with the black occluder removed) that depicted still-frame images. In the equal outcome, the empty bowl sat in front of the distributor and each recipient had two crackers on their own plates. In the unequal outcome, the identical event was shown except that one of the recipients had one cracker whereas the other recipient had three crackers. Infants saw two outcomes of each type, in alternation, order counterbalanced. Outcomes were displayed until infants looked away from the event or until 30 sec elapsed, whichever came first.

Control video. The control video was similar to the experimental video, but no recipients were present: a single female adult was seated at a table (the distributor). The distributor for the control video was different than that of the experimental video to avoid carry-over effects.

Distribution phase. As in the experimental video, the distributor had a transparent bowl containing four crackers and there was an empty plate on either side of her. At the beginning of the video, the distributor said, “Wow, look at this. This looks really good.” She then lifted the bowl up with a positive vocal expression (“Yummy!”). At this point, a black occluding screen appeared on the monitor, occluding the area containing the crackers, bowl, and plates. Then, the distributor grasped a number of crackers and placed them on each of the plates, saying “Here.” Then, the distributor lifted the empty bowl above the occluder and said, “All gone,” ending the event. The distribution phase was 41 sec.

Control outcome events. Infants were shown outcomes (with the black occluder removed) that depicted still-frame images. In the equal outcome, the empty bowl was placed in front of the distributor and each plate contained two crackers. The unequal outcome was identical except that one plate contained one cracker, and one plate contained three crackers. Infants saw two outcomes of each type, in alternation, with the order of the events counterbalanced.

Half of the infants viewed the experimental video followed by the control video and the second half viewed the videos in the opposite order. The order of experimental outcomes (equal vs. unequal), order of the control outcomes (equal vs. unequal), and the side to which the actor first distributed (left or right), as well as the unequal allocation (i.e., 1-3 distribution vs. 3-1 distribution) were counterbalanced.

Coding. Looking time was calculated online by an observer who was unaware of the events that the baby was watching. The observer watched the infant on a video monitor, and activated a computer program by pressing a button when the infant was looking at the display (Pinto, 1994). The outcomes lasted until infants looked away from the event for one consecutive second or until the maximum trial length (30 sec) was reached. Thus, the online coder determined the event length for each trial.

Reliability. A secondary observer coded infants' eye gaze during the outcomes from video. If the secondary observer disagreed with the event ending of the online coder, she (or he) noted whether the ending was earlier or later than the online coder's. The primary and secondary observers agreed on the ending of 96% of outcomes for the experimental condition and 95% of outcomes for the control condition. For both the control and experimental conditions, disagreements were categorized into four groups based on the outcome type (equal vs. unequal), and whether the secondary coder judged the event as ending earlier or later than the online coder indicated. Disagreements were randomly distributed for both the experimental condition (Fisher's exact test; $p = .14$) and the control condition (Fisher's exact test; $p = .99$).

Next, we analyzed the correlation between looking duration as measured by the online coder and the looking duration measured by the secondary coder for each outcome. In the experimental condition, the two coders' judgments were strongly correlated for both the equal outcome ($r = .96$, $p = .0001$) and the unequal outcome ($r = .98$, $p = .0001$). Similarly, in the control condition, the two coders' judgments were strongly correlated for both the equal outcome ($r = .94$, $p = .0001$) and the unequal outcome ($r = .86$, $p = .0001$).

Prosocial tasks

The prosocial tasks were recorded on videotape, and a coder who was unaware of the hypotheses of the experiment coded infants' responses. For the 12-month-old infants, the same actor performed all three tasks.

Sharing task: 15-month-olds. We adopted the sharing task that was used by Schmidt and Sommerville (2011). Fifteen-month-olds received the sharing task as part of a larger study (Schmidt & Sommerville, 2011). The sharing task with 15-month-old infants was identical to the sharing task with 12-month-old infants described below, except that 15-month-old infants had only up to 25 sec to respond.

Sharing task: 12-month-olds. During the *preference phase*, infants were presented with two toys (a green lego block and a lego doll), placed 54 cm apart on a table, and were encouraged to select one of the two toys. The distance between the toys prevented the infant from reaching for the two toys simultaneously.

During the subsequent *request phase*, the experimenter encouraged the infant to hold both toys. An unfamiliar actor subsequently knelt in front of the infant and held out her hands. She verbally requested a toy, alternating between “Can I have one?” and “Can I have one, please?” every 5-sec, while looking at the infant. If the infant shared a toy, or after 45 sec, the actor looked at her hands, smiled, and said, “Okay!”

