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Infants Associate Praise and Admonishment with Fair and Unfair Individuals

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Abstract

Recent evidence suggests that infants possess a rudimentary sensitivity to fairness: infants expect resources to be distributed fairly and equally, and prefer individuals that distribute resources fairly over those that do so unfairly. The goal of the present work was to determine whether infants' evaluations of fair and unfair individuals also includes an understanding that fair individuals are worthy of praise and unfair individuals are worthy of admonishment. After watching individuals

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¹Note that it is also possible that infants categorized these events not according to valence, but according to other characteristics that covaried with valence, such as the motion properties of the event.

²The following exclusion criteria was applied to all three experiments: an infant was excluded if they fussed out; if experimental error occurred during the test trial; if an infant did not look to both images of the distributors during the pretrial; if an infant's summed looking during a given trial of the first trial pair (Praise and Admonishment) summed to less than 1 second (only applicable to Experiment 2); or if an infant did not complete at least one trial pair (only applicable to Experiment 2).

³For all three experiments, we also analyzed the data using raw looking times (with outlier looking times that were +/- 2.5 SD removed; for Experiment 1, $n = 3$; for Experiment 2, $n = 0$; For Experiment 3, $n = 2$). 2 (Distributor: Fair vs. Unfair) \times 2 (Condition: Praise vs. Admonishment) ANOVAs and follow-up t -tests revealed an identical pattern of findings as the proportion scores. In Experiment 1, there was a significant Distributor \times Condition interaction, $F(1,31) = 4.57, p = .04, \eta^2_{partial} = .129$. Infants in the Praise condition looked longer at the unfair distributor ($M = 5.64, SE = .56$) than the fair distributor ($M = 4.02, SE = .50$), $t(15) = 2.25, p = .04, d = .56$; infants in the Admonishment condition did not differ significantly in their looking times to the unfair ($M = 4.01, SE = .54$) and fair distributors ($M = 4.97, SE = .59$), $t(15) = 1.01, p = .33, d = .24$. In Experiment 2, there was a significant Distributor \times Condition interaction, $F(1,21) = 7.60, p = .012, \eta^2_{partial} = .266$. Infants looked longer to the unfair distributor ($M = 3.88, SE = .50$) than the fair distributor ($M = 2.22, SE = .33$) during Praise trials, $t(21) = 3.89, p = .003, d = .72$; during the Admonishment trials infants did not differ in their looking times to the unfair ($M = 2.81, SE = .45$) and fair distributors ($M = 2.67, SE = .38$), $t(21) = .305, p = .76, d = .07$. In Experiment 3, there was a significant Distributor \times Condition interaction, $F(1,32) = 10.64, p = .003, \eta^2_{partial} = .249$. Specifically, infants in the Admonishment condition looked longer at the unfair distributor ($M = 8.55, SE = .79$) than the fair distributor ($M = 5.10, SE = .60$), $t(16) = 3.01, p = .008, d = .73$. Infants in the Praise condition did not significantly differ in their looking to the unfair ($M = 4.82, SE = .64$) and fair distributors ($M = 7.30, SE = 1.03$), $t(16) = 1.76, p = .10, d = .43$.

⁴One infant did not participate in the post-trial; therefore post-trial results were based on $n = 35$.

⁵Pretrial data from one infant was not included in analysis due to experimental error in the pretrial.

⁶Although our preferred interpretation is that infants' different responses at 13 and 15 months reflect a difference in the degree or strength of their associations at both ages, an alternative possibility raised by a reviewer is that infants' associations at 13 and 15 months are similar in strength or degree, but the ability to process the sentences that convey praise and admonishment change between 13 and 15 months. However, given that the praise and admonishment statements were spoken with positive and negative affect, which is a distinction that is readily processed and, therefore, a full semantic understanding of words conveying praise and admonishment may not be necessary, it seems more likely that the different responses observed among 13- and 15-month-old infants reflect a difference in strength of associations and not a result of different language processing abilities.

distribute goods fairly or unfairly to recipients, 15-month-old (Experiments 1 and 2) and 13-month-old (Experiment 3) infants took part in a test phase in which they saw only the distributors' faces accompanied by praise or admonishment. Across all experiments, infants differentially shifted their visual attention to images of the fair and unfair distributors as a function of the accompanying praise or admonishment, although the direction in which they did so varied by age. Thus, by the start of the second year of life, infants appear to perceive fair individuals as morally praiseworthy and unfair individuals as morally blameworthy.

Keywords

infancy; fairness; morality; moral evaluation

As humans, we are deeply concerned about morality. Moral evaluations guide our personal behavior, influence who we choose as social partners, permeate cultural and political debates, and formally influence decisions of blame and punishment in social and legal justice systems. Not surprisingly then, a burgeoning body of literature has investigated the origins and development of moral evaluations. This work has provided evidence that, by at least the preschool years, children make moral evaluations. Preschool aged children distinguish moral norms from conventional norms and selectively express that moral transgressions are wrong (Nucci & Nucci, 1982; Nucci & Turiel, 1978; Smetana, 1981; Turiel, 1983), and protest (e.g. “No, you’re not supposed to do that”) against actors who violate moral norms of harm (Vaish, Missana, & Tomasello, 2011), property rights (Rossano, Rakoczy, & Tomasello, 2011), and fairness (LoBue, Nishida, Chiong, DeLoache, & Haidt, 2011). Children of this age also intervene in cases of moral violations by tattling (Vaish et al., 2011) and enacting punishment on moral transgressors (Kenward & Osth, 2012).

Recently, there has been a push to identify the earliest emergence of sociomoral evaluations, and in particular, to determine whether sociomoral evaluations can be traced back to infancy. Much of the research on early moral responses comes from the domain of comfort/harm. Early work demonstrated that infants may categorize events based on their underlying positive or negative valence, viewing caressing and helping events as belonging to the same category and hitting and hindering as belonging to a separate category (Premack & Premack, 1997).¹ More recent work has established that after seeing events that depict helping agents or outcomes (e.g., one agent helping another agent achieve a goal) or hindering agents or outcomes (e.g., one agent hindering another agent from achieving a goal) infants form expectations of subsequent third-party interactions, expecting agents to approach other agents on the basis of whether they previously helped or harmed (Hamlin, Wynn, & Bloom, 2007; Kuhlmeier, Wynn, & Bloom, 2003). Critically, infants also show social preferences on the basis of such events, systematically preferring helpers to hinderers, as well as helpers to neutral agents, and neutral agents to hinderers (for a review see Hamlin, 2013). These findings, particularly those demonstrating infants' preferences for helping agents, are consistent with the possibility that infants make sociomoral evaluations in this domain (Buon et al., 2014; Hamlin, 2013, 2014; Hamlin et al., 2007; Hamlin, Wynn, & Bloom, 2010; Hamlin, Wynn, Bloom, & Mahajan, 2011). However, an alternative to this possibility

is that infants' responses on these tasks are driven by underlying affiliative preferences (e.g., a perception that the target agent possesses characteristics that are desirable in a social partner) rather than a recognition or understanding that a given target agent either abides by or transgresses moral norms or principles (Baillargeon et al., 2015)

The current paper sought to investigate infants' sociomoral evaluations in another domain: the domain of fairness. Past work suggests that 3-year-old children perceive individuals who equally distribute resources in a collaborative context as being nicer (Ng, Heyman, & Barner, 2011) and share more resources with individuals who previously shared compared to individuals who did not share (Olson & Spelke, 2008) suggesting that they evaluated such behaviors as being positive or good. Recent research with infants suggests that they also possess a nascent sensitivity to fairness. Specifically, by the second year of life infants appear to expect goods and resources to be distributed equally to recipients (Geraci & Surian, 2011; Schmidt & Sommerville, 2011; Sloane, Baillargeon, & Premack, 2012; Sommerville, Schmidt, Yun, & Burns, 2013) and prefer individuals who abide by this norm over individuals who violate this norm (Burns & Sommerville, 2014; Geraci & Surian, 2011).

While these paradigms provide clear evidence that infants both detect violations to fairness, and form affiliative preferences on the basis of whether an individual acts fairly or not, we do not yet know whether infants' evaluations of fair and unfair behavior incorporate notions of reward and punishment in a manner similar to adults' sociomoral evaluations (Dawes, Fowler, Johnson, McElreath, & Smirnov, 2007; Johnson, Dawes, Fowler, McElreath, & Smirnov, 2009).

