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Current Opinion in Psychology

The origins of infants' fairness concerns and links to prosocial behavior

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Concerns about fairness are central to mature moral judgments. We review research regarding the origins of a sensitivity to distributive fairness, and how it relates to early sharing. Infants' sensitivity to fairness appears to be commensurate with that of school-age children: infants notice violations to fairness norms and evaluate individuals based on their fair or unfair behavior. However, it may differ in other ways: there is no evidence that infants punish unfair individuals. Sharing behavior plays a role in both the developmental emergence of, and subsequent individual differences in, infants' fairness concerns. These results motivate novel questions, such whether infants can entertain other models of fairness, whether infants' socio-moral concerns hang together, and the relationship early fairness sensitivities and later fair behavior.

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Current Opinion in Psychology 2018, **20**:117–121

This review comes from a themed issue on **Early development of prosocial behavior**

Edited by **Felix Warneken** and **Robert Hepach**

For a complete overview see the Issue and the Editorial

Available online 31st January 2018

https://doi.org/10.1016/j.copsyc.2018.01.005

Introduction

Concerns regarding fairness, including how resources should be distributed (distributive fairness or justice), are central to mature socio-moral judgments. Research has demonstrated that in the context of resource distributions, when background information about recipients is not readily available, individuals are sensitive to the principle of equality (that all things being equivalent, goods or resources should be distributed equally to recipients) [1]. Both adults and children adhere to equality in their own resource distributions [2–4], evaluate others based on their adherence to this principle [5] and seek to punish those that violate equality and redistribute goods accordingly [6,7].

Recent empirical work has raised the question of when, in development, we see the earliest sensitivity to concerns about distributive fairness. Critically, early investigations regarding the origins and development of a sensitivity to fairness can address both classic and contemporary questions about the processes that underlie moral judgments [8,9], and the degree to which socialization as well as other types of experiences influence it [10,11]. Furthermore, examining the extent to which infants' early reactions to resource distribution events are aligned or independent of infants' moral behavior can help us understand the extent to which moral cognition and behavior are linked [12], enrich our knowledge of the nature and limitations of infants' early representations [13,14], and address theoretical speculation about inter-relations between different socio-moral constructs (such as fairness and altruism) [15].

Critically, there is currently a debate within the field of developmental psychology regarding whether simple behaviors present within infancy (i.e., infants' looking behavior and reaching behavior) can inform our understanding of deep concepts, including fairness and morality. One perspective on this debate is that these concepts must heavily rest on verbally laden explicit or declarative knowledge; as such concepts are necessarily the exclusive province of older children. Another perspective is that it is likely that these concepts encompass a number of different processes, including implicit and explicit processes, which range from the basic to the more sophisticated. We side with this latter perspective and take the approach of trying to break down deep concepts, such as fairness, into their constituent components and then systematically testing for the developmental emergence of each of these components. In keeping with this perspective, below we review recent evidence regarding what infants understand about distributive fairness, and how this understanding relates to their prosocial behavior, and in particular, infants' sharing behavior.

The developmental origins of distributive fairness concerns in infancy

For adults, the sheer ability to detect violations of socio-moral norms is central to moral judgments. Across a series of experiments we, and others, have used violation-of-expectation paradigms to investigate infants' detection of fairness norm violations [16,17,18••,19,20]. In one study [18••], infants at 6, 9, 12 and 15 months of age watched resource distributions that resulted in fair outcomes (2:2 distribution) or unfair outcomes (3:1 distribution). Twelve and 15-

month-old infants, but not 6-month-old and 9-month-old infants, looked longer to the unfair than fair outcomes. Similar studies have placed the emergence of a sensitivity to fairness norms at about 10 months of age [21•].

Of course, adults not only notice when distributive fairness norms have been violated but they also evaluate those that violate these norms: fair distributors are associated with positive affect and unfair distributors are associated with negative affect [22,23]. Indeed, the ability to attach positive and negative valence to fair and unfair individuals and outcomes is a pre-requisite to having a normative understanding of fairness. Although success on violation-of-expectancy paradigms provides evidence regarding infants' understanding of how resource distributions typically **do** proceed, establishing that infants negatively evaluate unfair individuals or outcomes provides initial evidence that infants also understand how these events **should** proceed (otherwise there would be no basis for a negative evaluation).

One approach to investigating infants' ability to evaluate individuals based on their fair and unfair behavior is to test infants' social preferences for fair or unfair actors. After seeing live third-party distributions in which one actor distributed resources fairly and a different actor distributed resources unfairly 15-month-old infants show a systematic preference for the fair actor [24, see also 19]. These findings demonstrate that infants' reactions to resource distributions include evaluative components.