Helping tasks: 12-month-olds (only). These tasks were adapted from prior work by Warneken and Tomasello (2006; instrumental helping task) and Liszkowski et al. (2006; informational helping task).

Informational helping task. In the informational helping task, the actor sat at the table across from the infant. She played with a stuffed toy dog and said, “This is my doggy. Hi doggy! What a nice doggy!” She then placed the toy on the end of the table, and said, “I’m going to build him a doghouse.” Next, she leaned over to the side of the table, picked up a box, and slid it across the table while looking away, pretending to accidentally push the toy off the edge of the table such that the dog landed on the floor. Then, she searched the surface of the table with a perplexed facial expression. For the first 15 sec, she repeated “Hmm, strange.” For the next 20 sec, she repeated, “Where is my doggy? Where did he go?” For the final 10 sec, she made eye contact with the infant and repeated “[Infant’s name], where is my doggy?” After 45 sec, the actor looked at the toy and said, “There he is!” and picked it up.

Instrumental helping task. In the instrumental helping task, the actor sat at the table across from the infant. The actor tossed a ball into a container and cheered, three times. On the fourth toss, the actor overshot the container, allowing the ball to roll within the infant’s reach, and said “Oops!” She then reached for the ball with an outstretched arm and hand.

For the first 15 sec, she made a yearning vocalization. For the next 20 sec, she alternated her gaze between the ball and the infant while vocalizing. For the final 10 sec, she reached for the ball, alternated her gaze, and repeated “Oh my ball! My toy!” If the infant handed the actor the ball, the actor tossed the ball into the container one last time and cheered. After 45 sec, or once the infant gave the actor the ball, the trial ended.

Coding. For the sharing task, we coded which of the two toys infants shared with the experimenter (preferred, non-preferred, or neither). For the informational helping task, we coded the presence of an arm movement that referred to the toy; infants received a score of 1 if this behavior was present and zero if it was not. In the instrumental helping task, we coded whether or not the infant gave or offered the toy to the experimenter; infants received a score of 1 if this behavior was present and zero if it was not.

For all tasks, to investigate the relation between individual differences in response speed on the sharing and helping tasks for infants that produced the target behavior (e.g., for infants who shared or helped) and VOE performance, infants’ latency to respond was recorded.

Reliability. A second research assistant, unaware of the hypotheses of the study, and unaware of infants’ performance on the VOE paradigm, coded 25% of the sample. For the target behaviors, coders had 82% agreement on the sharing task ($Kappa = .79$), 92% agreement on the informational helping task ($Kappa = .80$), and 100% agreement on the instrumental helping task ($Kappa = 1.00$). This research assistant also recorded latency for 25% of the sample; latency scores were highly correlated for the sharing ($r = .99$, $p = .001$), informational helping ($r = .88$, $p = .001$), and instrumental helping ($r = .98$, $p = .001$) tasks.

RESULTS

Looking to the experimental and control outcomes

A preliminary ANOVA revealed no effects or interactions with the side to which the actor first distributed (left or right), as well as the outcome location (e.g., equal event on left or right). Thus, subsequent analyses collapsed across these factors.

To compare infants’ looking times to the outcomes across age groups, we focused on only the first trial pair as 15-month-old infants received only a single trial pair. Infants whose looking times were 2.5 standard deviations above or below the mean were considered to be outliers and thus excluded

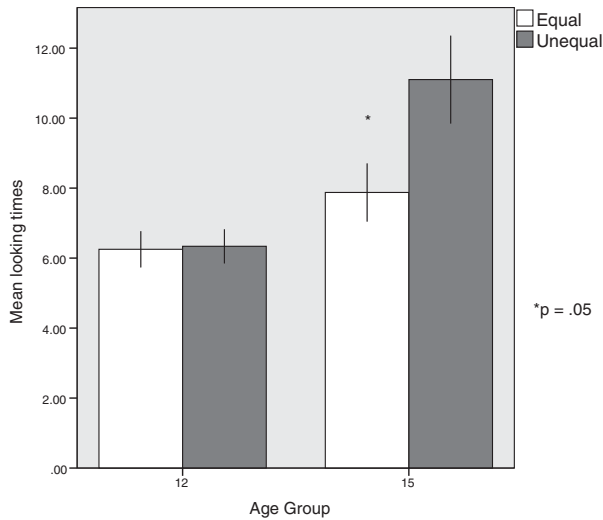


Figure 1 Mean looking times to the experimental outcomes as a function of age group.

from analyses. On this basis, one 12-month-old infant was removed from the experimental condition, and two 12-month-old infants and two 15-month-old infants were removed from the control condition. Retaining these infants did not change the pattern of findings.

