Infants expect ingroup support to override fairness when resources are limited

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Recent research suggests that the foundations of human moral cognition include abstract principles of fairness and ingroup support. We examined which principle 1.5-y-old infants and 2.5-y-old toddlers would prioritize when the two were pitted against each other. In violation-of-expectation tasks, a puppet distributor brought in either two (two-item condition) or three (three-item condition) items and faced two potential recipients, an ingroup and an outgroup puppet. In each condition, the distributor allocated two items in one of three events: She gave one item each to the ingroup and outgroup puppets (equal event), she gave both items to the ingroup puppet (favors-ingroup event), or she gave both items to the outgroup puppet (favors-outgroup event). Children in the two-item condition looked significantly longer at the equal or favors-outgroup event than at the favors-ingroup event, suggesting that when there were only enough items for the group to which the distributor belonged, children detected a violation if she gave any of the items to the outgroup puppet. In the three-item condition, in contrast, children looked significantly longer at the favors-ingroup or favors-outgroup event than at the equal event, suggesting that when there were enough items for all puppets present, children detected a violation if the distributor chose to give two items to one recipient and none to the other, regardless of which recipient was advantaged. Thus, infants and toddlers expected fairness to prevail when there were as many items as puppets, but they expected ingroup support to trump fairness otherwise.

infancy | moral cognition | fairness | ingroup support | resource allocation

Over the past decade, developmental research has begun to shed light on the foundations of morality in infancy (1–8). Part of this endeavor has involved uncovering the sociomoral principles embedded in the "first draft" (9) of human moral cognition (10–16). This effort has yielded evidence of early sensitivity to several candidate principles, including fairness (individuals are expected to act fairly toward others, by giving them their just deserts) and ingroup support (individuals in a group are expected to support ingroup members, by caring for their welfare and by displaying loyalty to them relative to noningroup members).

With respect to fairness, several different findings reveal early sensitivity to this principle. For example, infants ages 10–19 mo detected a violation when a distributor divided windfall resources unequally, as opposed to equally, between two similar individuals (17–19). Moreover, after seeing two distributors divide resources, one fairly and the other unfairly, 15- to 16-mo-olds preferred the fair over the unfair distributor in a forced-choice task (20, 21); 10-mo-olds detected a violation if a bystander who had witnessed the distributions gave a reward to the unfair as opposed to the fair distributor (22); and 15-mo-olds looked longer at the unfair distributor when hearing positive statements (e.g., "She's a good girl!"), as if detecting a mismatch between their evaluations of the unfair distributor and the praise that seemed to be directed at her (23). Finally, 21-mo-olds detected a violation when a protagonist rewarded two individuals equally for completing a chore if she could see that one of the individuals had done all of the work (19). Across tasks, infants demonstrated sensitivity to fairness in scenarios involving a wide range of characters, including humans, animal puppets, and shapes with eyes. Together, these results point to an abstract and early-emerging expectation of fairness: Individuals are expected to act fairly toward others and give them their just deserts, be it an equal share of a windfall resource or a reward commensurate with their efforts.

With respect to ingroup support, there is again growing evidence of early sensitivity to this principle. For example, infants ages 10–12 mo preferred toys or snacks endorsed by a native speaker of their language over those endorsed by a foreign speaker (24–26), and infants ages 14–19 mo were also more likely to imitate a novel conventional action modeled by a native as opposed to a foreign speaker (27, 28). Moreover, after watching two groups of nonhuman characters perform distinct novel conventional actions, infants ages 7–12 mo detected a violation if a member of one group chose to imitate the other group's conventional action (29). Similarly, after watching adult characters soothe baby characters (30), 16-mo-olds detected a violation if one baby approached and played with a baby who had been soothed by a different adult (and, hence, presumably belonged to a different group) as opposed to a baby who had been soothed by the same adult (and, hence, presumably belonged to the same group). Finally, when watching interactions among women assigned to minimal groups via novel labels, 17-mo-olds detected a violation if one of the women needed help and another woman from the same group chose not to help her (31, 32). Together, these findings suggest that beginning early in life, infants can form groups based on a variety of criteria, and they apply an abstract expectation of ingroup support to these groups: Individuals are expected to prefer and align with ingroup members and to give them help and comfort when needed.

The mounting evidence of early sensitivity to fairness and ingroup support led us to ask the following questions: How would infants expect individuals to act when fairness and ingroup

Significance

Recent research suggests that infants possess principles of fairness and ingroup support. We examined whether 1.5- and 2.5-y-olds would prioritize fairness or ingroup support when the two were pitted against each other. Children watched mixed-recipients resource-allocation events in which a puppet distributor faced two potential recipients, an ingroup and an outgroup puppet. Expectations about the distributor's actions depended on how many allocation items were available. When there were as many items as puppets, children expected fairness to prevail; when there were fewer items than puppets, however, children expected ingroup support to prevail. Thus, beginning early in life, children expect fairness in mixed-recipients scenarios unless there is a shortage of resources, in which case they expect ingroup support to override fairness.

