CHILD DEVELOPMENT PERSPECTIVES

The Role of Affect in the Neurodevelopment of Morality

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ABSTRACT—***Human social existence is characterized by an intuitive sense of fairness, concern for others, and the observance of cultural norms. This prosocial sensitivity is the foundation for adult morality, emanating from the sophisticated integration of emotional, motivational, and cognitive mechanisms across development. In this article, we discuss how an integrated neurodevelopmental approach helps us understand moral judgment and behavior. We examine data emphasizing the importance of affect in moral development and we suggest that moral cognition is underpinned by specific, although not unique, neural networks. The regions recruited in moral cognition underlie specific states of emotion, along with cognitive and motivational processes, which emerge and interconnect over the course of development to produce adaptive social behavior.***

KEYWORDS—*emotion; morality; development*

Morality, in general, has been defined as prescriptive norms regarding how people should treat one another, including concepts such as justice, fairness, and rights (Killen & Rutland, 2011). In the past decade, research in many academic domains has tried to more clearly define and investigate this construct. These studies suggest that mature moral abilities emerge from a sophisticated integration of emotional, cognitive, and motivational mechanisms. However, many of these theories lack the ability to test specific hypotheses about when and how these components combine.

A more accurate examination of the development of a mature moral self requires an increased focus on neurobiological perspectives. Establishing neurological methods within a developmental framework provides a more accurate account of moral mechanisms, bridging the gap between behaviors and their underlying neural correlates. Neuroscientific data may also allow us to better understand ambiguous behaviors early in life, taking into consideration the contributions of so-called emotional versus cognitive brain systems in response to morally laden stimuli. Furthermore, focusing on the ontogeny of morality provides opportunities to examine the interaction of moral systems before such components are fully developed and operational.

In this article, we use a multidisciplinary approach to investigate the role of affect in morality. First, we examine the developmental literature on early moral behavior, emphasizing the cognitive and affective changes that evolve during infancy. Then, we investigate the neural systems supporting these changes, focusing on the link between the maturation of the neural network and outward moral responses.

Specifically, we argue that current data support the view of morality as a functionally integrated ability, made up of several distributed neural networks that change in activation and integration over time. This moral development is not unidirectional, originating from purely emotional activations and developing into higher level cognizance. Rather, it involves nuanced changes in children's abilities to integrate their own affective reactions with the thoughts and desires of those around them.

EARLY MORAL SENSITIVITY

Most newborns are biologically prepared to enter the world ready to attend to social stimuli and engage in social interactions. After only a few days of life, neonates prefer prosocial stimuli, looking longer at happy facial expressions than at fearful or neutral ones (Farroni, Menon, Rigato, & Johnson, 2007). As they develop, infants are increasingly able to evaluate

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their social surroundings, differentiating people based on their social interactions with others. For example, 3-month-olds preferentially attend to a character who previously acted in a prosocial (vs. antisocial) manner (Hamlin, Wynn, & Bloom, 2010), suggesting an aversive reaction toward those who act badly. By 6 months of age, such preferences are evident in behavior. Infants not only selectively attend to prosocial agents but they selectively approach them when paired with antisocial or neutral characters (Hamlin & Wynn, 2011; Hamlin, Wynn, & Bloom, 2007), despite the fact that they have little personal experience with the repercussions of good or bad actions (Wynn, 2008). Premoral evaluations may also be associated with emotional expressions. For example, anecdotal evidence suggests that "babies are more likely to smile, clap, etc. when viewing prosocial events, and to frown, shake their heads, and look sad or otherwise upset during antisocial events" (Bloom, 2012, p. 83), suggesting an emotional response to others' good or bad deeds.

By 15 months, infants are able to combine moral evaluations with their own prosocial behaviors. When examining the relations between a visual violation of expectation task and behavior, infants who shared a toy they preferred (over a nonpreferred toy or no toy at all) attended significantly longer to a third-party interaction where the allocation of resources among conspecifics was unequal, thus demonstrating sensitivity to fairness (Schmidt & Sommerville, 2011). In other words, infants who behaved altruistically also expanded their prosocial expectations to others, demonstrating that other-regarding preferences are closely interwoven with personal social behaviors early in life.