Infants' looking times to the outcomes were analyzed via independent ANOVAs for each condition. Infants' looking times to the experimental and control outcomes, as a function of age, are depicted in Figure 1.

An ANOVA on infants' looking times to the experimental outcomes, with trial type (equal vs. unequal) as the within-subjects variable, and age group (12-month-old infants vs. 15-month-old infants) and test first (equal first vs. unequal first) as the between-subjects variables, revealed a main effect of age group, $F(1, 77) = 17.00, p = .001, \eta_p^2 = .18$, indicating that 15-month-old infants looked longer overall than 12-month-old infants to the experimental outcomes, a main effect of trial type, $F(1, 77) = 5.82, p = .018, \eta_p^2 = .07$, indicating that infants looked longer to the unequal outcome ($M = 8.34, SE = 0.47$) than the equal outcome ($M = 6.93, SE = 0.65$) overall, and a trial type by test first interaction, $F(1, 77) = 14.74, p = .0001, \eta_p^2 = .16$, indicating that infants who received the unequal outcome first looked longer to the unequal outcome: $M = 10.14, SE = 1.07$ than the equal outcome, $M = 5.98, SE = 0.57$, whereas those that received the equal outcome first looked about equally to both: unequal outcome, $M = 6.66, SE = 0.68$; equal outcome: $M = 7.82, SE = 0.71$. Such order effects are not unusual in infant research, particularly at transitional ages (e.g., Baillargeon, 1987).

Critically, this analysis also revealed a significant trial type by age group interaction, $F(1, 77) = 4.48, p = .037, \eta_p^2 = .06$. Planned comparisons revealed that whereas 15-month-old infants looked longer to the unequal outcome, $M = 11.10, SE = 1.26$, than the equal outcome, $M = 7.87, SE = 0.83, t(33) = 2.07, p = .047$, 12-month-old infants' looking times to the experimental outcomes (unequal: $M = 6.34, SE = 0.49$; equal: $M = 6.25, SE = 0.52$) did not differ, $t(46) = 0.13, p = .90$.

A parallel ANOVA on infants' looking to the control outcomes with trial type (equal vs. unequal) as the within-subjects variable, and age group (12-month-old infants vs. 15-month-old infants) and test first (equal first vs. unequal first) as the between-subjects variables, revealed a main effect of age group, $F(1,69) = 18.08, p = .001, \eta_p^2 = .21$, indicating that 15-month-old infants looked longer overall at the control outcomes, and no other main effects or interactions (all F s ns). Planned comparisons on infants' looking times to the control outcomes revealed that 15-month-old infants looked equally to the unequal outcome, $M = 7.09, SE = 0.68$ and the equal outcome, $M = 7.43, SE = 0.79, t(31) = 0.40, p = .691$, as did 12-month-old infants: unequal outcome, $M = 4.94, SE = 0.37$, and equal outcome, $M = 5.07, SE = 0.43, t(45) = 0.24, p = .814$.

Finally, we conducted two additional analyses to rule out potential alternate explanations for differences in 12-month-old infants' and 15-month-old infants' sensitivity to the fair (equal) vs. unfair (unequal) outcomes. Because 15-month-old infants received the control outcomes in a fixed order (the control outcomes always followed the experimental outcomes), whereas 12-month-old infants received these outcomes in a counterbalanced manner, it is possible that this procedural difference accounted for infants' differential attention to the experimental outcomes. To investigate this possibility, we conducted an ANOVA on 12-month-old infants' looking times to the experimental outcomes with test trial type (equal vs. unequal) as the within-subjects variable and order (control first vs. experimental first) as the between-subjects variable. This analysis revealed no interaction between condition order and test trial type, $F(1,46) = .87, p = .36$, suggesting that counterbalancing the experimental and control conditions did not obscure positive findings in the younger age group.

Second, we sought to investigate whether 12-month-old infants' shorter overall attention to the experimental outcomes could explain a failure to find longer looking to the unequal outcome vs. the equal outcome in this age group. To do so, we summed 12-month-old infants' attention to the experimental outcomes and correlated this score with infants' preference for the unequal outcome (looking to the unequal outcome minus looking to the equal outcome). This analysis revealed that overall attention to the experimental outcomes was independent of infants' preference for the unequal outcome, *Spearman's rho* (47) = $-.08, p = .58$, suggesting that differences

in overall levels of attention are unlikely to account for age-related changes in infants' sensitivity to unfair (unequal) vs. fair (equal) outcomes.