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support were pitted against each other and suggested different courses of actions? Was there an initial preferred ordering of the two principles in the first draft of moral cognition? If yes, what was the nature of this ordering? We addressed these questions using resource-allocation tasks. In prior tasks, infants were typically tested with nonmixed-recipients scenarios in which a distributor faced two similar potential recipients, who either both belonged to the same group as the distributor or both belonged to a different group. These scenarios consistently triggered an expectation of fairness: For example, infants expected an equal allocation when a Caucasian woman divided resources between either two Caucasian women or two Asian women (18, 20), when a woman divided resources between two puppet giraffes (19), and when a circle with eyes divided resources between two triangles with eyes (17). In the present research, we tested infants with mixed-recipients scenarios in which one recipient belonged to the same group as the distributor (ingroup recipient), and the other recipient belonged to a different group (outgroup recipient). If these mixed-recipients scenarios triggered both considerations of fairness (should each potential recipient be given an equal share of the resources?) and considerations of ingroup support (should the resources be reserved for the distributor's group?), we could begin to explore how infants might rank-order these considerations. There were at least four possibilities.

A first possibility was that there was no initial rank-ordering of the fairness and ingroup-support principles in the first draft of moral cognition; in this case, until infants discovered which ordering was preferred in their social environments, they would regard allocations consistent with either fairness or ingroup support as acceptable. A second possibility was that fairness was initially ranked above ingroup support; in this case, infants would expect the distributor to divide the resources equally between the ingroup and outgroup recipients. A third, converse possibility was that ingroup support was initially ranked above fairness; in this case, infants would expect the resources to be reserved for the distributor's group. Finally, a fourth possibility was that from the start, the two principles were rank-ordered differently in different contexts, in a manner befitting the principles themselves. Thus, fairness was expected to prevail as long as pursuing this course of action did not threaten, undermine, or otherwise infringe upon ingroup support; if it did, then ingroup support was expected to prevail. In this case, infants would expect the distributor to divide the resources equally between the ingroup and outgroup recipients unless factors germane to ingroup support, such as scarce or insufficient resources, made it necessary to reserve the resources for the distributor's group.

Which of the four preceding possibilities best described infants' expectations in mixed-recipients scenarios? Prior research indicated that by the preschool years, children use a context-sensitive ordering in these scenarios (33–36). In one experiment (34), 3.5-y-olds were asked to help a protagonist doll allocate items among four dolls, two who were identified as siblings or friends of the protagonist and two who were identified as strangers. When there were four items to allocate, children divided them equally among the four dolls, regardless of how they were identified; when there were only two items, however, children gave both items to the siblings or friends, leaving none for the strangers. Similarly, in another experiment (36), Caucasian 3- to 5-y-olds were shown photographs of two unfamiliar target children who differed in either gender or race, and they were asked to divide items between them. When there were two items to allocate, children divided them equally between the two targets; when there was only one item, however, children favored same-gender or same-race targets.

The preceding results suggest that by 3–5 y of age, children rank-order fairness and ingroup support in a context-sensitive manner: They produce equal allocations if there are as many resources as ingroup and outgroup recipients, but they favor ingroup recipients if there are fewer resources than recipients. Do children learn this ordering over the first 3 or 4 y of life, or is it suggested in the first draft of moral cognition? To shed light on this question, in Exp. 1 we presented 1.5-y-old infants with mixed-recipients resource-allocation scenarios and varied the number of items brought in by the distributor. Evidence that infants' expectations about the distributor's actions varied depending on the number of items available would suggest that a context-sensitive ordering of fairness and ingroup support is already in place by the second year of life.

Exp. 1

Exp. 1 examined 1.5-y-olds' responses to mixed-recipients resource-allocation scenarios adapted from the nonmixed-recipients scenarios of Sloane et al. (19), who also tested 1.5-y-olds. Infants from English-speaking families (n = 48) faced a puppet-stage apparatus and watched live interactions among puppets from two animal categories (prior research indicated that infants in the second year of life spontaneously assign different animals to different categories, ref. 37). A monkey or a giraffe distributor (counterbalanced) interacted with a monkey and a giraffe recipient; for ease of communication, we use the monkey distributor in our descriptions. Each infant received a single test trial in which the monkey distributor brought in either two (two-item condition) or three (three-item condition) items and allocated two items in one of three events: an equal event, a favors-ingroup event, or a favors-outgroup event (Fig. 1*A*).

The test trial had an initial phase and a final phase, and looking times during the two phases were computed separately. To begin the (31-s) initial phase of the trial in the two-item condition, a supervisor lifted a curtain at the front of the apparatus. The giraffe recipient protruded from a left or a right opening (counterbalanced) in the back wall of the apparatus; she tilted left and right twice, and then the monkey recipient entered through the other opening and clapped her hands twice (the two puppets were operated by a primary assistant). In front of each puppet was a small placemat. Next, the monkey distributor (operated by a secondary assistant) entered through a curtained window in the right wall of the apparatus, and the two recipient puppets turned to watch her actions. The distributor carried a tray with two identical cookies; after setting it down, she told the recipient puppets, "I have cookies!" In reply, the giraffe recipient tilted left and right and said "Yay, yay!" in a high voice, and the monkey recipient clapped her hands and said, "Yay, yay!" in a low voice (all puppets spoke in female voices; to heighten the differences between the giraffe and monkey recipients, they