Some existing work has attempted to directly investigate whether infants expect fair and unfair behaviors to be met with reward and punishment, respectively. In one study, 10-month-old infants look longer to events in which an agent gives an object to a previously unfair distributor versus a previously fair distributor (Meristo & Surian, 2013). In a subsequent study, 10-month-old infants looked longer to events in which antisocial actions (i.e., taking a toy away or hitting behavior) were directed at a previously unfair distributor versus a previously fair distributor (Meristo & Surian, 2014). Based on these findings the authors argued that infants recognize that fair behaviors should be met with rewards and unfair behaviors with punishment. However, because both of these studies revealed that infants show enhanced attention to test events that are directed toward an unfair agent (note that a control condition found equivalent looking to events in the vicinity of the fair and unfair actor but these events may have been too ambiguous for infants to process them as agent-directed), these results may reflect that infants possess affiliative expectations (i.e., they do not expect a third-party agent to approach an unfair agent) rather than particular expectations that fair behaviors or individuals should be rewarded and unfair behaviors or individuals should be punished (see Baillargeon et al., 2015 for a more general discussion of the distinction between affiliative preferences and sociomoral evaluations).

In the current paper we sought to directly investigate whether infants perceive fair behavior and individuals as worthy of praise and unfair behavior as worthy of punishment or admonishment. To do so, we first needed to develop an appropriate paradigm for asking this

question. Thus, we created a paradigm that would allow us to test whether infants *associate* praise and admonishment with individuals based on their previously fair or unfair behavior. Similar types of methods are quite prevalent within social psychology as a means to understand how both children and adults evaluate social stimuli (Baron & Banaji, 2006; Fazio, Jackson, Dunton, & Williams, 1995; Fazio, Sanbonmatsu, Powell, & Kardes, 1986; Greenwald & Banaji, 1995; Greenwald, McGhee, & Schwartz, 1998; Payne, Cheng, Govorun, & Stewart, 2005).

We investigated whether infants associate statements of praise and statements of admonishment with fair and unfair individuals using a novel looking-time paradigm that we dubbed the “Valence Association Task” (henceforth VAT). The VAT included two phases: a Distribution Phase and a Test Phase. During the Distribution Phase, infants viewed a third-party distribution task in which one distributor divided resources equally (i.e., fairly) and another distributor divided resources unequally (i.e., unfairly) to two recipients. During the Test Phase, infants were simultaneously presented with images of only the faces of the fair and unfair distributors while hearing accompanying statements of praise or admonishment. If infants associate praise and admonishment with fair and unfair individuals respectively, we expected that they would differentially shift their visual attention to the images of the fair and unfair distributors as a function of the accompanying praise or admonishment stimuli.

The VAT shares structural features with classic intermodal perception paradigms (Spelke, 1979). In intermodal paradigms, infants are presented with a stimulus through one sensory modality (e.g., an audio soundtrack of a woman speaking) while being simultaneously presented with both a matching (e.g., a video of a woman's face) and mismatching stimuli (e.g., a video of a man's face) from a different sensory modality (e.g., Walker-Andrews, Bahrick, Raglioni, & Diaz, 1991). Systematic visual preferences for either the matching or mismatching stimuli, versus random attention to either image, provide evidence for intermodal perception.

Structurally, the VAT is similar to these intermodal paradigms: after seeing one distributor perform a fair distribution, and another distributor perform an unfair distribution, infants are simultaneously presented with images of both distributors with accompanying vocal stimuli, and infants' visual attention to the faces of the distributors is measured. Importantly, however, the VAT also differs from intermodal paradigms in a number of ways. First, classic intermodal paradigms measure sensitivity to invariant properties (properties that always go together) between intermodal stimuli such as the temporal sound and visual motion of a bouncing ball (Spelke, 1979). Praise and admonishment, by comparison, are not uniquely linked to fair and unfair distributors or distributions. Second, intermodal paradigms measure infants' recognition of links between sensory and perceptual experiences (e.g., audition and vision), and the question is whether infants recognize the perceptual or sensory equivalence (that both sensory experiences refer to the same object). By contrast, the VAT tests infants' conceptual associations; specifically, whether infants associate certain individuals, and their social behavior, with praise and admonishment.

Most studies (but not all, see Flom, Whipple, & Hyde, 2009; Houston-Price & Nakai, 2004; Streri & Spelke, 1988) on intermodal perception have revealed that infants look longer to the

matching stimulus. In our study, however, given that our novel paradigm shares structural features with intermodal methods, but also differs in important ways, we had no *a priori* predictions about the directional shift in visual attention we should expect if infants associate praise and admonishment with fair and unfair individuals. On the one hand, if infants form such associations they may show a matching effect (i.e., longer looking to the fair distributor while hearing praise and/or longer looking to the unfair distributor while hearing admonishment) because their looking behavior is driven by a tendency to look to conceptually congruent (or familiar) stimuli. On the other hand, infants may show a mismatching effect (i.e., longer looking to the unfair distributor while hearing praise and/or longer looking to the fair distributor while hearing admonishment) if their looking is driven by a tendency to detect, and attend to, incongruent (or novel) stimuli. Regardless, we predicted that if infants do associate praise and admonishment with fair and unfair actions and individuals they should differentially shift their visual attention to the fair and unfair distributors to the degree that the accompanying stimuli was either congruent or incongruent with those associations.

Experiment 1

In Experiment 1, 15-month-old infants participated in the VAT. Fifteen-month-old infants discriminate fair and unfair outcomes, expect goods to be distributed fairly (Geraci & Surian, 2011; Schmidt & Sommerville, 2011; Sommerville, Schmidt, Yun, & Burns, 2013), and show affiliative preference for fair versus unfair individuals (Geraci & Surian, 2011; Burns & Sommerville, 2014). Therefore, we investigated whether infants at this age associate praise and admonishment with fair and unfair individuals. During the Distribution Phase, infants viewed four video-recorded distribution episodes, two fair distributions and two unfair distributions, in alternating order. During the Test Phase, infants heard praise (Praise condition) or they heard admonishment (Admonishment condition). If 15-month-old infants associate praise and admonishment with fair and unfair distributors, respectively, we predicted that they would differentially shift their attention to the fair and unfair distributors as a function of hearing praise or admonishment stimuli.

Method

Participants—Thirty-six 15-month-old infants participated in the experiment (22 girls; mean age: 15 months, 2 days; range: 14 months, 25 days to 15 months, 14 days). Of these infants, 26 identified as Caucasian, 6 as mixed race, 1 as Black/African American, and 3 selected “other” (among a list that included the former as well as Asian/Pacific Islander, Hispanic, and Native American). All infants were full term and typically developing. Participants were recruited from a database of parents who volunteered to participate in research at a large research institution in the Pacific Northwest. Five additional infants participated, but were excluded due to fussiness ($n = 3$), experimental error ($n = 1$), and because both a primary and reliability coder confirmed that the infant ($n = 1$) failed to look at both images during the pretrial phase.²

Stimuli & Materials

The Distribution Phase used video-recorded distribution episodes (described below). The props used in each episode were Graham crackers, white plates, and a transparent bowl. The distribution monitor was 51.5 cm. For the Test Phase, still images of each distributor's face were created and placed against a black background. The images were 23 cm tall and were displayed during the pretrial, test trial, and post-trial on two 48 cm monitors that flanked the central monitor. Audio-recordings were created using the voice of a female actress, not involved in the distribution episodes, saying a string of seven consecutive praise statements spoken with positive vocal affect (e.g. "She's a good girl", "She did a good job"; Praise condition) or seven consecutive admonishment statements spoken with negative vocal affect (e.g., "She's a bad girl", "She did a bad job"; Admonishment condition). Each string of statements lasted 20 seconds.

Procedure—Infants were randomly assigned to either the Praise condition or the Admonishment condition. Across conditions, the pre-trial and post-trial were identical; it was only the test trial that differed. The physical set up of the experiment consisted of a central monitor with two flanking monitors (one on the left side of the central monitor and the other on the right side of the central monitor). Throughout the procedure, infants were seated on a caregiver's lap, approximately 81 cm from the central monitor, equidistant from the flanking monitors. Caregivers were instructed to close their eyes and maintain a neutral facial expression for the duration of the procedure to avoid influencing the infant during the procedure. The primary experimenter confirmed compliance with these instructions throughout the procedure.

Distribution Phase: Participants watched four consecutive distribution episodes (adapted from Schmidt and Sommerville, 2011) on the central monitor. In each distribution episode, three female actors were seated at a table. One actor (the distributor) had a transparent bowl containing crackers. The two other actors (the recipients) were seated on either side of the distributor and each had a single empty plate in front of her. At the beginning of each distribution video, the distributor greeted the infant and each recipient. Next the distributor lifted the bowl with a positive vocal expression ("Yummy"). Both recipients simultaneously pushed their plates towards the distributor and said, "Please". The distributor distributed the crackers to the recipients, one recipient at a time, by placing a single handful of crackers (i.e., all crackers at once) on each plate and saying, "Here". The distributor always started by distributing crackers to the recipient on her left. Each distribution episode lasted for 28 seconds.