Although infants' ability to appropriately respond to social stimuli is fascinating, these reactions may be a result of pure affective arousal and involve little cognitive awareness (Vaish & Warneken, 2012). Infants may be responding positively to positive stimuli and negatively to aversive stimuli at an unconscious level. Such affective responses are likely to be mediated by early-developing neural systems such as the subcortical pathways, which connect brainstem nuclei, superior colliculus, hypothalamus, ventromedial prefrontal cortex, and amygdala (Decety, 2010). However, as children progress through the first few years of life, arousal-based internal reactions (such as personal distress or happiness) become the foundation for outward prosocial behaviors such as helping, altruism, and compassion. Empathic responses also increase throughout infancy, with the earliest forms appearing at 8–16 months and continuing to develop into the 2nd year (Roth-Hanania, Davidov, & Zahn-Waxler, 2011). By 18–36 months, empathic arousal becomes more specific, with children showing increased emotional distress and personal distress behaviors in response to another's sadness (Bandstra, Chambers, McGrath, & Moore, 2011). Furthermore, older children are more likely to show empathic concern than personal distress toward someone in pain, although no effect of age is found in reactions toward another's sadness.

An increase in the aforementioned prosocial behaviors often correlates with cognitive advancements in other areas of social development, such as rudimentary false-belief attribution (Baillargeon, Scott, & He, 2010) and emotional regulation (McGuigan & Nunez, 2006). Moreover, research in infancy and early childhood suggests that the development of executive function abilities, supported by the slow-to-mature prefrontal cortex, coincides with increased moral understanding. For example, the ability to selectively inhibit actions improves drastically during the 2nd year of life (Kochanska, Murray, & Harlan, 2000), just as children begin to inhibit personal distress behaviors in favor of helping others. In preschoolers, executive function abilities are highly correlated with an improved theory of mind, a skill often found necessary for mature moral understanding (Carlson, 2009). Together, these findings lend credence to the idea that early moral behavior involves communication between many neurocognitive systems.

In addition to cognitive advancements, social learning and cultural input also play an important role in children's moral development. Kohlberg's (1984) stage theory was one of the first to suggest that moral learning was facilitated by the social environment and recent work has supported such assumptions. For example, parenting practices have long been insinuated as a force in moral development (Dunn, 2006; Smetana, 1999), with research demonstrating greater socioemotional development in toddlers who come from homes where mothers talk more about conflict resolution (Laible & Thompson, 2002), and increased altruism in children who come from families displaying emotional warmth (Brody & Shaffer, 1982). Furthermore, abused infants often respond to peers with anger whereas securely attached infants exhibit attention and empathy (Main & George, 1985), suggesting that early experience may modulate how well children understand and regulate their own emotions, which in turn affects their ability to empathize with others.

THE NEURODEVELOPMENT OF MORAL CIRCUITRY

As we have illustrated, young children experience complex cognitive and affective developments over the first few years of life. Many of these changes are both reflected in and expanded upon in the neuroscience literature. The neural data highlight the contributions of both conscious and unconscious processes to moral evaluations and allow us to disambiguate what networks are activated by moral stimuli in ways not possible with the behavioral data alone.

As was seen in early affective responses, evolution has tailored the human brain to be sensitive to the emotional expressions of others, especially when these expressions are vocalized. Neonates appear to possess a neural mechanism for vocal affective discrimination, demonstrating within the first few days of life a mismatch electroencephalographic response over the right hemisphere in response to emotionally laden (happy and fearful vs. neutral) syllables (Cheng, Lee, Chen, Wang, & Decety, 2012). In 3- to 7-month-olds, sad vocalizations are associated with a selective increase of brain activity in affective-processing regions, such as the orbitofrontal cortex and insula (Blasi et al., 2011). Such a social-emotional sensitivity is crucial for survival, attachment, empathy, and eventually, for the development of care-based morality.

Because of methodological constraints, very few neuroimaging studies have examined the neural processes underpinning morality in young children. However, a series of studies by Decety and colleagues have demonstrated important shifts in brain activation from children as young as 4 years through adulthood. In a developmental fMRI study, 7- to 40-year-old participants were scanned while viewing scenarios depicting individuals being accidentally or intentionally physically harmed by another (Decety & Michalska, 2010). Consistent with previous studies examining the perception of others' distress, this study detected neural activation in participants of all ages in a network of regions including the anterior insular cortex (AIC), dorsal anterior cingulate cortex, anterior midcingulate cortex, supplementary motor area, amygdala, periaqueductal gray (PAG), and ventromedial prefrontal cortex (vmPFC). These areas are often implicated in reactions to emotional stimuli, whether affective or on a more integrated cognitive level. Interestingly, nuanced changes in neural activations from childhood through adulthood suggest a shift in the level of emotional resonance felt when perceiving others in pain.