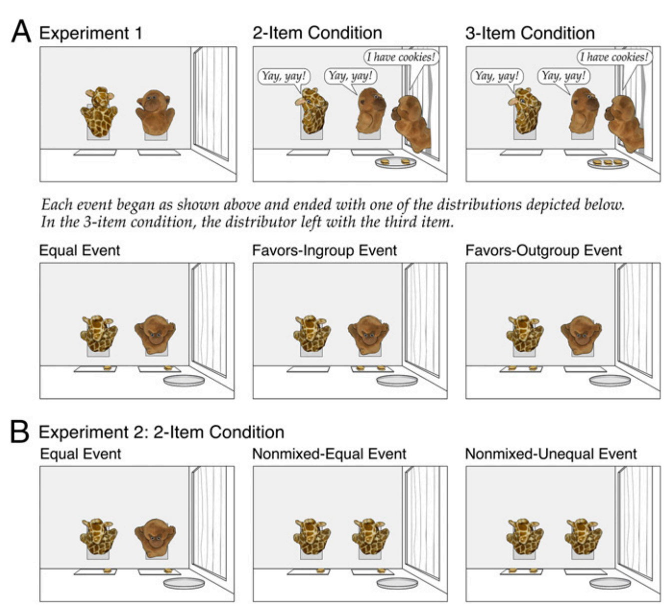

Fig. 1. Schematic depiction of the test trial in Exps. 1 (*A*) and 2 (*B*).

appeared separately, engaged in different actions, and spoke in high or low voices).

Next, in the equal event, the monkey distributor placed one cookie on the placemat in front of her ingroup member, the monkey recipient; she placed the other cookie on the placemat in front of the giraffe recipient; and then she exited the apparatus. The other events were identical to the equal event except that the monkey distributor gave both the first and the second cookies to the monkey recipient (favors-ingroup event) or the giraffe recipient (favors-outgroup event). In each event, the recipients watched the distributor's actions until she left, at which point they looked down at their placemats and paused. In the final phase of the trial, infants watched this paused scene until the trial ended.

Events in the three-item condition were identical to those in the two-item condition except that the monkey distributor brought in three identical cookies on the tray. However, she did not distribute this third cookie and took it away when she left the apparatus (in Exp. 3, the distributor simply left the third item on the tray before exiting the apparatus, with similar results). Thus, for each event, the distributor acted in exactly the same way toward the recipients in the 2- and three-item conditions. This design ensured that differences in infants' responses between the two conditions could not be attributed to superficial differences in the distributor's actions.

We reasoned that if infants (*i*) assigned the monkey and giraffe puppets to distinct groups, based on the various cues provided, (*ii*) brought to bear considerations of fairness and ingroup support when forming expectations about the distributor's actions, and (*iii*) rank-ordered these considerations in a context-sensitive manner that took into account how many allocation items were available, then different responses might be observed in the 2- and three-item conditions. In the research with 3- to 5-y-olds described earlier (34, 36), children acted as distributors and compared the number of items available to the number of ingroup recipients when deciding whether to produce a fairness-based or an ingroup-based allocation. In our task, however, infants did not act as distributors but watched third-party interactions among monkey and giraffe puppets. Consequently, we speculated that infants would be more likely to compare the number of items available to the number of puppets in the distributor's group (e.g., the number of monkey puppets) when predicting a fairness-based or an ingroup-based allocation. If so, infants in the two-item condition should notice that there were only enough cookies for the distributor's group (e.g., two cookies and two monkeys), they should rank-order ingroup support over fairness, and they should detect a violation when the distributor failed to keep both cookies for the group: Giving one or both of the cookies to the outgroup puppet resulted in a shortage for the group and, hence, was detrimental to it. Infants should thus look significantly longer if shown the equal or favors-outgroup event than if shown the favors-ingroup event. In contrast, infants in the three-item condition should notice that there were as many cookies as puppets, they should rank-order fairness above ingroup support, and they should detect a violation when the distributor gave two cookies to one recipient and none to the other, regardless of which recipient was advantaged: With three cookies available, giving one away to the outgroup puppet did not cause a shortage for the distributor' group, so fairness should prevail. Infants should thus look significantly longer if shown the favors-ingroup or favors-outgroup event as opposed to the equal event.

Infants were highly attentive during the initial phase of the test trial; across conditions and events, they looked, on average, for 98% of the initial phase. The final phase of the test trial ended when infants either looked away for two consecutive seconds after having looked for at least five cumulative seconds or looked for a maximum of 45 cumulative seconds; the 5-s minimum value gave infants the opportunity to continue processing the event after it ended. Looking times during the final phase (Fig. 2) were submitted to an analysis of variance (ANOVA) with condition (2- or three-item) and event (equal, favors-ingroup, or favors-outgroup) as between-subject factors. The analysis yielded only a significant Condition × Event interaction, $F(2, 42) = 8.71$, $P = 0.001$, $\eta_p^2 = 0.29$. Planned comparisons revealed that in the two-item condition, as predicted, infants looked significantly longer at the equal [mean (M) = 30.76, SD = 9.70] and favors-outgroup (M = 26.95, SD = 11.92) events than at the favors-ingroup event (M = 14.76, SD = 7.79), $F(1, 42) = 10.07$, $P = 0.003$, $\eta_p^2 = 0.19$; looking times at the favors-outgroup and equal events did not differ significantly, $F(1, 42) = 0.56$, $P = 0.458$, Cohen's $d = -0.35$. In the three-item condition, again as predicted, infants looked significantly longer at the favors-ingroup (M = 27.16, SD = 13.25) and favors-outgroup (M = 28.36, SD = 11.85) events than at the equal event (M = 13.43, SD = 3.18), $F(1, 42) = 10.41$, $P = 0.002$, $\eta_p^2 = 0.20$; looking times at the favors-ingroup and favors-outgroup events did not differ significantly, $F(1, 42) = 0.06$, $P = 0.808$, $d = 0.10$. Nonparametric Kruskal–Wallis tests confirmed the significant main effect of event in the two-item condition, χ^2 (2) = 8.49, $P = 0.014$, and the three-item condition, χ^2 (2) = 9.66, $P = 0.008$.