For two episodes, the distributor distributed the crackers equally (henceforth, the fair distributor); for the other two episodes, a second distributor distributed the crackers unequally (henceforth, the unfair distributor). Fair and unfair distributions occurred in alternating order. In the fair episodes, the distributor equally distributed two crackers to each recipient (2:2; first fair episode) and then three crackers to each recipient (3:3; second fair episode). In the unfair episodes a *different* distributor unequally distributed three crackers to one recipient and one cracker to the other recipient (3:1; first unfair episode) and then five crackers to one recipient and one to the other recipient (5:1; second unfair episode). The

recipient that was advantaged in the two unfair distribution episodes was consistent across those episodes. Furthermore, the identity of the fair (and unfair) distributor, and order of fair (and unfair) distributions were counterbalanced across all infants. At the end of each episode, the distributor lifted the now-empty bowl and said, “All gone”. Infants then saw a still-frame image of the outcome for 5 seconds to ensure that they encoded each outcome. Then the monitor went black for 4 seconds until the next distribution episode began. In this experiment, and all subsequent experiments, the primary experimenter ascertained that all infants attended to all distribution episodes.

Test Phase: The Test Phase was composed of a pretrial to allow infants time to encode the location of the distributors faces and to ensure baseline attention to the distributors did not vary by condition, a test trial to measure whether infants would shift their attention as a function of the nature of the vocal stimuli, and a post-trial to determine if attention would return to baseline levels.

Pretrial: During the pretrial, infants were simultaneously presented with the faces of the fair and unfair distributors, 122 cm apart, on the flanking monitors (one face per side) for 10 seconds, while the center monitor was black. The locations of the fair and unfair distributors (e.g., fair on the monitor to the infant's right) were counterbalanced across all infants.

Test Trial: The test trial followed directly after the pretrial. Images of the distributors faces remained in the same locations as in the pretrial, while either the Praise (for infants in the Praise condition) or the Admonishment stimuli (for infants in the Admonishment condition; see Stimuli and Materials) emanated from a central speaker, equidistant between the two images. The test trial lasted for 20 seconds.

Post-trial: Immediately following the test trial, once the vocal stimuli ceased, the faces of both distributors remained in the same location for 5 seconds.

Coding and Analysis—A primary trained coder, who was unaware of the locations (left or right monitor) and the identities (fair and unfair) of the distributors, coded, from video, infants' duration looking to the left monitor and the right monitor during the pretrial, test trial, and post-trial using a computer-based program (JHab; Casstevens, 2007). Another trained reliability coder, unaware of the locations (left or right monitor) and the identities (fair and unfair) of the distributors, independently coded all infants and all trials. Looking times from the primary coder and reliability coder were highly correlated, $r(214) = .98, p < .001$. All subsequent analyses use the primary coder's looking times, yet all results remain unchanged if using the reliability coder's data.

Looking times were then converted to proportion scores, such that larger proportions reflect looking longer to the unfair distributor (for similar conversion of raw looking time to proportion scores see Skerry, Carey, & Spelke, 2013). Mean proportion scores looking to the unfair distributor during the pretrial and during the post-trial were compared to chance (.50). Additionally, mean proportion scores looking to the unfair distributor between conditions were compared using a two-tailed independent *t*-test. For the test trial, mean proportion scores looking to the unfair distributor in each condition were compared using a two-tailed

independent samples t -test. Mean proportion scores looking to the unfair distributor in each condition were then compared to chance (.50) using a one-sample t -test.

Results

Preliminary analyses found no effect of fair (or unfair) actor identity, actor location (right or left), or distribution order, therefore all future analyses collapsed across these factors.

During the pretrial, infants' proportion of looking to the unfair distributor did not differ from chance, one-sample $t(35) = .22, p = .83$. Infants' looking to the unfair actor during the pretrial did not differ according to condition, independent samples $t(34) = 1.41, p = .17$.

Of central interest was infants' looking during the test trial. As shown in Figure 1, infants in the Praise condition spent a greater proportion of their time looking at the unfair distributor ($M = .59, SE = .03$) than infants in the Admonishment condition ($M = .42, SE = .04$), $t(34) = 2.50, p = .02, d = .83$. In the Praise condition, infants looked to the unfair distributor significantly above chance, one-sample $t(17) = 2.19, p = .04, d = .53$. Looking in the Admonishment condition was not significantly different from chance, one-sample $t(17) = 1.46, p = .16, d = .35$.³

During the post-trial, infants' proportion of looking to the unfair distributor did not differ from chance, one-sample $t(34) = .16, p = .87$, nor did infants' looking to each distributor differ between conditions, independent samples $t(33) = .97, p = .97$.⁴

Discussion

In Experiment 1, 15-month-old infants differentially attended to the fair and unfair distributors as a function of accompanying praise or admonishment. Critically, infants' attention to the fair and unfair distributors did not differ during the pretrial or during the post-trial suggesting that infants' differential attention to the fair and unfair distributors during the test trial were the result of the accompanying praise and admonishment stimuli. This pattern of results suggests that 15-month-old infants associate praise and admonishment with fair and unfair individuals using a third-party distribution task. An asymmetry in visual attention was also found: infants in the Praise condition looked longer to the unfair distributor, but infants in the Admonishment condition did not differ in duration looking to the distributors. We will return to this issue in the General Discussion.

Experiment 2

The goal of Experiment 2 was to test the robustness of the effect found in Experiment 1 using a within-subjects design. Specifically, we sought to replicate and extend the findings of Experiment 1 by testing infants under more challenging conditions. Infants watched a live distribution phase and then took part in the test phase after an intervening delay. These manipulations allowed us to address important questions regarding the nature of the effect found in Experiment 1. First, past research suggests that infants' learning is often context specific (see, for example, Sommerville & Crane, 2009); thus, by testing whether infants can transfer what they have learned from a live distribution phase to digitized images in the test phase we can investigate the extent to which the effect is context general versus context

specific. Critically, this manipulation also speaks to the issue of the degree to which positive and negative associations may guide infants' evaluations in the real world, as it is common for infants to (re)encounter individuals across contexts. Second, testing whether infants' associations withstand a delay provides critical information regarding whether such associations are relatively short-lived or more longstanding.

Method

Participants—Twenty-two 15-month-old infants participated in the experiment (13 boys; mean age: 15 months, 9 days; range: 14 months, 24 days to 15 months, 28 days). Of these infants, 21 identified as Caucasian, and 1 chose not to report. All infants were full term and typically developing. Participants were recruited from a database of parents who volunteered to participate in research at a large research institution in the Pacific Northwest. Two additional infants were tested, but were excluded due to not meeting a preset minimum looking time criteria (see Footnote 1; $n = 1$) or if the infant did not complete at least one trial pair (see Footnote 1; $n = 1$).

Infants in the current sample overlapped with infants tested in the CF/CUF condition of Burns and Sommerville (2014). Infants in both studies viewed the live distribution phase as described in the current paper and in Burns & Sommerville (2014), followed by affiliation trials in which they could select between the fair and unfair distributor who were performing identical behaviors (described and reported in Burns and Sommerville, 2014). Then infants participated in the test phase of the Valence Association Task (unique to the current study). In the current experiment, no aspects of infants' performance on the VAT were related to their performance in the affiliation trials reported in Burns & Sommerville (2014) supporting the idea that affiliative preferences may be different than the ability to recognize fair behavior as praiseworthy and unfair behavior as worthy of admonishment (see Baillargeon et al., 2015). Moreover, infants' performance on the VAT in Experiment 2 was also unrelated to the length of delay (described below) between the distribution phase and test phase of the VAT.

Stimuli and Materials—The props used during the live distribution episodes were green toy frogs, yellow Lego blocks, a transparent toy container, white plates, and opaque plate lids. For the Test Phase, still images of the distributors were created in the same manner as in Experiment 1. The audio-recordings of vocal stimuli were the same as in Experiment 1.

Procedure—Infants in Experiment 2 viewed live distributions during the Distribution Phase. During the Test Phase, infants participated in one pretrial to measure baseline visual attention to the distributors, four test trials (two Praise and two Admonishment in alternating order) to measure visual attention to the distributors as a function of accompanying praise and admonishment, and three inter-trial intervals to prevent visual attention from being influenced by the previous trial. For the live Distribution Phase, infants were seated on a caregiver's lap approximately 60 cm from the display table. The caregiver was instructed to gaze neutrally at the top of the infant's head and to avoid interacting with their infant during the procedure. For the Test Phase, infants were moved to a different testing room and were seated on a caregiver's lap approximately 81 cm from the central monitor, equidistant from

the flanking monitors. Caregivers were given the same instructions as in the Distribution Phase. The primary experimenter confirmed compliance with these instructions throughout the procedure.

Distribution Phase: Infants in Experiment 2 viewed four live distribution episodes. A total of four well-trained female actors (different from those in Experiment 1) performed in the live distribution episodes. Two actors served as the distributors (one as the fair distributor, the other as the unfair distributor; see below) and two actors served as the recipients. In the fair episodes, the (fair) distributor distributed toy frogs (first fair distribution episode) and then Lego blocks (second fair distribution episode) equally (2:2) to the two recipients. In the unfair episodes, the (unfair) distributor distributed toy frogs (first unfair distribution episode) and then Lego blocks (second unfair distribution episode) unequally (3:1). Each distribution episode was 85 seconds. Across the unfair distribution episodes, the identity of the advantaged recipient (the one who received 3 toys) remained constant. Distribution-type (fair and unfair) occurred in alternating order. Furthermore, the distribution-type order (i.e., fair episode first or unfair episode first), and the identity of the fair (and unfair) distributor were counterbalanced across all infants. For further details of the live Distribution Phase, see Burns and Sommerville (2014).