To illustrate, age was negatively correlated with activation in the amygdala, AIC, and vmPFC when perceiving others in distress, with the youngest participants exhibiting the highest level of activation. Similarly, age was negatively correlated with degree of hemodynamic response in the insula. The fact that younger participants demonstrated stronger activations in these brain regions than adults may speak to the children's tendency to be aroused by others' distress in a direct sense, leading to a heightened experience of discomfort and a visceral response to potential threat.

In contrast to the above findings, age was positively correlated with a greater signal change in the prefrontal regions involved in cognitive control and response inhibition, such as the dorsolateral prefrontal cortex and right inferior frontal gyrus (Aron, Robbins, & Poldrack, 2004). This suggests that adults use more abstract secondary representations of pain than children when perceiving others in distress. These findings are further supported by changes observed within the vmPFC in response to intentional harm, where the locus of activation shifted from the medial portion (thought to regulate motor and visceral responses to stimuli) to the lateral portion (crucial for integrating mental representations with affective states) as participants aged (Hurliman, Nagode, & Pardo, 2005).

Overall, this pattern of developmental change in response to the perception of others' distress is indicative of a gradual shift from the monitoring of somatovisceral responses in young children to a more cognitive evaluative level associated with executive control of higher order emotion processing in older participants. Furthermore, the engagement of the amygdala, PAG, insula, and vmPFC in children as they perceived others' distress coincides temporally with the structural maturation of these regions. These reciprocally interconnected regions come online relatively early in ontogeny, underlie the rapid processing of affective signals, and are involved in arousal and somatovisceral resonance (Decety & Sveltova, 2012). In contrast, the medial and lateral regions of the prefrontal cortex undergo more prolonged maturation across the lifespan, becoming progressively specialized for the evaluation of social stimuli (Paus, 2011). These latter regions of the prefrontal cortex are also vital for more advanced forms of empathy, including those associated with perspective taking, theory of mind, and moral decision making (Figure 1).

A second study examined developmental changes in response to morally laden stimuli (Decety, Michalska, & Kinzler, 2012). This study, involving participants aged 4–37 years, combined moral evaluations, eye tracking, and fMRI measures in response to animated visual scenarios. Participants viewed scenarios during scanning that depicted people or objects being injured intentionally or accidentally. Varied intentionality was crucial in providing a cue concerning whether the action was malicious. After scanning, participants were again presented with the visual scenarios and were asked to judge whether the perpetrators' actions were intentional or not. Participants also responded to questions probing moral judgment (wrongness and punishment), empathic concern for the victim, personal distress, and mental state understanding.

In all participants, perceived intentional harm to people (as opposed to accidental harm) was associated with increased activation in brain regions such as the right pSTS, which are sensitive to the perception, prediction, and interpretation of others' intentions (Blakemore et al., 2003). Furthermore, increased activation was found in regions known to process the affective consequences of these actions, namely, the insula, vmPFC, and amygdala. Participants' personal distress in response to harmful actions was correlated with increased activity in the amygdala, a region that plays a significant role in attention and in detecting relevance (Sander, Grafman, & Zalla, 2003).

Age was negatively correlated with empathic sadness for the victim of harm, with the youngest participants exhibiting the greatest personal sadness. Ratings of sadness for the victim correlated with increased activity in the insula and subgenual prefrontal cortex, the latter part of which has extensive connections with circuits implicated in emotional behavior and response to stressors (Drevets et al., 1997). In fact, damage to the subgenual prefrontal cortex is associated with abnormal autonomic responses to emotional experiences and impaired comprehension of the adverse consequences of pernicious social behaviors (Bechara, Tranel, Damasio, & Damasio, 1996). These findings suggest that younger children experience more personal distress than their adult counterparts.