Infants varied whether they prioritized fairness or ingroup support depending on how many resources were available. When there were as many cookies as puppets (three-item condition), infants expected fairness to prevail: They detected a violation when the distributor gave two cookies to one recipient and none to the other, regardless of whether the ingroup or the outgroup puppet was advantaged. However, when there were just enough cookies for the distributor's group (two-item condition), infants expected ingroup support to prevail: They detected a violation when the distributor gave any of the cookies to the outgroup puppet.

Exp. 2

Infants in Exp. 1 expected a fairness-based allocation when there were as many resources as puppets, but an ingroup-based allocation when there were just enough resources for the puppets in the distributor's group. Focusing on the equal event in particular, infants saw it as expected in the three-item condition but as unexpected in the two-item condition, $F(1, 42) = 11.57$, $P = 0.001$, $d = -2.40$. Exp. 2 had two goals. One was to confirm that infants detected a violation in the equal event of the two-item condition, and the other was to bolster our interpretation of this response by contrasting it with infants' responses to events from a nonmixed-recipients scenario (Fig. 1*B*). Infants ($n = 24$) saw one of three events: an equal event identical to that in the two-item condition of Exp. 1; a nonmixed-equal event in which a distributor from one group (e.g., a monkey; counterbalanced) divided two cookies equally between two puppets from the other group (e.g., two giraffes); and a nonmixed-unequal event identical to the nonmixed-equal event except that the distributor gave both cookies to the same puppet. As we saw earlier, infants typically expect equal allocations in nonmixed-recipients scenarios (17–23). Thus, evidence that infants looked significantly

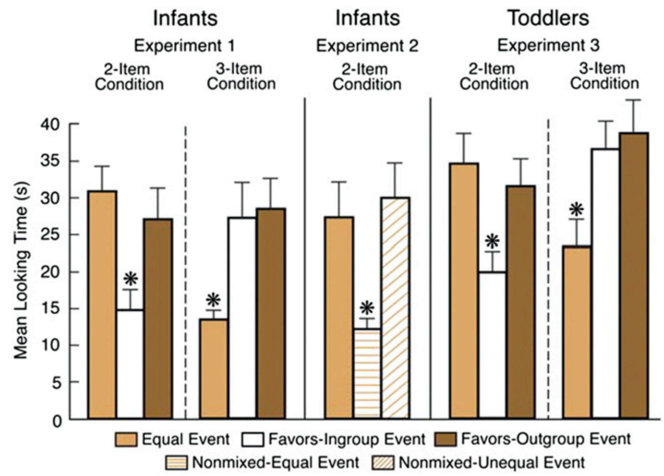

Fig. 2. Mean looking times at the test events in Exps. 1–3. Error bars represent SEM and an asterisk denotes a significant difference within a condition ($P < 0.05$ or better).

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longer at the equal and nonmixed-unequal events than at the nonmixed-equal event would confirm that when the distributor brought in two items, infants viewed an equal allocation as expected with two outgroup recipients, but as unexpected with an ingroup and an outgroup recipient.

The procedure for the equal event was identical to that in the two-item condition of Exp. 1. The procedure for the nonmixed-equal and nonmixed-unequal events was similar with a few exceptions. First, at the start of each event, the two outgroup recipients already occupied the two openings in the back wall of the apparatus, and they tilted left and right in unison for a few more seconds than in Exp. 1. Second, in response to the protagonist's announcement ("I have cookies!"), the two recipients said, "Yay, yay!" twice in unison, using similar voices (the supervisor and the primary assistant spoke in concert). These small changes served to equate the length of the initial phase of the test trial (31 s) across experiments and events, and they also heightened the similarities between the recipients (the two appeared together, engaged in similar actions, and spoke in unison). After the recipients spoke, the distributor gave the first cookie to one recipient (counterbalanced), and then she gave the second cookie to either the other recipient (nonmixed-equal event) or the same recipient (nonmixed-unequal event). She then left, and the recipients looked down and paused until the trial ended.

Infants were highly attentive during the initial phase of the test trial (M = 98%). Looking times during the final phase (Fig. 2) were analyzed using an ANOVA with event (equal, nonmixed-equal, or nonmixed-unequal) as a between-subject factor. The main effect of event was significant, $F(2, 21) = 5.68$, $P = 0.011$, $\eta_p^2 = 0.35$. As predicted, infants looked significantly longer if shown the equal event (M = 27.23, SD = 13.57) or the nonmixed-unequal event (M = 29.86, SD = 13.65), as opposed to the nonmixed-equal event (M = 12.13, SD = 4.07), $F(1, 21) = 11.00$, $P = 0.003$, $\eta_p^2 = 0.34$; looking times at the equal and nonmixed-unequal events did not differ significantly, $F(1, 21) = 0.21$, $P = 0.651$, $d = -0.19$. A Kruskal–Wallis test confirmed the main effect of event in infants' looking times, χ^2 (2) = 7.82, $P = 0.020$. Thus, when a distributor from one group divided two cookies between two recipients from a different group, infants expected the distributor to divide the cookies equally between the two recipients, as in prior research (17–23). When the distributor faced an ingroup and an outgroup recipient, however, infants expected the distributor to reserve both cookies for her group, as in Exp. 1.