Relations between the sharing and helping tasks at 12 months

For the sharing task, sharing task video footage for three infants was missing; consequently, these infants were excluded from subsequent analyses. For the informational helping task, five infants did not see the dog fall from the table during the informational helping task; consequently, these infants were excluded from subsequent analyses. During the sharing task, 24 infants (53%) shared neither toy, 10 infants (22%) shared the non-preferred toy, and 11 infants (24%) shared the preferred toy. During the informational helping task, 17 infants (40%) indicated the toy, whereas 26 infants (60%) did not. During the instrumental helping task, 29 infants (60%) helped the experimenter, whereas 19 infants (40%) did not help the experimenter. There was no significant difference in rates of the target behaviors between sharing and instrumental helping, McNemar test, $p = .227$ and sharing and informational helping, McNemar test, $p = .454$. Helping scores on the informational helping task were lower than on the instrumental helping task, McNemar test, $p = .021$.

We next investigated when infants responded during the helping tasks. Recall that for each task, there were three response phases, which corresponded to the first 15 sec, the next 20 sec, and the final 10 sec of the response period, each of which was associated with increasingly supportive cues from the experimenter. The proportion of infants who responded during each phase of the task as a function of task is presented in Table 1. There was a significant association between when infants responded and task type, $\chi^2 (df = 1) = 8.93$, $p = .012$ (two-tailed), indicating that infants responded earlier in the instrumental helping task than in the informational helping task.

An initial analysis revealed a positive association between infants' performance on the informational helping task and the instrumental helping task, Fisher's exact test; $\chi^2 (df = 1) = 4.6$, $p = .052$ (two-tailed); $Phi = .33$. Thus, to investigate relations with infants' sharing behavior we created a

TABLE 1
Infants' Performance on the Helping Tasks as a Function of Response Phase and Task Type

<i>Task</i>	<i>First 15 sec (%)</i>	<i>Next 20 sec (%)</i>	<i>Last 10 sec (%)</i>	<i>No response (%)</i>
Informational helping	9.3	18.6	11.6	60.5
Instrumental helping	41.7	12.5	6.3	39.5

summed helping score for each infant (the sum of scores on the informational and instrumental helping tasks; range 0–2).

Our central question of interest was whether there was an association between infants' performance on the sharing task and the helping tasks. To address this question, we performed an ANOVA on infants' summed helping scores with toy shared (preferred vs. non-preferred vs. none) as the between-subjects variable. This analysis revealed a main effect of toy shared, $F(1, 37) = 8.53, p = .001, \eta_p^2 = .32$. Planned comparisons revealed that infants who shared the preferred toy, $M = 1.33, SE = 0.24$, engaged in more helping behavior than infants who shared neither toy, $M = 0.64, SE = 0.15, t(29) = 2.44, p = .02$, and that infants who shared the non-preferred toy, $M = 1.67, SE = 0.17$, engaged in more helping behavior than infants who shared neither toy, $t(29) = 3.88, p = .001$. However, helping scores between infants who shared the preferred and non-preferred toy did not differ, $t(16) = 1.16, p = .27$. Thus, although there was evidence of an association between whether infants shared any toy and the presence of helping behavior, infants' helping scores did not vary as a function of which toy they shared.

Relations between the VOE and the sharing task at 12 and 15 months

To examine the relation between infants' sharing performance and VOE performance, we reduced the response window for the sharing task to 25 sec, as 15-month-olds tested by Schmidt and Sommerville (2011) only received up to 25 sec to respond. Table 2 presents infants' sharing rates (preferred, non-preferred, no sharing), and mean latencies to share, as a function age. There was a significant association between sharing status and age, $\chi^2 = 7.82, df = 2, p = .02$ (two-tailed), reflecting that more 15-month-old infants shared a toy than did 12-month-old infants. There was no association between whether infants shared the preferred or non-preferred toy and age, $\chi^2 = .26, df = 1, p = .61$ (two-tailed). Fifteen-month-old infants shared more quickly than did 12-month-old infants, $t(70) = 2.17, p = .03$.