Between the Distribution Phase and the Test Phase infants participated in range of unrelated tasks (see Burns and Sommerville, 2014), which created an average delay of 13-minutes (range: 9 minutes, 14 seconds to 20 minutes, 3 seconds) between the Distribution Phase and the Test Phase of the VAT.

Test Phase

Pretrial: The pretrial followed the same structure as in Experiment 1.

Test Trials: There were four test trials (two Praise and two Admonishment). The structure of each test trial was the same as in Experiment 1. Praise and Admonishment test trials occurred in alternating order. The trial-type that came first and the starting locations of the distributors' faces (e.g., fair on the monitor to the infant's right) were counterbalanced across all infants. After the second test trial, the faces of the distributors switched monitors.

Inter-trial Intervals: There were three inter-trial intervals. Two 5-second inter-trial intervals separated the first from the second test trial and the third from the fourth test trial to prevent visual attention from being influenced by the previous trial. Following the second test trial, the location of the distributors' faces switched sides. Therefore, between the second and third test trials a 10-second inter-trial interval was used, again to prevent visual attention from being influenced by the previous trial and also to allow time for infants to encode the new locations of each distributor. During all inter-trials the faces of the distributors remained onscreen with no vocal stimuli.

Coding and Analysis—A primary trained coder, unaware of the locations (left or right monitor) and the identities (fair and unfair) of the distributors, coded, from video, infants' duration looking to the left monitor and the right monitor during the pretrial and test trials using a computer-based program (JHab; Casstevens, 2007). Another trained reliability coder,

unaware of the locations (left or right monitor) and the identities (fair and unfair) of the distributors, independently coded all infants and all trials. Looking times from the primary coder and reliability coder were highly correlated, $r(354) = .97, p < .001$. All subsequent analyses use the primary coder's looking times, yet all results remain unchanged if using the reliability coder's data.

As in Experiment 1, looking times were then converted to proportion scores, such that larger proportions reflect looking longer to the unfair distributor. For infants who completed all four trials ($n = 18$), proportion scores were averaged over the two trial types. For infants who only completed one trial pair (i.e., one Praise and one Admonishment; $n = 4$), proportion scores for those single trials were used. A two-tailed, paired-sample t -test was used to compare mean proportions of looking to the unfair distributor as a function of trial type. One-sample t -tests were carried out to compare mean proportion of looking to the unfair distributor in each trial-type to chance (.50).

Results

Preliminary analyses found no effect of fair (or unfair) actor identity, actor location (right or left), distribution order, or test trial order, therefore all future analyses collapsed across these factors.

Infants did not show a baseline preference for looking to the fair or unfair distributor prior to the first test trial. During the pretrial, infants looked equally to both distributors, $t(20) = 1.42, p = .17$.⁵

Of central interest was whether infants would differentially shift their attention to the distributors as a function of trial-type during the test trials. As shown in Figure 2, infants spent a greater proportion of their time attending to the unfair distributor during Praise trials ($M = .62, SE = .03$) than Admonishment trials ($M = .47, SE = .04$), $t(21) = 2.48, p = .02, d = .53$. In the Praise trials, infants looked to the unfair distributor significantly above chance, one-sample $t(21) = 3.65, p = .002, d = .78$. However, looking in the Admonishment condition did not differ from chance, one-sample $t(21) = .58, p = .57, d = .12$. See Table 1 for mean proportion looking to the unfair distributor in all four individual test trials.

Discussion

In Experiment 2, as in Experiment 1, 15-month-old infants differentially shifted their attention to the fair and unfair distributors as a function of trial-type across both Praise and Admonishment test trials. Critically, infants did not differ in baseline looking to the fair and unfair distributors during the pretrial suggesting that differential attention to the fair and unfair distributors during the test trials were the result of the accompanying praise and admonishment stimuli. Furthermore, the current finding that infants looked proportionately longer to the unfair distributor while hearing praise, but did not look longer to the fair distributor while hearing admonishment, replicates the asymmetry found in Experiment 1.

Of critical importance, Experiment 2 replicated the finding of Experiment 1 under more challenging conditions. In a within-subjects design, infants differentially shifted their attention to fair and unfair distributors across both Praise and Admonishment trials

following a temporal delay. This suggests that infants' associations are not fleeting but can withstand at least a 13-minute delay; future research can address the bounds of these associations. Moreover, infants associations extended from live events to digitized images. These finding suggest that beyond the controlled conditions of the laboratory, infants likely form (and may potentially use) positive and negative associations, or notions of praise and admonishment, with fair and unfair individuals in the real world.

Experiment 3

The goal of Experiment 3 was to investigate whether younger infants also associate praise and admonishment with fair and unfair individuals. Recent evidence suggests that the onset of group level sensitivity to fairness norms may emerge between 9- and 12-months of age (Ziv & Sommerville, under review). Thus, we tested 13-month-old infants in Experiment 3. In addition to revealing the potential origins of the development of sociomoral evaluations, testing infants at this age allows us to begin to identify whether infants' evaluations and the ability to discriminate fair versus unfair outcomes follow similar or different developmental trajectories.

Infants in Experiment 3 viewed a video-recorded Distribution Phase and then participated in a Test Phase similar to that of Experiment 1. If 13-month-old infants also associate praise and admonishment with fair and unfair distributors, we expected them to differentially shift their attention to the images of the fair and unfair distributors as a function of accompanying praise or admonishment. However, due to previous reports of age-related changes in the direction of infants' looking preferences (e.g, Ferry, Hespos, & Waxman, 2013; Houston-Price & Nakai, 2004), we did not have a prediction regarding the direction in which 13-month-olds would shift their attention.

Method

Participants—Thirty-six 13-month-old infants participated in the experiment (19 girls; mean age: 12 months, 28 days; range: 12 months, 18 days to 13 months, 13 days). Of these infants, 24 identified as Caucasian, 6 as Multiracial, 3 as Asian/Pacific Islander, 1 as Hispanic, and 2 chose not to report. All infants were full term and typically developing. Participants were recruited from a database of parents who volunteered to participate in research at a large research institution in the Pacific Northwest. An additional five infants were tested, but were excluded from the final sample due to fussiness.

Stimuli and Materials—The video-recorded distribution episodes were the same as in Experiment 1 except that they were presented to the infant on a projector screen. For the Test Phase, still images of the fair and unfair distributors were the same as in Experiment 1 except that they were presented to the infant on a projector screen. Vocal stimuli were the same as in Experiment 1 and emanated from a central speaker directly behind the projector screen, equidistant from the images of the distributors' faces, during the test trial.

Procedure—The procedure of Experiment 3 was similar to that of Experiment 1. In Experiment 3, infants were seated on a caregiver's lap approximately 74 cm from the center of a white projector screen for the duration of procedure.

Distribution Phase: Infants viewed the same four distribution episodes as in Experiment 1, except these episodes were presented on the center of a white projector screen.

Test Phase: Infants were randomly assigned to either the Praise condition or the Admonishment condition. Aside from the use of the projector screen and a modified post-trial (see below), the Test Phase was identical to Experiment 1.

Pretrial: The pretrial was the same as in Experiment 1.

Test Trial: The test trial was the same as in Experiment 1.

Post-trial: During the post-trial, the distributors faces were presented in the same locations as in the pretrial and test trial, however, the post-trial in the current experiment lasted for 10 seconds to make the pretrial and post-trial equivalent. Furthermore, prior to the post-trial, the distributors' faces temporarily disappeared and infants were presented with a central attention getter (animated xylophone) to shift infants' attention to the center before the post-trial began. Once the primary experimenter confirmed that infants' attention was centered for at least 2 seconds, the post-trial began.

Coding and Analysis—A primary trained coder, who was unaware of the locations (left or right side) and the identities (fair and unfair) of the distributors, coded, from video, infants' duration looking to the left image and the right image during the pretrial, test trial, and post-trial using a computer-based program (JHab; Casstevens, 2007). Another trained reliability coder, unaware of the locations (left or right side) and the identities (fair and unfair) of the distributors, independently coded all infants and all trials. Looking times from the primary coder and reliability coder were highly correlated, $r(214) = .98, p < .001$. All subsequent analyses use the primary coder's looking times, yet all results remain unchanged if using the reliability coder's data.

As in Experiments 1 and 2, looking times were converted to proportion scores such that larger proportions reflect looking longer to the unfair distributor, and the same analytic approach was taken.

