Life-history theory explains childhood moral development

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Infants understand harm and fairness in third-party situations and yet children require years of development before they apply this understanding to their own interactions with others. We suggest that the delay is explained by a life-history analysis of when behaving morally becomes beneficial. The human species is characterized by an extended period of juvenile dependence during which cooperation with non-kin is mostly superfluous. Later, as children age, moral behaviors supporting cooperation become increasingly beneficial.

Explaining the gradual emergence of moral behavior

Children's moral behavior emerges gradually over several years. For example, 3-year-olds do not share resources equally with other children [1] and 5-year-olds select a spiteful distribution over a fair distribution [2], but 9-year-olds share equally and select fair distributions [1,2]. A previously plausible explanation for the gradual emergence of moral behavior was that children need time to learn basic moral norms from their culture. However, recent research has established that even infants recognize harm and fairness in their social evaluations of others [3] and that 3-year-olds understand that they should share equally [1].

Given that even young children understand basic rules of harm and fairness, an alternative explanation for the gradual emergence of moral behavior is that moral motivation starts low and increases with age. Supporting this hypothesis, older children report more positive feelings than younger children when they engage in moral behavior [4]. However, the increasing motivation must itself be explained, as it is unclear why increasing age should be associated with increasing moral motivation.

Here we suggest that the mismatch between competent infant social evaluation and limited childhood moral behavior can be explained by a life-history analysis of the differing benefits of moral behavior at different ages. Life-history theory is an approach in evolutionary biology that investigates how natural selection has shaped the timing of key events in an organism's life (Box 1). Applied to morality, life-history theory suggests that, if there is a consistent pattern across the species regarding which ages are associated with high benefits for moral behavior, natural selection may have worked to shape the developing expression of moral behavior such that individuals have stronger moral motivation at ages typically associated with higher benefits from moral behavior. Thus, we first discuss the potential benefits of moral behavior and then we discuss how variations in these benefits at different ages might explain the timeline of moral development.

We also argue that, in contrast to moral behavior, the social evaluation of others requires little cost and can be beneficial to infants. As a result, natural selection has favored earlier developmental emergence of third-party social evaluation than of moral behavior. Our application of life-history theory thus provides a framework for understanding why moral behavior develops years after children understand what morality requires.

Shifting benefits associated with moral behavior

Moral behavior can be beneficial to an individual when the short-term costs of acting morally toward others are outweighed by associated long-term benefits derived from mutualistic cooperation with others [5]. Specifically, when people can choose with whom they associate for joint projects, they will choose partners who have a good moral reputation since such people are likely to put in at least their fair share of effort and take at most their fair share of benefit. Thus, a bad moral reputation due to previous selfish behavior can lead to long-term costs from being shunned from future joint projects, whereas a good reputation due to previous moral behavior can lead to long-term benefits from access to future joint projects.

Importantly, across each individual's ontogeny, there is a consistent pattern regarding the importance of mutualism for securing resources. Human life history is characterized by an extended period of juvenile dependence followed later in development by substantial cooperation with non-kin. During infancy, humans' caloric input is limited to intake obtained through lactation. Even for several years after nursing, young children remain largely dependent on resource transfers from kin. Importantly, kin have an interest (via inclusive fitness) in the well-being of the child and this interest is independent of that child providing benefits via cooperation. Some resources may also be provided by non-kin who are acting as alloparents [6] but, like the resources provided by kin, resources provided by non-kin alloparents are independent of the child being involved in mutualistic interactions.

Thus, although it might be possible for a young child to gain additional benefits from kin and non-kin though moral behavior, the marginal utility of those benefits over those already being received might not justify the cost. However, the situation changes a few years after birth.

Box 1. Life-history theory

Life-history theory is an approach in evolutionary biology that investigates how natural selection has shaped the timing of key events in an individual's life [14]. It treats development as an optimization problem in which the goal is to maximize the number of offspring an individual has given constraints on resources. For example, one trade-off studied within a life-history framework is the age of sexual maturation, at which time an individual reduces investment in his or her own growth and instead directs investment toward producing offspring. An optimal timing for sexual maturation balances the benefits of early sexual maturation (allowing more time to produce more offspring) and late sexual maturation (allowing more time to develop one's own body to be effective at surviving long enough to produce and care for many offspring). Other common topics, each of which has previously been studied in humans, include total number of offspring versus investment in each offspring and senescence. Here we propose another application to humans in the domain of social cognition: that the timing of the development of moral behavior has been influenced by when moral behavior is likely to produce a net gain in resources.

Extensive ethnographic data regarding hunter–gatherer societies indicate an average interval between births of around 3 years [7]. This marks an important transition for the young child, who at 3 years old is likely to see many maternal resources diverted to the next offspring. Moreover, children with younger siblings are often involved with providing resources to their kin [8]. Thus, at some point during the fourth year, a child's access to 'free' resources is likely to decrease, leading to a corresponding increase in the marginal utility that might be gained from access to cooperation.