To investigate the relation between infants' performance on the sharing task and their attention to the experimental outcomes in the VOE, we contrasted infants who shared their preferred toy against infants who shared their non-preferred toy. Figure 2 depicts infants' looking times to the experimental outcomes

TABLE 2
Infants' Sharing Rates and Mean Latencies (*SE*) to Share as a Function of Age

Age group	Preferred (%)	Non-preferred (%)	No sharing (%)	Mean latency (<i>SE</i>)
12 Months	17.8	15.6	66.7	18.3 (1.5)
15 Months	29.6	37.0	33.3	13.0 (2.0)

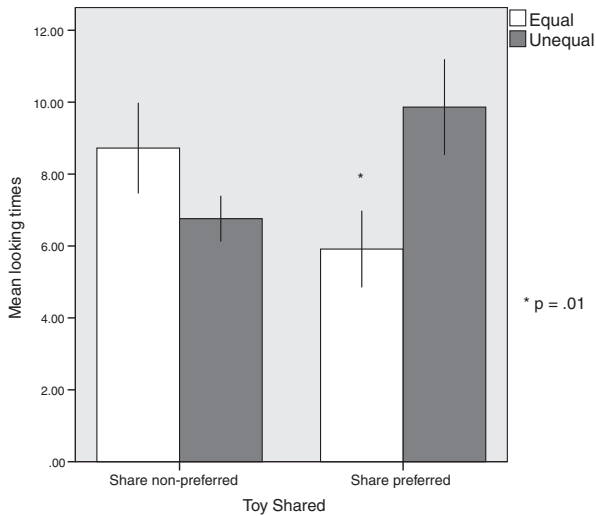


Figure 2 Mean looking times to the experimental outcomes for infants who shared the preferred toy vs. the non-preferred toy.

as a function of sharing status. Infants who failed to share either toy were excluded from this analysis because a failure to share may arise for reasons other than whether a given infant takes a selfish or altruistic approach to the task. For example, ancillary factors, such as an infant's degree of stranger anxiety or an infant's difficulty identifying the experimenter's desire or need, may lead an infant to fail to share. Consistent with the former possibility, Schmidt and Sommerville (2011) found that indices of stranger anxiety (concerned or fearful looks, avoidance of the experimenter, distress; Brooks & Lewis, 1976; Feinman, 1980; Sroufe, 1977) were higher in non-sharing than sharing infants. Consistent with the latter possibility, Brownell et al. (e.g., Brownell, Svetlova, & Nichols, 2009; Svetlova, Nichols, & Brownell, 2010) have demonstrated that increases in infants' social-cognitive skills contribute to increases in the frequency of prosocial behavior with age. Selectively including infants who responded on the task (e.g., who shared one of the two toys) controls for extraneous factors that may influence infants' task performance and focuses on *how* infants elect to share toys with the experimenter. Critically, isolating prosocial motivation from these extraneous factors that may also contribute to task performance helps to constrain the theoretical meaning of any observed relation between infants' sharing behavior and their VOE performance.

An ANOVA on looking times to the experimental outcomes with trial type (equal vs. unequal) as the within-subjects variable, and age group (12-month-old infants vs. 15-month-old infants) and sharing status

(preferred vs. non-preferred toy) as the between-subjects variables, revealed a significant trial type by sharing status interaction, $F(1, 29) = 8.29$, $p = .007$; $\eta_p^2 = .22$ and no other significant effects (all F s *ns*). Planned comparisons revealed that infants who shared their preferred toy looked significantly longer to the unequal outcome, $M = 9.86$, $SE = 1.33$, than the equal outcome, $M = 5.91$, $SE = 1.07$, $t(15) = 2.95$, $p = .010$. Infants who shared the non-preferred toy showed a numerical, but non-significant, preference for the equal outcome, $M = 8.72$, $SE = 1.26$, over the unequal outcome, $M = 6.76$, $SE = 0.64$, $t(16) = 1.36$, $p = .190$. Nonparametric analyses confirmed this association between sharing status and differential attention to the experimental outcomes: 75% of infants who shared the preferred toy looked longer to the unequal outcome, whereas 71% of infants who shared the non-preferred toy looked longer to the equal outcome (Fischer's exact test $p = .015$). A parallel ANOVA on infants' looking times to the control outcomes with trial type (equal vs. unequal) as the within-subjects variable, and age group (12-month-old infants vs. 15-month-old infants) and sharing status (preferred vs. non-preferred toy) as the between-subjects variables revealed no main effects or interactions (all F s *ns*), suggesting that infants' sharing status was uniquely related to their attention to the experimental outcomes, and not the control outcomes. Thus, these findings demonstrate a relation between infants' sharing behavior and their sensitivity to the unfair (i.e., unequal) outcomes. Moreover, the fact that there was no three-way interaction between trial type, sharing status, and age suggests that this relation does not vary between 12- and 15-month-old infants.