Results

Preliminary analyses found no effect of fair (or unfair) actor identity, actor location (right or left), or distribution order, therefore all future analyses collapsed across these factors.

During the pretrial, infants' proportion of looking to the unfair distributor did not differ from chance, one-sample $t(35) = .32, p = .75$. Infants' looking to the unfair actor during the pre-trial did not differ according to condition, independent samples $t(34) = .48, p = .63$.

Of central interest was infants' looking during the test trial. As shown in Figure 3, infants in the Admonishment condition spent a greater proportion of their time looking at the unfair distributor ($M = .60, SE = .04$) than infants in the Praise condition ($M = .44, SE = .06$), $t(34) = 2.16, p = .04, d = .36$. In the Admonishment condition, infants looked to the unfair distributor significantly above chance, one-sample $t(17) = 2.14, p = .03, d = .50$. However,

proportion of infant looking in the Praise condition did not differ from chance, one-sample $t(17) = .96, p = .35, d = .23$.

During the post-trial, infants' proportion of looking to the unfair distributor did not differ from chance, one-sample $t(35) = 1.45, p = .16$, nor did infants looking to the unfair actor differ by condition, independent samples $t(34) = 1.55, p = .13$.

Additionally we tested whether the pattern of visual attention among 13-month-old infants in the current experiment was reliably different from that of 15-month-old infants in Experiment 1. There was a significant Condition \times Age Group interaction, $F(1,69) = 10.92, p = .002, \eta^2_{partial} = .137$. Specifically, 15-month-olds looked longer to the unfair distributor ($M = .59, SE = .04$) than 13-month-olds ($M = .44, SE = .06$) in the Praise condition, $t(34) = 2.04, p = .05, d = .68$. Conversely, 13-month-olds looked longer to the unfair distributor ($M = .60, SE = .04$) than 15-month-olds ($M = .42, SE = .05$) in the Admonishment condition, $t(34) = 2.62, p = .01, d = .91$.

Discussion

In Experiment 3, 13-month-old infants differentially attended to the fair and unfair distributors as a function of accompanying praise or admonishment. Critically, infants' attention to the fair and unfair distributors did not differ during the pretrial or during the post-trial suggesting that differential attention to the fair and unfair distributors during the test trial were the result of the accompanying praise and admonishment. Interestingly, whereas 15-month-old infants looked longer to the unfair distributor while hearing praise (mismatching effect), 13-month-old infants looked longer to the unfair distributor while hearing admonishment (matching effect). Furthermore, an asymmetry in visual attention during the test trial was also found. We will return to these two issues in the General Discussion. Presently, these patterns of results suggest that 13-month-old infants also differentially associate praise and admonishment with fair and unfair individuals.

General Discussion

The current experiments demonstrate that both 15- and 13-month-old infants differentially associated praise and admonishment with fair and unfair individuals. In Experiment 1, using a between-subjects design, infants associated praise statements and admonishment statements with the fair and unfair distributors, respectively. Experiment 2 replicated and extended this finding using a within-subjects design, under more challenging circumstances (i.e., after a temporal delay and across presentational mediums). Experiment 3 provided evidence that 13-month-old infants also associated praise and admonishment with fair and unfair individuals. During the Test Phase, infants in all experiments were only presented with the faces of the distributors, and not the outcomes. Thus, infants are not merely evaluating the outcomes of distribution events; rather, these evaluations apply to the individuals producing those outcomes.

Although infants at both ages associated praise and admonishment with fair and unfair distributors, the ways in which they expressed their associations during test differed between both ages. That is, both age groups differentially shifted their attention to the fair and unfair

distributors as a function of accompanying praise and admonishment, but the direction in which they did so varied between 13 and 15 months of age. Thirteen-month-olds showed a matching effect (i.e., they looked longer to the unfair distributor when they were presented with accompanying admonishment). Fifteen-month-old infants showed a mismatching effect (i.e., they looked longer to the unfair distributor when they were presented with accompanying praise). This age-related shift from a matching effect to a mismatching effect of visual attention is consistent with developmental trends in infants' looking behavior under similar testing conditions. For example, Flom, Whipple, and Hyde (2009) used a similar paradigm to test infants' intermodal perception of canine facial expressions and vocalizations. They found that 6-month-olds looked longer to the canine facial expression that matched the aggressive or nonaggressive tone of the vocalizations. Conversely, 18-month-olds looked longer to the canine facial expression that mismatched the vocalizations. Similar transitions have been seen in younger infants with simpler stimuli (e.g., Ferry, Hespos & Waxman, 2013).

Given prior work suggesting that infants may shift from a familiarity preference to a novelty preference in their visual attention as a function of how well processed the stimuli is (Houston-Price & Nakai, 2004; Hunter & Ames, 1988; Roder, Bushnell, & Sasseville, 2000), we suggest that 13-month-old infants showed a matching effect of visual attention during test because their associations (e.g., an unfair distributor is associated with admonishment) were either less well-entrenched or not as strong as those of 15-month-old infants. This suggests that there may be age-related changes between 13 and 15 months of age regarding the degree or strength of these associations of praise and admonishment with fair and unfair individuals.⁶ Future work can directly investigate this possibility by a) investigating whether 13-month-old infants, like 15-month-old infants, maintain associations after a delay, and b) investigating whether different amounts of counter-evidence are necessary to change these associations as a function of age.

Across all three experiments, infants showed an asymmetry of visual attention to the fair and unfair distributors. Fifteen-month-old infants looked significantly longer to the unfair distributor while hearing praise, but did not look significantly longer to the fair distributor while hearing admonishment. Similarly, 13-month-old infants looked significantly longer to the unfair distributor while hearing admonishment, but did not look significantly longer to the fair distributor while hearing praise. However, even in conditions in which infants' looking did not differ significantly from chance (i.e., 15-month-old infants' attention to the fair distributor during admonishment, and 13-month-old infants' attention to the fair distributor during praise), effect size estimates revealed small to medium effects. Moreover, all three experiments revealed effects of condition on infants' attention to the distributors. Therefore, this asymmetry is probably best conceived of as continuous (e.g., infants' associations were stronger in some conditions than others) rather than categorical (e.g., infants' associations were present in some conditions versus absent in other conditions).

Nevertheless, one possible explanation for this asymmetry is there is a lack of equivalence in the extent to which unfairness is viewed as blameworthy and fairness as praiseworthy; that is, unfairness is viewed as more blameworthy than fairness is praiseworthy. Thus, infants at both ages more readily associated admonishment with the unfair actor. This corresponds

with findings among children and adults demonstrating that negative actions or outcomes, compared to good actions or outcomes, are more diagnostic and have a greater influence on impression formation and moral judgment (Buon et al., 2014; Leslie, Knobe, & Cohen, 2006; Riskey & Birnbaum, 1974; Skowronski & Carlston, 1992; Vaish, Grossmann, & Woodward, 2008). Moreover, in the domain of fairness, adults appear to treat the equal division of goods as the expected norm (Deutsch, 1975) and punish those who violate this norm (Dawes et al., 2007; Johnson et al., 2009) suggesting that they perceive deviance from the expected norm to be more salient. Here, it may have been that infants' also perceived the unfair distribution as violating an expected norm, leading to strong associations between admonishment and unfairness and perceived fair distributions as aligning with an expected norm, leading to weaker associations between praise and fairness.

The current experiments demonstrate that infants differentially associated praise and admonishment with fair and unfair individuals. However, one alternative explanation could be that infants in our experiments were not responding to the meaning of praise and admonishment *per se*, but were more generally associating the positive and negative valence in which the praise and admonishment statements were spoken with the fair and unfair distributors. Future work can disentangle these possibilities by expanding the investigation of the scope of positive and negative stimuli that infants will associate with fair and unfair individuals. Critically however, both possibilities are consistent with previous findings suggesting that infants differentially evaluate prosocial and antisocial individuals.

Moreover, if infants were more generally associating the positive and negative valence of the vocal stimuli with the fair and unfair distributors, this would provide important converging evidence for previous work that has shown that infants prefer prosocial relative to antisocial individuals. Our findings would build on this prior work by providing more precise information regarding what drives these affiliative patterns. Preference patterns provide information about the relative positivity or negativity of two alternatives: selecting A>B could signal that A is perceived as more positive than B or that A is perceived as less negative than B. The extent to which our findings demonstrate more general associations of fair and unfair behavior with positive and negative stimuli, they suggest that infants' affiliative preferences for fair agents are likely more strongly driven by a dislike for unfair agents over a liking of fair agents.

Our particular approach also contributes to the literature in other ways. Some past studies have used distribution events featuring two objects, such that fair outcomes consist of both recipients receiving a toy (1:1) and unfair outcomes consist of one recipient receiving toys and the other receiving none (2:0; Geraci & Surian, Meristo & Surian, 2013; Meristo & Surian, 2014, Sloane et al., 2012). In these cases it is possible that infants may construe one distributor as including all individuals in a social exchange (the fair distributor), and another as excluding certain individuals from a social exchange (the unfair distributor). Infants' subsequent reactions to outcomes and distributors may be based on their preferences for social inclusion in exchanges rather than fairness *per se*. In contrast, the use of a 2:2 versus 3:1 distributions in the current paper, and in some prior work (Burns & Sommerville, 2014; Schmidt & Sommerville, 2011; Sommerville et al., 2013) de-conflates these two

possibilities since both actors are involved in the exchange, yielding an approach that *uniquely* focuses on issues of fairness.