Exp. 3

Exps. 1 and 2 indicated that like preschoolers (33–36), 1.5-y-olds use a context-sensitive ordering of fairness and ingroup support in mixed-recipients resource-allocation scenarios: They expect fairness to prevail when there are sufficient resources for all parties present, but they expect ingroup support to prevail when resources are limited so that giving some to the outgroup would result in a shortage for the ingroup. In a final experiment, we tested 2.5-y-old toddlers using the same design as in Exp. 1, to provide further evidence that this context-sensitive ordering is already in place in the first few years of life. English-speaking toddlers ($n = 48$) were randomly assigned to a two- or a three-item condition. The procedure was similar to that in Exp. 1 with a few exceptions. First, to increase the perceptual variety of our stimuli, we used elephants and monkeys as puppets, and we used toys (e.g., alphabet blocks) as allocation items. Second, in the three-item condition, the distributor left the third item on the tray, instead of taking it with her when she exited the apparatus. In Exp. 1, leaving an edible cookie on the tray in front of our 1.5-y-old subjects was unadvisable; in Exp. 3, the items were no longer tempting cookies so it became possible to leave the third item on the tray, for a clearer three-item manipulation.

Toddlers were highly attentive during the initial phase of the test trial (M = 98%). Looking times during the final phase (Fig. 2) were analyzed as in Exp. 1. The analysis yielded only a significant Condition × Event interaction, $F(2, 42) = 7.03$, $P = 0.002$, $\eta_p^2 = 0.25$. As predicted, planned comparisons revealed that in the two-item condition, toddlers looked significantly longer at the equal (M = 34.45, SD = 11.77) and favors-outgroup (M = 31.41, SD = 10.32) events than at the favors-ingroup event (M = 19.80, SD = 7.74), $F(1, 42) = 7.98$, $P = 0.007$, $\eta_p^2 = 0.16$; looking times at the equal and favors-outgroup events did not differ significantly, $F(1, 42) = 0.33$, $P = 0.569$, $d = -0.27$. In the three-item condition, in contrast, toddlers looked significantly longer at the favors-ingroup (M = 36.40, SD = 10.83) and favors-outgroup (M = 38.59, SD = 12.21) events than at the equal event (M = 23.25, SD = 10.52), $F(1, 42) = 9.39$, $P = 0.004$, $\eta_p^2 = 0.18$; looking times at the favors-ingroup and favors-outgroup events did not differ significantly, $F(1, 42) = 0.17$, $P = 0.682$, $d = 0.19$. Kruskal–Wallis tests confirmed the significant main effect of event in the two-item condition, χ^2 (2) = 6.30, $P = 0.043$, and the three-item condition, χ^2 (2) = 6.73, $P = 0.035$. Thus, like infants in Exp. 1, toddlers in Exp. 3 used a context-sensitive ordering of fairness and ingroup support. They expected fairness to prevail when there were as many toys as puppets (three-item condition), but they expected ingroup support to prevail when there were fewer toys than puppets (two-item condition).

Overall Analyses

Lastly, to test the robustness of our results, we compared Exps. 1 and 3 ($n = 96$) using an ANOVA similar to that in Exp. 1, but with age (1.5 or 2.5 y) as an additional between-subject factor. The analysis yielded a significant main effect of age, $F(1, 84) = 11.06$, $P = 0.001$, $\eta_p^2 = 0.12$. Overall, toddlers (M = 30.65, SD = 12.24) looked longer than infants (M = 23.57, SD = 11.85), suggesting that they particularly enjoyed our puppet shows. However, age did not interact with any other factor, all P values >0.210, suggesting that the two age groups responded similarly to the events they observed. The ANOVA also yielded a significant main effect of event, $F(2, 84) = 3.99$, $P = 0.022$, and a significant Condition × Event interaction, $F(2, 84) = 15.65$, $P < 0.001$, $\eta_p^2 = 0.27$. For the sake of completion, in our final planned comparisons, we compared responses to each event across conditions. As expected, looking times at the equal event were significantly longer in the two-item (M = 32.61, SD = 10.59) than the three-item (M = 18.34, SD = 9.06) condition, $F(1, 84) = 14.98$, $P = 0.0002$, $d = 1.45$; looking times at the favors-ingroup event were significantly longer in the three-item (M = 31.78, SD = 12.63) than the two-item (M = 17.28, SD = 7.94) condition, $F(1, 84) = 15.47$, $P = 0.0002$, $d = 1.37$; and looking times at the favors-outgroup event did not differ in the two-item (M = 29.18, SD = 11.02) and three-item (M = 33.48, SD = 12.77) conditions, $F(1, 84) = 1.36$, $P = 0.247$, $d = -0.36$. Nonparametric Wilcoxon sum-rank tests confirmed the results obtained with the equal ($W = 169$, $P < 0.001$), favors-ingroup ($W = 188$, $P = 0.004$), and favors-outgroup ($W = 235$, $P = 0.267$) events.

General Discussion

When a puppet distributor divided items between an ingroup and an outgroup puppet, 1.5- and 2.5-y-olds brought to bear principles of fairness and ingroup support to form expectations about the distributor's actions; which principle was prioritized depended on how many items were available. If there were as many items as puppets, fairness was prioritized: Infants detected a violation if the distributor gave two items to one recipient and none to the other, regardless of whether the ingroup puppet or the outgroup puppet was advantaged. However, if there were only enough items for the distributor's group, ingroup support was prioritized: Infants detected a violation if the distributor gave any of the items to the outgroup puppet.