We also categorized infants into two groups contrasting infants who shared the preferred toy vs. those who shared the non-preferred toy and those who shared neither toy to determine whether a similar pattern of findings was obtained. Infants who shared the preferred toy showed a significant preference for the unequal outcome, $t(15) = 2.95$, $p = .01$, whereas infants who shared the non-preferred toy or neither toy did not differ in their looking times to the unequal and equal outcome, $t(56) = 0.59$, $p = .55$.

Finally, we sought to determine whether individual differences within infants who shared the preferred toy were related to performance on the VOE, by relating the speed with which infants shared the preferred toy to their sensitivity to the unequal outcome in the experimental condition. Our prediction was that infants who shared the preferred toy more quickly would show a stronger preference for the unequal outcome (vs. the equal outcome) than those infants who shared the toy less quickly. We created an unequal outcome preference score by subtracting infants' attention to the equal outcome from infants' attention to the unequal outcome for the experimental condition and correlated this with infants' latency to share the preferred toy. This analysis revealed a significant relation between infants' latency to share

and their preference for the unequal outcome, *Spearman's rho* (16) = $-.43$, $p = .050$; one-tailed, indicating that infants who shared the preferred toy more quickly showed a stronger preference for the unequal outcome (for infants who shared the non-preferred toy, infants' unequal outcome preference was unrelated to how quickly they shared the non-preferred toy; *Spearman's rho* (17) = $.28$, $p = .136$; one-tailed).

Relations between the VOE and the helping tasks at 12 months

To investigate the relation between infants' helping scores and their VOE performance, we focused on the first 25 sec of the response period, to parallel analyses between the sharing task and the VOE. We created an unequal outcome preference score by subtracting infants' attention to the equal outcome from infants' attention to the unequal outcome for the experimental condition and correlated this with infants' summed helping score (score on the informational helping task plus score on the instrumental helping task; range 0–2). Infants' helping scores were independent of their preference for the unequal outcome, *Spearman's rho* (43) = $-.18$, $p = .251$. When the response window for the helping tasks was expanded to the full 45 sec, there was likewise no relation between infants' summed helping score and their preference for the unequal outcome, *Spearman's rho* (43) = $.003$, $p = .99$. For those infants who helped, infants' preference for the unequal outcome was also independent of their latency to respond in the informational helping task—*Spearman's rho* (17) = $.31$, $p = .112$; one-tailed—and in the instrumental helping task—*Spearman's rho* (27) = $.28$, $p = .081$; one-tailed.

DISCUSSION

In this study, we investigated whether 12-month-old infants are sensitive to fairness violations in a resource distribution task, and whether such sensitivity is related to their production of prosocial behaviors in experimental helping and sharing tasks. Previous studies have demonstrated that infants possess expectations regarding how resources are typically distributed by 15–16 months of age (Geraci & Surian, 2011; Schmidt & Sommerville, 2011) and that infants' detection of these violations is systematically related to their ability or tendency to share a preferred toy (Schmidt & Sommerville, 2011).

The development of fairness expectations in infancy

To investigate the developmental change, we compared our sample of 12-month-old infants to a sample of 15-month-old infants who were tested in a

similar VOE paradigm and sharing task as part of a larger study (Schmidt & Sommerville, 2011). The results of the current study provide important initial information regarding the developmental trajectory of infants' fairness expectations. Whereas 15-month-old infants looked longer to the unfair (unequal) outcomes in the experimental condition of the VOE paradigm, 12-month-old infants looked equally to both outcomes. These findings suggest that there may be age-related changes between 12 and 15 months in infants' expectations regarding how resources are typically distributed. Because infants were tested across different studies, there were some minor differences in the VOE paradigm for the 12- and 15-month-old infants. Whereas 12-month-old infants received the control and experimental outcomes in a counterbalanced order, 15-month-old infants received the control outcomes following the experimental outcomes. Follow-up analyses revealed that it is unlikely that this procedural difference accounts for the changes across age groups, because 12-month-old infants' looking times to the experimental outcomes did not differ as a function of the order in which the conditions were administered.