The present findings also raise other important questions for future work. Specific to the VAT that was used in our experiments is the question of whether infants' responses during the test phase of the VAT are based on a memory of one distributor previously behaving fairly and the other distributor behaving unfairly, or, in contrast, if during the Distribution Phase, infants simply tag one distributor with positive valence and the other with negative valence and bring this tagging to bear during the Test Phase. Children (LoBue et al., 2011) and adults (Pillutla & Murnighan, 1996) appear to do both. Whether or not infants do one or the other, or both, is an important question for future work since these two processes may have different outcomes.

Another important question for future inquiry concerns the developmental timetable of discrimination, preference, and evaluation processes. Specifically, does the ability to discriminate, prefer, and evaluate (along moral dimensions) fair and unfair behavior (and prosocial and antisocial behavior more broadly) follow a common developmental timetable or do these dissociate in the course of development? In order to better understand the relationships between these processes we need information about the earliest emergence of each process and whether these converge or diverge on a developmental level. In the domain of fairness, all three processes are now shown to be operative among 15-month-old infants. Whether all three are operative at a younger age remains to be seen. Recent evidence suggests that 10-month-old infants are sensitive to fairness (Meristo & Surian, 2013; Meristo & Surian, 2014), that the developmental transition for discriminating fair and unfair outcomes occurs between 9 and 12 months of age (Ziv, & Sommerville, under review), and that 13-month-old infants associate praise and admonishment with fair and unfair individuals suggesting they may be making sociomoral evaluations (Experiment 3). However, we do not know if infants younger than 15 months of age form preferences for fair versus unfair individuals; nor do we know if infants younger than 13 months of age associate praise and admonishment with fair and unfair individuals.

Our findings set a precedent for future investigation of sociomoral evaluation in other moral domains. The extant literature has largely focused on the origins and developmental timetables of infants' abilities to show discrimination of, and preference for, different actions and actors in the domains of fairness (Burns & Sommerville, 2014; Geraci & Surian, 2011; Meristo & Surian, 2013; Meristo & Surian, 2014; Schmidt & Sommerville, 2011; Sloane et al., 2012; Sommerville et al., 2013) and comfort/harm (Buon et al., 2014; Hamlin, 2013, 2014; Hamlin et al., 2007, 2010; Hamlin et al., 2011; Kuhlmeier et al., 2003; Premack & Premack, 1997). However, we do not know what range of moral and immoral actions (from an adult perspective) infants evaluate on a sociomoral level. Therefore, future projects should work towards identifying the range of morally relevant actions and events that infants evaluate as being praiseworthy or deserving of admonishment. Towards this goal, the Valence Association Task described here offers a promising means for directly investigating infants' associations.

In conclusion, three experiments demonstrated that 15- and 13-month-old infants differentially shifted their visual attention to images of fair and unfair distributors as a function of accompanying praise or admonishment stimuli suggesting that infants differentially associated praise and admonishment with fair and unfair individuals. Taken together, these results suggest that, in the second year of life, infants evaluate fair and unfair behavior in ways that are, at least in some respects, continuous with sociomoral evaluations made by older children and adults. Furthermore, by measuring something other than affiliative preferences, and instead asking whether infants perceive fair and unfair individuals as being deserving of praise and admonishment, the current experiments offer important new information regarding sociomoral evaluation in infancy.

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References

- Baillargeon, R.; Scott, RM.; He, Z.; Sloane, S.; Setoh, P.; Jin, K.; Wu, D.; Bian, L. Psychological and Sociomoral Reasoning in Infancy. In: Mikulincer, M.; Shaver, PR.; Borgida, E.; Bargh, JA., editors. *APA Handbook of Personality and Social Psychology: Vol 1 Attitudes and Social Cognition*. Vol. 1. Washington D.C.: American Psychological Association; 2015. p. 79-150.
- Baron A, Banaji M. The Development of Implicit Attitudes: Evidence of Race Evaluations From Ages 6 and 10 and Adulthood. *Psychological Science*. 2006; 17(1):53–58. Retrieved from <http://ps.sagepub.com/content/17/1/53.short>. [PubMed: 16371144]
- Buon M, Jacob P, Margules S, Brunet I, Dutat M, Cabrol D, Dupoux E. Friend or foe? Early social evaluation of human interactions. *PLoS One*. 2014; 9(2):e88612. <http://doi.org/10.1371/journal.pone.0088612>. [PubMed: 24586355]
- Burns MP, Sommerville JA. “I pick you”: the impact of fairness and race on infants' selection of social partners. *Frontiers in Psychology*. 2014; 5(February):93. <http://doi.org/10.3389/fpsyg.2014.00093>. [PubMed: 24575069]
- Casstevens, RM. jHab: Java Habituation Software. Chevy Chase, MD: Java; 2007.
- Dawes CT, Fowler JH, Johnson T, McElreath R, Smirnov O. Egalitarian motives in humans. *Nature*. 2007; 446(7137):794–6. <http://doi.org/10.1038/nature05651>. [PubMed: 17429399]
- Deutsch M. Equity, Equality, and Need: What Determines Which Value Will Be Used as the Basis of Distributive Justice? *Journal of Social Issues*. 1975; 31(3):137–149.
- Fazio RH, Jackson JR, Dunton BC, Williams CJ. Variability in Automatic Activation as an Unobtrusive Measure of Racial Attitudes: A Bona Fide Pipeline? *Journal of Personality and Social Psychology*. 1995; 69(6):1013–1027. [PubMed: 8531054]
- Ferry AL, Hespos SJ, Waxman SR. Nonhuman primate vocalizations support categorization in very young human infants. *Proceedings of the National Academy of Sciences of the United States of America*. 2013; 110(38):15231–5. <http://doi.org/10.1073/pnas.1221166110>. [PubMed: 24003164]
- Flom R, Whipple H, Hyde D. Infants' intermodal perception of canine (*Canis familiaris*) facial expressions and vocalizations. *Developmental Psychology*. 2009; 45(4):1143–51. <http://doi.org/10.1037/a0015367>. [PubMed: 19586184]