These results suggest that by the second year of life, children are already capable of sophisticated moral computations that weave together several different factors. In the present experiments, children first had to determine that the scenario they were watching was a resource-allocation scenario: The distributor's goal was to divide all or some of the resources on her tray between the two potential recipients. Next, to form specific expectations about the distributor's actions, children had to consider the group memberships of the distributor and recipients. When both recipients belonged to the same group (nonmixed-recipients scenario), infants expected fairness even if the distributor belonged to a different group: For example, they expected a monkey distributor to divide two items fairly between two giraffe recipients. This and similar findings (17–23) support evolutionary accounts that fairness applies broadly across social beings: All other things being equal, one is expected to be fair when dividing resources between similar individuals. Such an expectation might have evolved in part because it represents a cost-effective strategy for reducing the likelihood of future negative interactions (10). By adhering to fairness, a distributor avoids having to work out in each and every resource-allocation situation that a recipient is likely to be dissatisfied if offered less than an equal share of a resource, for no obvious reason. Over evolutionary time, an abstract expectation of fairness could have emerged that bypassed these mentalizing efforts, reduced errors, and ultimately benefited the distributor as well as the recipients.

When one recipient belonged to the same group as the distributor and the other recipient belonged to a different group (mixed-recipients scenario), infants and toddlers had to take into account one additional factor, the relative numbers of resources and puppets. If the distributor brought in and allocated two items, children expected her to reserve both items for her group and detected a violation if she divided them equally between the ingroup and outgroup puppets. As we saw earlier, when 3.5-y-olds were asked to divide two items between two ingroup dolls and two outgroup dolls (34), they gave both items to the ingroup dolls; giving one item to each pair of dolls would have caused one ingroup doll to go without, so children prioritized ingroup support over fairness. Likewise, when there were only enough items for the distributor's group in our experiments (e.g., two cookies and two monkeys), infants and toddlers prioritized ingroup support over fairness; giving any of the items to the outgroup would have caused a shortage for the ingroup. These results are consistent with evolutionary accounts that depict ingroup support obligations as depersonalized and extended to all members of the group (11, 38). Finally, if the distributor brought in three items and allocated two, children expected her to do so equally, as there was no obvious reason to do otherwise—giving away an item to the outgroup would not cause a shortage for the ingroup.

Future research can support our findings and conclusions by exploring variations of our mixed-recipients scenarios. For example, imagine that the distributor brought in one, two, or three items; gave one to the ingroup puppet; and then exited the apparatus, leaving the remaining item(s) on the tray. We would expect infants to detect a violation in this favors-ingroup event when the distributor brought in three items (fairness should prevail), but not one or two items (ingroup support should prevail).

Together, our results provide additional evidence that the first draft of moral cognition includes principles of fairness and ingroup support, and also demonstrate that this draft includes a context-sensitive ordering of the two principles that befits their contents. Specifically, one is expected to adhere to fairness except in contexts where doing so would be detrimental to one's group, in which case ingroup support is expected to trump fairness. Our results indicate that resource scarcity is one context in which infants and toddlers expect ingroup support to prevail: When there is not enough to go around, the group must come first.

With experience, children gradually identify additional contexts in their social environments in which ingroup support is expected to override fairness. Some of these contexts are tied to competitive activities, such as games and sports, in which groups are not merely distinct but compete for points or resources (39–41). In one experiment (40), for example, 8- to 10-y-olds were told stories about two competing color-based teams of cartoon children. A child from one team allocated either 6 or 12 cookies among 12 potential recipients: six children from the same team and six children from the other team. Participants judged which of two allocations was more likely: giving all of the cookies to the ingroup team or dividing them equally between the two teams. Regardless of how many cookies were available, participants expected the distributor to give all of the cookies to the ingroup team, suggesting that they expected ingroup support to override fairness. (These results do not mean that older children do not value fairness. When ingroup support is not implicated, children age 6 y and older adhere to fairness in both first- and third-party tasks, due to their greater ability to control their self-interest, and they even throw away resources or incur costs to avoid or reduce unfairness to others; refs. 42–44).

Further evidence that preschoolers gradually identify new contexts in which ingroup support is expected to overrule fairness comes from an experiment with 3- to 6-y-olds (45). Children were given 10 stickers and asked how many they wanted to donate to an unfamiliar child who belonged to either the same color-based group or a different color-based group. Boys donated significantly more items to ingroup than outgroup recipients, whereas girls did not distinguish between them. In line with the account offered here, the authors suggested that this gender difference was partly due to the fact that boys "more frequently engage in competitive and group-like interactions (e.g., sports, ball games)."

Together, the results reviewed in this article paint a coherent picture. The first draft of moral cognition includes principles of fairness and ingroup support (among others); when the two principles apply to the same situation, the first draft rank-orders the principles in a predictable way. In mixed-recipients resource-allocation contexts, fairness is expected to prevail unless resources are scarce, in which case ingroup support is expected to override fairness. This context-sensitive ordering can be observed in infants (Exps. 1 and 2), toddlers (Exp. 3), and preschoolers (33–36). (Of course, this ordering most likely applies only to interactions among groups with positive or neutral attitudes toward each other, ref. 11; other expectations would come into play for groups with negative attitudes toward each other). Finally, this initial ordering is gradually elaborated by socialization practices as children learn, for example, that groups who are engaged in competitive games do not share resources, even when plentiful.