Although infants' forced choices are useful for telling us how infants rank order two different individuals, these paradigms do not provide all the information one might want to know regarding the underlying nature of infants' evaluations. For example, infants may evaluate both the fair and unfair actor positively (but evaluate the fair actor more positively than the unfair actor), infants may evaluate both actors negatively (but evaluate the unfair actor more negatively than the fair actor), or they may evaluate the fair actor positively and the unfair actor negatively. To distinguish these possibilities, after watching videotaped fair and unfair distributions on a center monitor, infants saw just the distributor's faces on flanking monitors, accompanied by either positive verbal stimuli (praise) or negative verbal stimuli (admonishment) [25•]. Infants as young as 13 months of age looked longer to the unfair actor when they heard admonishment than when they heard praise; in particular, infants showed stronger associations between the unfair actor and negative stimuli than the fair actor and positive stimuli. These findings suggest that infants evaluate fair individuals positively, and unfair individuals negatively, although infants' (negative) evaluations of unfair individuals appear to be stronger than their (positive) evaluations of fair individuals.

Finally, we (Ziv & Sommerville, unpublished) recently asked whether infants, like adults, engage in spontaneous reward and punishment in response to moral adherence or transgressions. Using a novel touch screen method, we trained 16-month-old infants that pressing a panel on one side of the screen elicited reward (e.g., a center actor received a cookie), whereas pressing a panel on the other side of the screen elicited punishment (e.g., a center actor had a cookie taken away from her). After watching fair and unfair distributions by different actors, the actors' faces appeared (one at a time) with the reward and punishment panels flanking the face. Our results indicated that infants showed a systematic tendency to spontaneously reward fair actors but no tendency to spontaneously punish unfair actors. We are currently seeking to unpack the meaning of these findings; for example, it is possible that infants do not yet understand reward and punishment as a system of causal intervention (in which case infants' reward behavior may be more akin to moral approval), that infants find punishment hard to enact due to it's paradoxical nature (i.e., one must approach an individual one would ordinarily avoid in order to punish), or that infants do not possess feelings of sufficient moral agency or authority to engage in punishment (i.e., typically punishment is administered by those in a position of authority; infants may not yet feel sufficiently authoritative to engage in punishment).

Taken together, these findings suggest that infants' fairness concerns share features with older children and adults: they appear to expect fair (i.e., equal) resource distributions, want to affiliate with fair individuals, and negatively evaluate unfair actors. However, this work also suggests that there may be important differences in infants' fairness responses (and quite possibly, by extension, their responses in other moral domains): infants do not appear to systematically use punishment in response to unfair behavior (whereas adults do) [6,7]. Critically, these findings can also inform our understanding of the nature of older children's sharing behavior and fairness concerns. First, they tell us that when older children deviate from fair distributions it is not because they are unaware of fairness norms; rather, additional capacities such as perspective-taking abilities and self-regulatory abilities [26,27] may place limits on children's abilities to act fairly despite appreciating the basic principles of fairness. Second, they tell us that the systematic use of reward and punishment behavior is not an automatic outgrowth of the ability to evaluate fair and unfair behavior, which helps to explain why some recent studies have found that even at age 3 children are reluctant to engage in punishment [28]. Rather the ability to engage in systematic reward and punishment behaviors may rely on additional capacities, as articulated above.

Relations between fairness and sharing: why are fairness concerns and sharing behavior linked?

In addition to documenting age-related trends and shifts in infants' fairness concerns, we have found two ways in

which individual variability in infants' fairness concerns are linked to infants' sharing behavior.

First, our work has demonstrated a relation between the onset of infants' naturalistic sharing behavior at ~9 months of age and whether infants detect fairness norms violations. Parent-reported variability in 9-month-old infants' ability to engage in naturalistic sharing predicts whether infants detect violations to distributive fairness: infants who share naturalistically look longer to unfair versus fair distribution outcomes whereas those that are not yet sharing do not [18••]. These findings suggest that the onset of infants' sharing behavior is closely linked to the developmental onset of infants' ability to detect violations to fairness norms.

Second, at 12–15 months of age, variability in infants' fairness concerns are predicted by their tendency to generously share preferred toys. In a task we dubbed the 'altruistic sharing task', infants have the opportunity to select one of two toys; the toy the infant selects is considered infant's preferred toy and the unselected toy their non-preferred toy. Then, infants are approached by an unfamiliar experimenter who makes an ambiguous request for one of the toys ('Can I have one?'). Infants have the option of sharing their preferred or non-preferred toy: our underlying assumption is that sharing the preferred toy is a relatively more generous act, and sharing the non-preferred toy is a relatively more selfish act. Our findings demonstrate that at 12–15 months of age, infants' fairness concerns are predicted by which toy they share: infants who share their preferred toy show greater differences in attention to the unfair versus fair distribution outcome than those that share their non-preferred toy [16,17,18••].

Perhaps the relation we have documented between infants' sharing behavior and fairness concerns merely reflects the fact that some infants are more developmentally advanced, cognitively sophisticated, or socially savvy than other infants (and thus they 'succeed' at both sharing and detecting violations to fairness norms). We think this is unlikely for two reasons. First, in our altruistic sharing task, there is no 'correct answer'; rather the experimenter's request is intentionally ambiguous and sharing either toy is a perfectly acceptable response. Second, neither sharing status at 9 months of age (i.e., whether infants share or not), or how infants share at 12–15 months of age (i.e., whether infants share preferred or non-preferred toys) are predicted by measures of developmental maturity, cognitive performance or receptive vocabulary size [18••].