- Geraci A, Surian L. The developmental roots of fairness: infants' reactions to equal and unequal distributions of resources. *Developmental Science*. 2011; 14(5):1012–20. <http://doi.org/10.1111/j.1467-7687.2011.01048.x>. [PubMed: 21884317]
- Greenwald AG, Banaji MR. Implicit social cognition: attitudes, self-esteem, and stereotypes. *Psychological Review*. 1995; 102(1):4–27. Retrieved from <http://www.ncbi.nlm.nih.gov/pubmed/7878162>. [PubMed: 7878162]
- Greenwald AG, McGhee DE, Schwartz JL. Measuring individual differences in implicit cognition: the implicit association test. *Journal of Personality and Social Psychology*. 1998; 74(6):1464–80. Retrieved from <http://www.ncbi.nlm.nih.gov/pubmed/9654756>. [PubMed: 9654756]
- Hamlin JK. Failed attempts to help and harm: intention versus outcome in preverbal infants' social evaluations. *Cognition*. 2013; 128(3):451–74. <http://doi.org/10.1016/j.cognition.2013.04.004>. [PubMed: 23811094]
- Hamlin JK. Context-dependent social evaluation in 4.5-month-old human infants: the role of domain-general versus domain-specific processes in the development of social evaluation. *Frontiers in Psychology*. 2014; 5(June):614. <http://doi.org/10.3389/fpsyg.2014.00614>. [PubMed: 24994991]
- Hamlin JK, Wynn K, Bloom P. Social evaluation by preverbal infants. *Nature*. 2007; 450(7169):557–9. <http://doi.org/10.1038/nature06288>. [PubMed: 18033298]
- Hamlin JK, Wynn K, Bloom P. Three-month-olds show a negativity bias in their social evaluations. *Developmental Science*. 2010; 13(6):923–9. <http://doi.org/10.1111/j.1467-7687.2010.00951.x>. [PubMed: 20977563]
- Hamlin JK, Wynn K, Bloom P, Mahajan N. How infants and toddlers react to antisocial others. *Proceedings of the National Academy of Sciences of the United States of America*. 2011; 108(50):19931–6. <http://doi.org/10.1073/pnas.1110306108>. [PubMed: 22123953]
- Houston-Price C, Nakai S. Distinguishing novelty and familiarity effects in infant preference procedures. *Infant and Child Development*. 2004; 13(4):341–348. <http://doi.org/10.1002/icd.364>.
- Hunter, M.; Ames, E. A multifactor model of infant preferences for novel and familiar stimuli. In: Rovee-Collier, C.; Lipsitt, L., editors. *Advances in Infancy Research*. Vol. 5. Ablex; Stamford: 1988. p. 69-95.
- Johnson T, Dawes CT, Fowler JH, McElreath R, Smirnov O. The role of egalitarian motives in altruistic punishment. *Economics Letters*. 2009; 102(3):192–194. <http://doi.org/10.1016/j.econlet.2009.01.003>.
- Kenward B, Osth T. Enactment of third-party punishment by 4-year-olds. *Frontiers in Psychology*. 2012; 3(October):373. <http://doi.org/10.3389/fpsyg.2012.00373>. [PubMed: 23162486]
- Kuhlmeier V, Wynn K, Bloom P. Attribution of dispositional states by 12-month-olds. *Psychological Science*. 2003; 14(5):402–8. Retrieved from <http://www.ncbi.nlm.nih.gov/pubmed/12930468>. [PubMed: 12930468]
- Leslie AM, Knobe J, Cohen A. Acting Intentionally and the Side-Effect Effect Theory of Mind and Moral Judgment. *Psychological Science*. 2006; 17(5):421–428. [PubMed: 16683930]
- LoBue V, Nishida T, Chiong C, DeLoache JS, Haidt J. When Getting Something Good is Bad: Even Three-year-olds React to Inequality. *Social Development*. 2011; 20(1):154–170. <http://doi.org/10.1111/j.1467-9507.2009.00560.x>.
- Meristo M, Surian L. Do infants detect indirect reciprocity? *Cognition*. 2013; 129(1):102–13. <http://doi.org/10.1016/j.cognition.2013.06.006>. [PubMed: 23887149]
- Meristo M, Surian L. Infants distinguish antisocial actions directed towards fair and unfair agents. *PloS One*. 2014; 9(10):e110553. <http://doi.org/10.1371/journal.pone.0110553>. [PubMed: 25329149]
- Ng R, Heyman G, Barner D. Collaboration Promotes Proportional Reasoning about Resource Distribution in Young Children. *Developmental Psychology*. 2011; 47(5):1230–1238. <http://doi.org/10.1037/a0024923.Collaboration>. [PubMed: 21806299]
- Nucci LP, Nucci MS. Children's Responses to Moral and Social Conventional Transgressions in Free-Play Settings. 1982; 53(5):1337–1342.
- Nucci L, Turiel E. Social interactions and the development of social concepts in preschool children. *Child Development*. 1978; 49(2):400–407. Retrieved from <http://www.jstor.org/stable/1128704>.
- Olson KR, Spelke ES. Foundations of cooperation in young children. *Cognition*. 2008; 108(1):222–31. <http://doi.org/10.1016/j.cognition.2007.12.003>. [PubMed: 18226808]

- Payne BK, Cheng CM, Govorun O, Stewart BD. An inkblot for attitudes: affect misattribution as implicit measurement. *Journal of Personality and Social Psychology*. 2005; 89(3):277–93. <http://doi.org/10.1037/0022-3514.89.3.277>. [PubMed: 16248714]
- Pillutla M, Murnighan J. Unfairness, anger, and spite: Emotional rejections of ultimatum offers. *Organizational Behavior and Human Decision* 1996; 68(3):208–224.
- Premack D, Premack aJ. Infants Attribute Value± to the Goal-Directed Actions of Self-propelled Objects. *Journal of Cognitive Neuroscience*. 1997; 9(6):848–56. <http://doi.org/10.1162/jocn.1997.9.6.848>. [PubMed: 23964604]
- Riskey D, Birnbaum M. Compensatory Effects in Moral Judgment: Two Rights Don't Make Up for a Wrong. *Journal of Experimental Psychology*. 1974; 103(1):171–173. [PubMed: 4419712]
- Roder BJ, Bushnell EW, Sasseville AM. Infants' Preferences for Familiarity and Novelty During the Course of Visual Processing. 2000; 1(4):491–507.
- Rossano F, Rakoczy H, Tomasello M. Young children's understanding of violations of property rights. *Cognition*. 2011; 121(2):219–27. <http://doi.org/10.1016/j.cognition.2011.06.007>. [PubMed: 21774921]
- Schmidt MFH, Sommerville Ja. Fairness expectations and altruistic sharing in 15-month-old human infants. *PloS One*. 2011; 6(10):e23223. <http://doi.org/10.1371/journal.pone.0023223>. [PubMed: 22003380]
- Skerry AE, Carey SE, Spelke ES. First-person action experience reveals sensitivity to action efficiency in prereaching infants. 2013; 110(46) <http://doi.org/10.1073/pnas.1312322110/-/DCSupplemental.www.pnas.org/cgi/doi/10.1073/pnas.1312322110>.
- Skowronski J, Carlston D. Caught in the act: When impressions based on highly diagnostic behaviours are resistant to contradiction. *European Journal of Social* 1992; 22:435–452. Retrieved from <http://onlinelibrary.wiley.com/doi/10.1002/ejsp.2420220503/full>.
- Sloane S, Baillargeon R, Premack D. Do infants have a sense of fairness? *Psychological Science*. 2012; 23(2):196–204. <http://doi.org/10.1177/0956797611422072>. [PubMed: 22258431]
- Smetana JG. Preschool Children's Conceptions of Moral and Social Rules Preschool Children's Conceptions of Moral and Social Rules. 1981; 52(4):1333–1336.
- Sommerville, Ja; Crane, CC. Ten-month-old infants use prior information to identify an actor's goal. *Developmental Science*. 2009; 12(2):314–25. <http://doi.org/10.1111/j.1467-7687.2008.00787.x>. [PubMed: 19143804]
- Sommerville, Ja; Schmidt, MFH.; Yun, J.; Burns, M. The Development of Fairness Expectations and Prosocial Behavior in the Second Year of Life. *Infancy*. 2013; 18(1):40–66. <http://doi.org/10.1111/j.1532-7078.2012.00129.x>.
- Spelke ES. Perceiving bimodally specified events in infancy. *Developmental Psychology*. 1979; 15(6): 626–636. <http://doi.org/10.1037//0012-1649.15.6.626>.
- Streri, a; Spelke, ES. Haptic perception of objects in infancy. *Cognitive Psychology*. 1988; 20(1):1–23. Retrieved from <http://www.ncbi.nlm.nih.gov/pubmed/3338265>. [PubMed: 3338265]
- Turiel E. The Development of Social Knowledge. 1983
- Vaish A, Grossmann T, Woodward A. Not all emotions are created equal: the negativity bias in social-emotional development. *Psychological Bulletin*. 2008; 134(3):383–403. <http://doi.org/10.1037/0033-2909.134.3.383>. [PubMed: 18444702]
- Vaish A, Missana M, Tomasello M. Three-year-old children intervene in third-party moral transgressions. *The British Journal of Developmental Psychology*. 2011; 29(Pt 1):124–30. <http://doi.org/10.1348/026151010X532888>. [PubMed: 21288257]
- Walker-Andrews AS, Bahrick LE, Raglioni SS, Diaz I. Infant's Bimodal Perception of Gender. *Ecological Psychology*. 1991; 3(2):55–75.
- Ziv T, Sommerville JA. Developmental changes in infants' fairness expectations from 6 to 15 months of age. (under review).