Could the context-sensitive ordering of fairness and ingroup support demonstrated in the present experiments be gradually acquired via social and cognitive mechanisms, as opposed to being a part of the first draft of human moral cognition? Our results do not rule out this possibility, although they set constraints on potential learning mechanisms. Future research can address this issue by investigating whether infants in the first year of life already employ a context-sensitive ordering, and by exploring contexts other than scarcity in which infants might rank ingroup support over fairness. For example, would infants expect a distributor to prioritize ingroup support when allocating resources that might be needed by the group to complete a task, or resources that appear to be laden with symbolic value for the group? The younger the age at which a context-sensitive ordering can be observed, and the richer and more varied the contexts in which it can be demonstrated, the more compelling will be the conclusion that this ordering is a part of the first draft of moral cognition.

In sum, when a distributor divided items between an ingroup and an outgroup recipient, 1.5- and 2.5-y-olds expected fairness when there were sufficient items for all parties involved, but they expected ingroup support to trump fairness otherwise. From early in life, charity is understood to begin with the ingroup.

Methods

Participants. Participants were 72 full-term infants (35 male; range: 18 mo, 22 d to 20 mo, 3 d) and 48 toddlers (24 male; range: 25 mo, 23 d to 33 mo, 5 d). Mean ages were 19 mo, 12 d (Exp. 1), 19 mo, 11 d (Exp. 2), and 28 mo, 5 d (Exp. 3). Another nine infants and seven toddlers were excluded because they were fussy (5), distracted (e.g., wanted a cookie; 4), active (1), or angry at the puppet distributor (1), because their parent interfered in the test trial (1), or because their test looking time was over 2.5 SDs from the condition mean (4; one infant saw the two-item favors-ingroup event, one infant saw the three-item equal event, one infant saw the nonmixed-equal event, and one toddler saw the two-item favors-ingroup event). Equal numbers of children ($n = 8$) saw each event in each condition. Each child's parent gave written informed

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consent, and the protocol was approved by the Institutional Review Board of the University of Illinois at Urbana–Champaign.

Apparatus and Stimuli. The apparatus consisted of a brightly lit display booth (201 cm high × 102 cm wide × 58 cm deep) with a large opening (56 cm × 95 cm) in its front wall; a curtain hid this opening until the test trial began. Inside the apparatus, the walls were painted white, and the back wall and floor were covered with a colored adhesive paper. The distributor puppet entered the apparatus through a window (51 cm × 38 cm and filled with a white fringe curtain) in the right wall of the apparatus; the recipient puppets protruded from openings (each 20 cm × 12.5 cm and filled with beige felt) located 20 cm apart in the back wall of the apparatus. Centered beneath each recipient puppet was a white placemat. In Exps. 1 and 2, the puppets were brown monkeys and tan giraffes, the items were edible brown cookies, and the protagonist used a round blue tray. In Exp. 3, the puppets were brown monkeys and gray elephants, the items were green alphabet blocks (three-item condition) or orange toy cups (two-item condition), and the protagonist used a round beige tray. During each test session, two cameras captured images of the events and child; the two images were combined, projected onto a monitor located behind the apparatus, and checked by the supervisor to confirm that the trial followed the prescribed script. Recorded sessions were also checked offline for observer and experimenter accuracy.

Procedure. Each child sat on a parent's lap; parents were instructed to remain silent and close their eyes during the test trial. Each child's looking behavior was monitored by two hidden naïve observers; looking times were computed using the primary observer's responses. Interobserver agreement in the final phase of the test trial (calculated by dividing the number of 100-ms intervals in which the observers agreed by the total number of intervals in the final phase) averaged 95% per child across experiments. Preliminary test analyses revealed no significant interactions of condition and event (Exps. 1 and 3) or event (Exp. 2) with the child's sex, the animal distributor, or the side of the ingroup puppet (Exps. 1 and 3), all P values >0.125.