Behavioral consequences

We suggest that the timing of moral motivation is aligned with this developmental transition and that, sometime in their fourth year of life, children start to display a range of behaviors that reflect their increasing involvement in the social world. The expression of these behaviors may initially be relatively inconsistent and then show increasing consistency over several years as children continue to gain resources through mutualistic cooperation.

For example, children start to manage their reputations as social cooperators in the preschool years and their motivation to flatter others changes during this time. In one study, 5-year-olds, but not 3-year-olds, rated a drawing as better when the drawer was present compared with when the drawer was absent [9]. Likewise, 5-year-olds are much more generous in providing stickers to a familiar peer when the other child has knowledge of the available options, compared with when the options are hidden from the recipient [10].

During their preschool years, children also modulate their moral behavior according to the identity of the recipient, most notably the recipient's likelihood of being available and willing to engage in future mutualisms. They selectively invest in their reputations only when they are interacting with others who are likely future cooperators. Five-year-olds in the drawing-rating study were especially likely to rate the drawing highly if the person who made the drawing was known to the child (i.e., someone with a good chance of being a potential future collaborator) [9]. In another study, 5-year-olds shared a higher proportion of

ten stickers with a third party while being observed by another child who was part of the participant's ingroup (as opposed to outgroup), especially when the observer could later choose to share stickers with the participant [11].

The gradual development of moral behavior, timed to when children typically begin to rely on the benefits of cooperation with non-kin, is in contrast to the early emergence of third-party social evaluation, which is far less costly (requiring observation but no costly behavior) and may provide advantages to an infant. Specifically, it may be advantageous to learn as early as possible which people one should affiliate with for future cooperation and which people one should avoid. Furthermore, such learning might have immediate advantages, such as the ability to direct appeals to the kin caregivers who are most prosocial toward the infant and to selectively learn from others who show prosocial rather than antisocial behaviors [12].

Future directions and concluding remarks

We have suggested that a life-history approach explains motivational differences for moral behavior in the earliest years of life. An important future direction will be to apply the same framework to understand variations in moral behavior across a wider range of ages. In particular, given teenagers' intense reliance on non-kin relationships, our framework predicts a particularly strong moral motivation during the teenage years. In line with this idea, preliminary evidence suggests that teenagers are more generous than adults in economic games [13].

A second promising avenue for future research would investigate the extent to which the developmental timeline of moral behavior across childhood may be flexible in response to contextual differences in the availability of cooperative opportunities. Certainly, evidence of cross-population variation with adult samples suggests that the mature state of morality is influenced by such differences (Box 2). To the extent that the developmental timeline is flexible, future research might attempt to identify the factors that determine this timeline (i.e., key inputs to

Box 2. Cross-population variation

There is variation across populations in how much interaction occurs among unrelated people. This variation can be captured by a 'market integration' variable operationalized as the percentage of calories that a person purchases (as opposed to calories provided by a family member who has hunted, gathered, or grown the food). At one end of the spectrum, some people live in populations (e.g., the USA) with nearly 100% market integration and thus have constant mutualistic interactions with strangers. At the other end of the spectrum, some people live in populations with no market integration (e.g., the Hadza) and have limited experience engaging in mutualistic interactions with strangers. When asked to play economic games with anonymous others, market integration positively predicts cooperative behavior [15].

In the main text, we suggest that children's moral motivation increases over development due to a species-typical timeline of decreasing 'free' resources from caregivers that increases the importance of gaining resources from cooperation. Complementarily, individuals who live in populations with frequent opportunities to gain resources from cooperation with diverse people (i.e., populations with high market integration) may show relatively higher moral motivation and a wider 'moral circle' of people who are treated morally.

the cognitive mechanisms that evaluate the potential costs and benefits of cooperation). For example, these mechanisms might rely on the variety and frequency of cooperative interactions observed in one's environment, since this information suggests that there are diverse situations in which one might want to be selected as an interaction partner. Alternatively, they might rely on information related to the number of potential cooperative partners, since this information suggests that there are many individuals one might want to convince of one's trustworthiness as an interaction partner.

A third future direction might be to investigate potential differences in the emergence of different components of moral behavior. As previously noted, the fourth year of life represents an important transition, but moral behavior becomes more consistently expressed over several subsequent years. It may be that, as life history theory provides an explanation for the relatively early emergence of social evaluation compared with moral behavior, it might account for differences in the relative emergence of different components of moral behavior (e.g., general fairness motivations versus ingroup favoritism).

Finally, future research should continue to explore the relationship between infant social evaluation and childhood morality. We have been careful not to make the strong claim that infant social evaluation is synonymous with adult moral judgments. What is clear is that infants make social evaluations based on harm and fairness and that young children make statements about what they should do at earlier ages than those at which they follow through with such behaviors. This is sufficient to raise the question of why moral behavior emerges gradually, but it is not sufficient to settle the issue of what factors are necessary for a social evaluation to be a moral evaluation and whether infants possess all of the relevant factors.

To conclude, we suggest that life-history theory accounts for the early emergence of social evaluation in infancy, compared with the later and gradual emergence of moral behavior over years of childhood development. We look forward to future research on the potentially adaptive nature of when and how moral behavior develops.

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