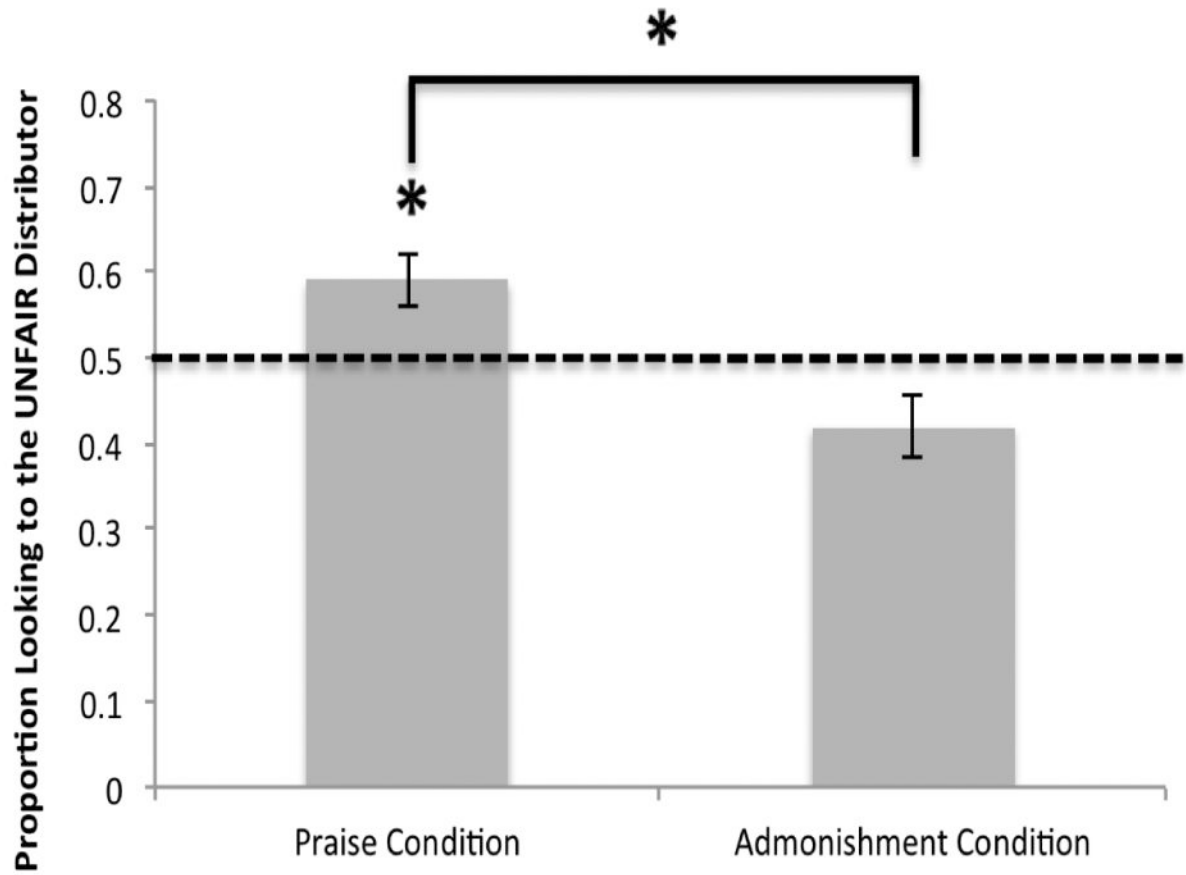


Figure 1. Proportion looking to the unfair distributor in the Praise and Admonishment conditions of Experiment 1 (15-month-old infants). Error bars represent ± 1 SE. * $p < .05$

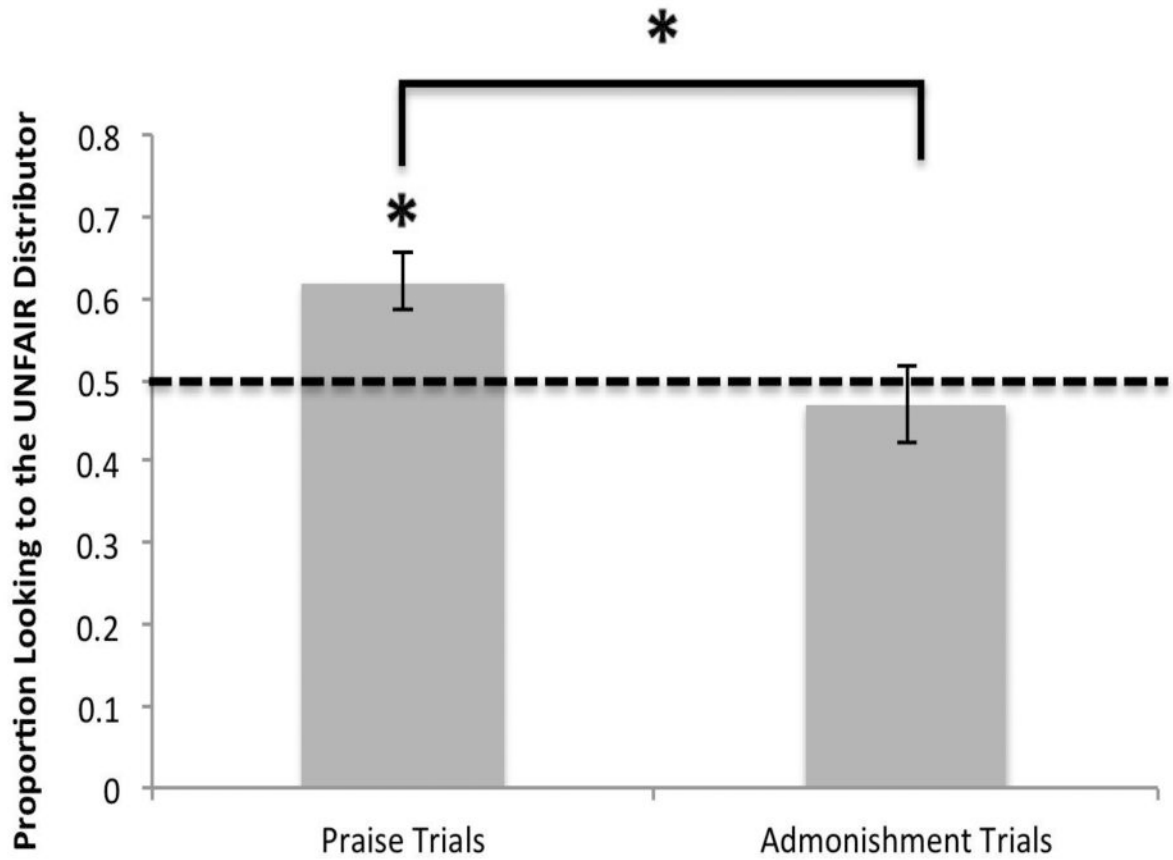


Figure 2. Proportion looking to the unfair distributor in the Praise and Admonishment test trials of Experiment 2 (15-month-old infants). Error bars represent ± 1 SE. * $p < .05$

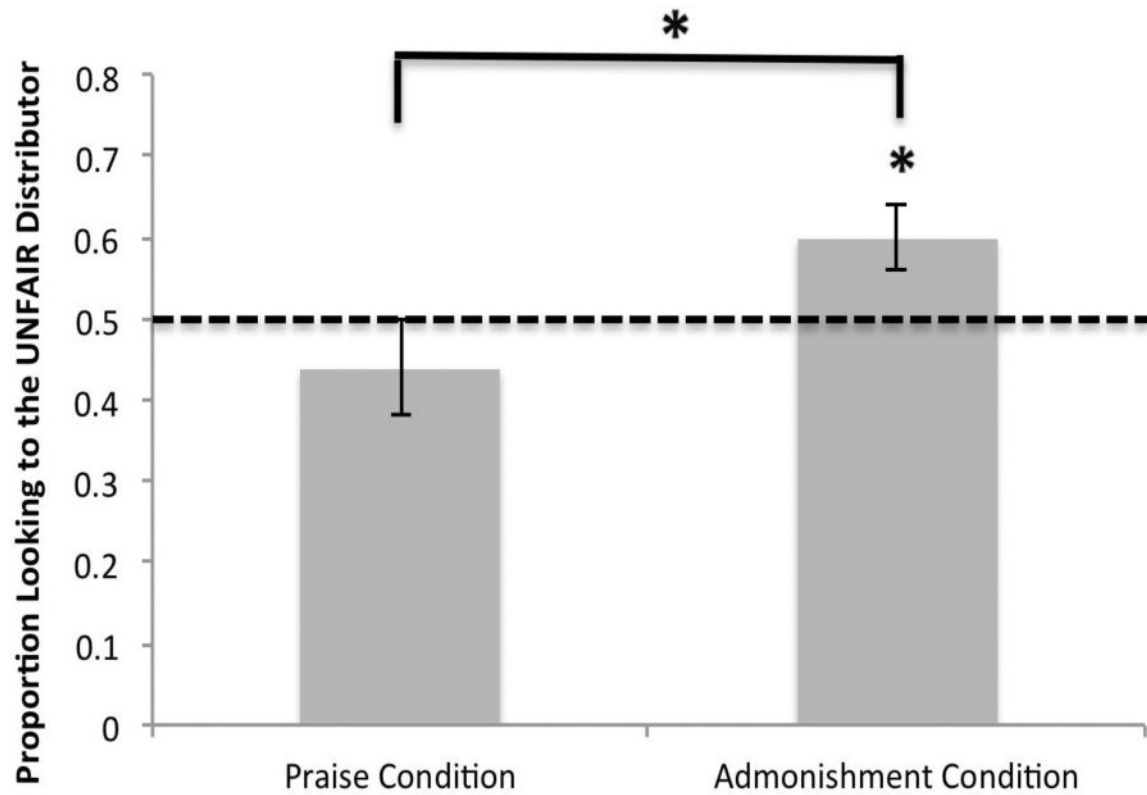


Figure 3. Proportion looking to the unfair distributor in the Praise and Admonishment conditions of Experiment 3 (13-month-old infants). Error bars represent ± 1 SE. * $p < .05$

Table 1
Proportion looking to the unfair distributor in the Praise and Admonishment test trials in Experiment 2 (15-month-old infants)

Experiment 2 Proportion Looking to the Unfair Distributor	
Trial Type	<i>M(SE)</i>
Reward 1	.60 (.05)
Admonishment 1	.48 (.05)
Reward 2	.64 (.07)
Admonishment 2	.48 (.07)

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