Our results indicated that, overall, 15-month-old infants were more attentive to the outcomes in the VOE than 12-month-olds. We think that it is unlikely that differences in infants' overall attention to the outcomes across age groups accounted for the observed differences in infants' looking preferences across ages for several reasons. First, infants at both ages were equally attentive to the distribution phase, suggesting that both age groups were engaged in the task. Second, past work has demonstrated that infants discriminate test outcomes at 12 months in VOE and habituation paradigms when overall attention levels are equivalent (e.g., Sommerville & Woodward, 2005a,b). Third, 12-month-old infants' overall attention to the experimental outcomes was unrelated to the degree of their preference for the unequal outcome, suggesting that the effect is independent of infants' overall attention.

Convergent evidence for the claim that infants' sensitivity to fairness may undergo age-related changes comes from Geraci and Surian (2011), who showed that 16-month-old infants, but not 10-month-old infants, expect agents to approach other agents who previously distributed goods fairly (equally), and that 16-month-old infants, but not 10-month-old infants, select fair over unfair distributors in a manual choice task. Nevertheless, future work should directly match testing conditions across age groups to more systematically investigate age-related changes.

While the findings of the current work suggest developmental change from 12 to 15 months of age in infants' expectations regarding resource distribution, it is unclear whether this change is qualitative or quantitative in nature. The order in which infants saw the experimental outcomes impacted

their preference for the unequal outcome: infants who saw the unequal outcome first showed a preference for the unequal outcome but infants who saw the events in the reverse order did not. Order effects are common in infant research when infants are at transitional ages (e.g., Baillargeon, 1987). It is possible that infants at 12 months of age possess expectations regarding how resources are typically distributed but that such expectations are less robust than those of 15-month-old infants. We are currently investigating whether 12-month-old infants (and 15-month-old infants) demonstrate sensitivity to fairness violations using a paradigm in which both outcomes are displayed simultaneously, to circumvent any order effects.

Our findings have implications for both the nature of infants' expectations regarding how goods are typically distributed and the developmental origins of such expectations. Specifically, our findings suggest that infants' expectations regarding how resources are typically distributed are not, or at least are not solely, the product of innate, abstract principles of fairness or equality; if this was the case, developmental continuity between 12 and 15 months would be expected. Assuming the age-related shift between 12 and 15 months of age is replicated, our findings suggest that infants' expectations regarding resource distribution are either learned or shaped by experience. A critical task for future researchers, then, is identifying the experiences and mechanisms that drive developmental change.

Prosocial behavior during infancy

A secondary goal of the current paper was to investigate prosocial behavior during the second year of life. Both 12- and 15-month-old infants received a sharing task in which they could share a preferred toy, a non-preferred toy, or no toy at all. We found age-related increases in both infants' willingness to share a toy, and how quickly they did so, but no difference in the relative proportion of infants sharing their preferred vs. non-preferred toy as a function of age. It is important to highlight several features of our sharing task. First, infants received direct requests to share a toy ("Can I have one?"; although some infants shared prior to hearing any request); thus, age-related changes in infants' sharing (in general) and latency to share may reflect changes in infants' ability to recognize or understand the experimenter's request, vs. changes in prosocial motivation per se. Second, infants only received a single trial of the sharing task. Given that infants' rates of sharing the preferred and non-preferred toy were similar, one could argue that infants' choice of which toy to share reflected chance performance. However, the finding of an association between which toy infants shared and their performance on the VOE in the predicted direction argues against this possibility. Nevertheless, future

work can improve upon the current paradigm by administering multiple trials of the sharing task.

More specifically, our experiment was designed to investigate relations between tasks designed to measure prosocial behavior, and to investigate relations between prosocial behavior and infants' expectations about resource distribution. With respect to the first question, we found mixed evidence for a relation among prosocial tasks. Infants' instrumental and informational helping behaviors were interrelated, although more infants engaged in instrumental helping than informational helping, and infants responded earlier in the response period in the instrumental helping task than during the informational helping task. Helping scores, in turn, were related to the presence of sharing behavior (e.g., whether or not the child shared a toy) but not to which toy the infant shared. What might account for this pattern of findings?

Typical prosocial tasks code the presence vs. absence of a target behavior (for example, picking up an out-of-reach object to give it to an experimenter). However, whether or not an infant actually produces a given behavior may rely heavily on factors in addition to an infant's prosocial motivation, such as an infant's ability to identify another's unmet need or desire, an infant's level of stranger anxiety, and an infant's general willingness or desire to engage socially. Given these multiple contributing factors, it may be the case that the mere production of a target behavior on a given task does not discriminate individual infants in terms of their degree of prosocial motivation (e.g., their desire or willingness to assist another person). This may particularly be the case when the cost involved in producing the behavior is low, because it requires little effort or because it does not require infants to give up an object of subjective value. Interrelations between the mere presence of helping and sharing behavior (e.g., sharing either toy) could reflect their common reliance on these ancillary factors, vs. prosocial motivation *per se*.