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1. Baillargeon R, et al. (2015) Psychological and sociomoral reasoning in infancy. *APA Handbook of Personality and Social Psychology, Volume 1: Attitudes and Social Cognition*, eds Borgida E, Bargh J (Am Psychol Assoc, Washington, DC), pp 79–150.
2. Bloom P, Wynn K (2016) *What Develops in Moral Development? Core Knowledge and Conceptual Change*, eds Barner D, Baron AS (Oxford Univ Press, New York), pp 347–364.
3. Hamlin JK (2013) Moral judgment and action in preverbal infants and toddlers. *Curr Dir Psychol Sci* 22:186–193.
4. Martin A, Olson KR (2015) Beyond good and evil: What motivations underlie children's prosocial behavior? *Perspect Psychol Sci* 10:159–175.
5. Premack D (2007) Foundations of morality in the infant. *Social Brain Matters: Stances on the Neurobiology of Social Cognition*, eds Vilarroya O, Argimon FI (Rodopi, Amsterdam), pp 161–167.
6. Spelke ES, Kinzler KD (2007) Core knowledge. *Dev Sci* 10:89–96.
7. Tomasello M, Vaish A (2013) Origins of human cooperation and morality. *Annu Rev Psychol* 64:231–255.
8. Vaish A, Warneken F (2012) Social-cognitive contributors to young children's empathic and prosocial behavior. *Empathy: From Bench to Bedside*, ed Decety J (MIT Press, Cambridge, MA), pp 131–146.
9. Graham J, et al. (2013) Moral foundations theory: The pragmatic validity of moral pluralism. *Adv Exp Soc Psychol* 47:55–130.
10. Baumard N, André J-B, Sperber D (2013) A mutualistic approach to morality: The evolution of fairness by partner choice. *Behav Brain Sci* 36:59–78.
11. Brewer MB (1999) The psychology of prejudice: Ingroup love or outgroup hate? *J Soc Issues* 55:429–444.
12. Cosmides L, Tooby J (2013) Evolutionary psychology: New perspectives on cognition and motivation. *Annu Rev Psychol* 64:201–229.
13. Dupoux E, Jacob P (2007) Universal moral grammar: A critical appraisal. *Trends Cogn Sci* 11:373–378.
14. Jackendoff R (2007) *Language, Consciousness, Culture: Essays on Mental Structure* (MIT Press, Cambridge, MA).
15. Rai TS, Fiske AP (2011) Moral psychology is relationship regulation: Moral motives for unity, hierarchy, equality, and proportionality. *Psychol Rev* 118:57–75.
16. Shweder RA, Much NC, Mahapatra M, Park L (1997) The "big three" of morality (autonomy, community, and divinity) and the "big three" explanations of suffering. *Morality and Health*, eds Brandt A, Rozin P (Routledge, New York), pp 119–169.
17. Meristo M, Strid K, Surian L (2016) Preverbal infants' ability to encode the outcome of distributive actions. *Infancy* 21:353–372.
18. Schmidt MFH, Sommerville JA (2011) Fairness expectations and altruistic sharing in 15-month-old human infants. *PLoS One* 6:e23223.
19. Sloane S, Baillargeon R, Premack D (2012) Do infants have a sense of fairness? *Psychol Sci* 23:196–204.
20. Burns MP, Sommerville JA (2014) "I pick you": The impact of fairness and race on infants' selection of social partners. *Front Psychol* 5:93.
21. Geraci A, Surian L (2011) The developmental roots of fairness: Infants' reactions to equal and unequal distributions of resources. *Dev Sci* 14:1012–1020.
22. Meristo M, Surian L (2013) Do infants detect indirect reciprocity? *Cognition* 129: 102–113.
23. DesChamps TD, Eason AE, Sommerville JA (2016) Infants associate praise and admonishment with fair and unfair individuals. *Infancy* 21:478–504.
24. Kinzler KD, Dupoux E, Spelke ES (2007) The native language of social cognition. *Proc Natl Acad Sci USA* 104:12577–12580.
25. Kinzler KD, Dupoux E, Spelke ES (2012) "Native" objects and collaborators: Infants' object choices and acts of giving reflect favor for native over foreign speakers. *J Cogn Dev* 13:67–81.
26. Shutts K, Kinzler KD, McKee CB, Spelke ES (2009) Social information guides infants' selection of foods. *J Cogn Dev* 10:1–17.
27. Buttelmann D, Zmyj N, Daum M, Carpenter M (2013) Selective imitation of in-group over out-group members in 14-month-old infants. *Child Dev* 84:422–428.
28. Howard LH, Henderson AM, Carrazza C, Woodward AL (2015) Infants' and young children's imitation of linguistic in-group and out-group informants. *Child Dev* 86:259–275.
29. Powell LJ, Spelke ES (2013) Preverbal infants expect members of social groups to act alike. *Proc Natl Acad Sci USA* 110:E3965–E3972.
30. Spokes AC, Spelke ES (2017) The cradle of social knowledge: Infants' reasoning about caregiving and affiliation. *Cognition* 159:102–116.
31. Jin KS, Baillargeon R (2017) Infants possess an abstract expectation of ingroup support. *Proc Natl Acad Sci USA* 114:8199–8204.
32. Jin KS, Houston JL, Baillargeon R, Groh AM, Roisman GI (2018) Young infants expect an unfamiliar adult to comfort a crying baby: Evidence from a standard violation-of-expectation task and a novel infant-triggered-video task. *Cognit Psychol* 102:1–20.
33. Dunham Y, Baron AS, Carey S (2011) Consequences of "minimal" group affiliations in children. *Child Dev* 82:793–811.
34. Olson KR, Spelke ES (2008) Foundations of cooperation in young children. *Cognition* 108:222–231.
35. Paulus M, Moore C (2014) The development of recipient-dependent sharing behavior and sharing expectations in preschool children. *Dev Psychol* 50:914–921.
36. Renno MP, Shutts K (2015) Children's social category-based giving and its correlates: Expectations and preferences. *Dev Psychol* 51:533–543.
37. Diesendruck G, Deblinger-Tangi R (2014) The linguistic construction of social categories in toddlers. *Child Dev* 85:114–123.
38. Hogg MA (2003) Social identity. *Handbook of Self and Identity*, eds Leary MR, Tangney JP (Guilford, New York), pp 462–479.
39. Buttelmann D, Böhm R (2014) The ontogeny of the motivation that underlies in-group bias. *Psychol Sci* 25:921–927.
40. Dejesus JM, Rhodes M, Kinzler KD (2014) Evaluations versus expectations: Children's divergent beliefs about resource distribution. *Cogn Sci* 38:178–193.
41. Rutland A, Killen M (2017) Fair resource allocation among children and adolescents: The role of group and developmental processes. *Child Dev Perspect* 11:56–62.
42. McAuliffe K, Blake PR, Steinbeis N, Warneken F (2017) The developmental foundations of human fairness. *Nat Hum Behav* 1:0042.
43. McAuliffe K, Jordan JJ, Warneken F (2015) Costly third-party punishment in young children. *Cognition* 134:1–10.
44. Shaw A, Olson KR (2012) Children discard a resource to avoid inequity. *J Exp Psychol Gen* 141:382–395.
45. Benozio A, Diesendruck G (2015) Parochialism in preschool boys' resource allocation. *Evol Hum Behav* 36:256–264.