Instead, we believe that the sharing plays a dual role in infants' fairness concerns. First, at transitional ages (~9 months of age) sharing provides a means for learning about fairness norms. Sharing interactions provide rich opportunities to learn about principles such as equality and reciprocity that are central to fairness. Moreover, once infants are able to share objects they have the opportunity to experience being both the agent and the recipient of fair and unfair behavior. These experiences may help infants appreciate the consequences of inequality, and thus account for their tendency to allocate enhanced attention to unfair outcomes. A critical test of this hypothesis would be to conduct sharing interventions with pre-sharing infants, which have been shown to lead to the onset of sharing [29•], to see whether they also impact infants' ability to both detect violations to fairness norms, and assign valence to the actors that perform them.

At 12 and 15 months, as discussed above, infants who share toys generously show greater sensitivity to violations to fairness norms than those that share toys less generously. Our interpretation of these findings is that infants, like adults, show individual differences in terms of how much they care about fairness, which are linked to dispositional differences in infants' generosity or altruism. Similar relations between fairness and altruism have been documented in adults [30].

Irrespective of the exact relation between infants' sharing behavior and their fairness concerns, these findings help to constrain the range of interpretations regarding the looking time findings. The fact that infants' responses to fairness norm violations (and not matched control outcomes) are related to how generously or altruistically infants share toys suggests that their concerns are socio-moral per se and do not merely reflect a detection of statistical regularities in their environment [16].

Open questions and future directions

In some ways, infants have a fairly rich understanding of fairness. By the same token, our work suggests that there are several experiential and individual difference factors (such as infants' altruistic tendencies, sharing experience, and the presence of siblings) that influence the developmental onset of fairness concerns, or are related to individual differences in such concerns. Moreover, there may be some limitations to infants' fairness responses: infants show no evidence of punishing unfair individuals.

Important questions remain concerning the early development of a sensitivity to fairness. These include whether infants use information regarding the background characteristics of recipients to inform their resource distribution expectations, like adults [31]. Initial research suggests that infants have at least a rudimentary ability to do this: by 18 months of age infants expect resource allocations to align with a recipient's social status (i.e., they expect a dominant individual to receive more resources than a submissive individual) [32•, see 20 for evidence that older infants may take into account merit in their resource distribution expectations]. Furthermore,

although our work has demonstrated interesting linkages between infants' fairness concerns and some aspects of prosocial behavior, other research has suggests that infants' performance on prosocial tasks may be more task specific [33,34]. Therefore, it is important to understand potential developmental changes in linkages across both socio-moral domains [35••] and response modalities, and the circumstances in which consistency versus variability is found, as well as how an early sensitivity to fairness relates to later fair or unfair behavior [36]. Gaining traction on each of these issues will help shed further light on the developmental origins and trajectory of fairness concerns, along with infants' socio-moral behavior and cognition more broadly.

Conflict of interest statement

Nothing declared.

Acknowledgments

This paper was made possible through the support of grants from the John Templeton Foundation and NICHD (1R01HD076949-01). The opinions expressed in this publication are those of the authors and do not necessarily reflect the views of the John Templeton Foundation or the NICHD.

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These experiments examined infants' fairness expectations at 6, 9, 12 and 15 months of age, in order to determine whether fairness expectations are continuous across ages (and therefore likely innate) or are acquired with development. The results showed a developmental shift between 6 and 12 months of age: whereas 12-month-old and 15-month-old infants showed enhanced attention to unfair versus fair outcomes, 6-month-old and 9-month-old infants did not. Critically, at 9 months of age, whether infants were sensitive to violations of fairness norms was linked to whether or not parents reported they had engaged in naturalistic sharing or not. At 12 and 15 months of age individual differences in infants' sensitivity to fairness was documented, related to infants' willingness to generously share toys, and whether or not they had siblings.

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In this set of experiments, researchers investigated whether infants as young as 10 months of age expect equal resource distributions. In Experiment 1, infants saw an equal and an unequal resource distribution: 10-month-old infants looked significantly longer at unequal compared to equal distributions. In three additional control experiments, the researchers found that infants did not differentially look to unequal and equal outcomes when the recipients were inanimate, when the recipients already had equal and unequal numbers of resources without a distribution, and when distributors moved as if distributing but did not give any resources. Taken together these results suggest that by 10 months of age, infants expect resources to be distributed equally.

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In this paper, the authors investigated whether infants can use background information about recipients to modulate their expectations regarding the outcomes of resource distribution events. Specifically, they tested whether 18-month-old infants expect dominant individuals to receive more resources than submissive individuals. The authors replicated past work showing that infants have an understanding of dominance, and expect equal resources without any background information about recipients. Most critically, they demonstrated that after viewing videos where one puppet is dominant and one puppet is submissive, infants look longer to equal outcomes than outcomes in which the dominant individual receives more resources than the submissive individual, and longer to outcomes in which the submissive individual receives more than the dominant individual. These results show that infants incorporate information about the recipients' social status when forming expectations about the outcomes of resource distributions.

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