Our findings have implications for the construct of prosocial behavior as assessed in infancy. In a recent experimental study, Dunfield et al. (2011) tested 18- and 24-month-old infants on three prosocial tasks: a helping task, a sharing task, and a comforting task. Dunfield et al. (2011) found that although rates of prosocial behavior were similar across tasks, infants' performance was inconsistent across tasks, raising questions regarding whether infants can be said to have prosocial dispositions. In contrast, our findings provide evidence for some associations in prosocial behavior across tasks; however, these associations may occur because of features of the task that could be independent of a prosocial disposition *per se*. This study differed from Dunfield et al. (2011) in several ways: we tested infants who were significantly younger than

Dunfield et al. (2011), with a longer response window (45 vs. 10 sec in Dunfield et al., 2011), and provided multiple cues to the experimenter's need (whereas Dunfield et al., 2011 provided no verbal requests for aid). Any or all of these differences may have led to the differential pattern of results. More broadly, it is important to point out that associations in prosocial behavior may arise even when tasks designed to measure prosocial behavior vary in the degree of prosocial motivation required because of their common reliance on other factors, and that dissociations may emerge under conditions in which task demands are not equated. Overall, our findings suggest that care should be taken to (a) equate tasks in terms of various task demands and (b) isolate the construct of interest (e.g., infants' socio-cognitive understanding vs. infants' prosocial motivation vs. stranger anxiety, etc.) when investigating prosocial behavior in infancy (and beyond).

Relations between infants' fairness expectations and sharing behavior

The results of this study provide evidence that the relation between infants' expectations regarding resource distribution and sharing behavior is consistent between 12 and 15 months of age, both in terms of infants' willingness to share a preferred toy and their speed in doing so. In contrast, infants' helping behavior was unrelated to such expectations. The unique association between fairness expectations and sharing behavior may have arisen for (at least) two reasons. First, it may be the case that the acquisition of expectations regarding resource distribution is uniquely linked to behaviors that require a relatively high degree of prosocial or, perhaps even altruistic, motivation. Infants who are more prosocially motivated might attend more to the outcomes of social interactions that involve allocations of goods and thus learn more quickly about these types of events. In our study, there was no evidence of infants who shared their preferred toy looking longer overall at the experimental outcomes, but this does not preclude the possibility for this to be the case in infants' real world viewing of events. It is also possible that sensitivity to fairness violations drive infants' sharing behavior. For example, infants who more readily detect such violations may be more motivated to act in a generous manner because they have more opportunities to reflect on the consequences of inequalities. Finally, the acquisition of expectations regarding resource distribution and sharing a preferred toy could be underwritten by a common variable, such as empathic concern. Future studies can test between these alternatives.

An alternate explanation for the unique association between sharing behavior and expectations regarding resource distribution may have to do with how infants acquire these expectations. Past work provides evidence for

increases in sharing behavior starting at 12 months of age (Hay, 1979) and demonstrates that infants show higher levels of sharing behavior after prior exposure to requests for objects and give-and-take games (Hay & Murray, 1982). Infants' increasing participation in sharing games with caregivers may form the basis for learning about how resources are typically distributed. From this perspective, it is the similarity in content between the sharing task and the VOE paradigm that drives the relation between the two tasks. We are currently evaluating each of these possibilities in ongoing studies. Irrespective, our findings suggest that infants' sensitivity to fairness violations and the manner in which they share toys are interrelated from early in development.

CONCLUSIONS

Our findings suggest that there may be changes in infants' fairness expectations between 12 and 15 months of age, indicating that experience likely plays a role in infants' developing expectations of equality in the context of resource distribution. However, there is much to be learned about the nature of these expectations. An important question for future work concerns the basis upon which infants are reacting to violations in the equal distributions of resources. One possibility is that infants have learned particular statistical regularities or rules regarding how resources are typically distributed to recipients (e.g., that resources are typically distributed equally). Another possibility is that infants, like older children and adults, go beyond this to recognize unequal distributions as norm violations or perhaps even moral transgressions. Our findings have begun to contribute to this question by demonstrating a close alliance between infants' behavior, in this case how they share toys, and infants' expectations regarding how resources are typically distributed. Future work can directly address this question by investigating whether and how infants discriminate events that violate statistical regularities, from those that involve normative or moral transgressions.

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