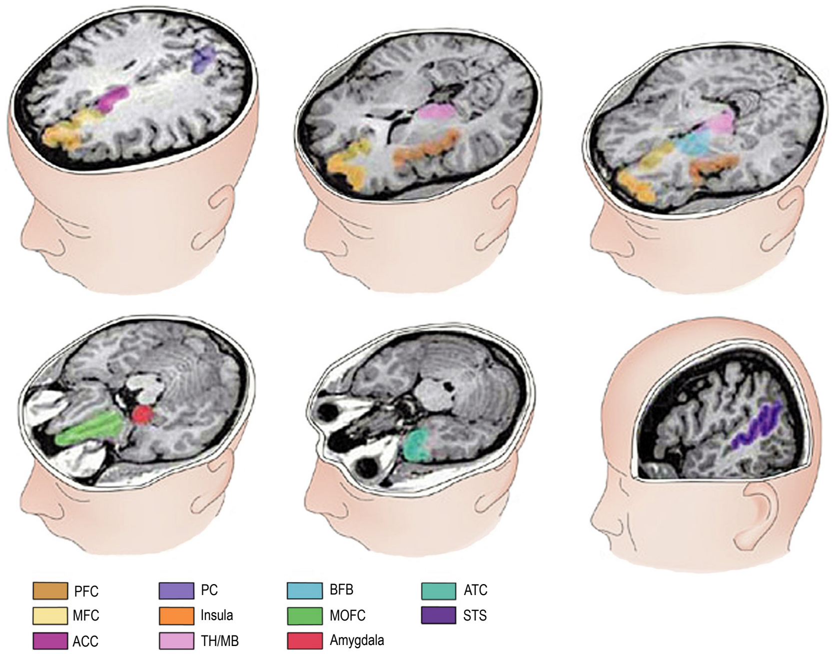

Figure 1. Brain regions implicated in moral cognition (courtesy of Jorge Moll).
Note. Subcortical structures include the brainstem, basal forebrain, hypothalamus, ventral striatum, and amygdala. Cortical regions include sectors of the prefrontal cortex, especially the ventromedial prefrontal cortex, orbitofrontal cortex and medial prefrontal cortex, and anterior cingulate cortex, posterior superior temporal sulcus (aka as TPJ), and insula.

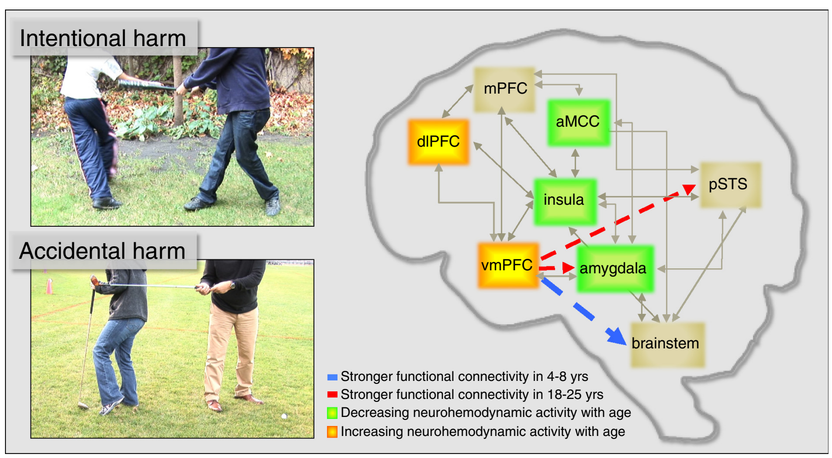

Figure 2. Schematic representation of the neural networks engaged when individuals being scanned are presented with short scenarios depicting intentional harm versus accidental harm, with the black arrows representing the changes in functional connectivity and the solid arrows showing the anatomical connectivity between the different regions.
Note. Several regions that play a critical role in emotion processing such as the insula, amygdala, and anterior midcingulate cortex showed decreasing activity with age, whereas other regions—the dorsolateral prefrontal cortex and ventromedial prefrontal cortex (vmPFC), computing affective and cognitive evaluations—showed an age-related increase. Functional connectivity analyses (dashed arrows), seeded in the vmPFC, showed greater functional connectivity with the brainstem in early childhood (4–8 years), whereas in young adults (18–25 years), vmPFC increased its connectivity with amygdala, and posterior superior temporal sulcus (adapted with permission from Decety et al., 2012).

Patterns of functional connectivity while participants perceived intentional harm relative to accidental harm demonstrate increased prefrontal cortex and amygdala integration across time (Figure 2). Changes in functional integration between vmPFC and amygdala were observed, with the older participants showing significant coactivation in these regions, whereas the youngest children exhibited a significant covariation only between the vmPFC and brainstem. Furthermore, adult participants showed a stronger connectivity between vmPFC and pSTS while viewing moral relative to nonmoral actions than the younger participants, suggesting developmental changes in the functional integration of information within the mentalizing system.

Neurodevelopmental changes during the perception of morally laden situations are clearly seen in structures involved in emotion saliency (amygdala and insula), where activation decreases with age. Conversely, activity in regions of the medial and ventral prefrontal cortex, reciprocally connected with the amygdala and involved in decision making and evaluation, increases with age as these regions become more functionally coupled. This pattern of developmental change is reflected in moral evaluations, which require the capacity to integrate a representation of others' mental states together with the consequences of their actions (Leslie, Knobe, & Cohen, 2006). Although judgments of wrongness did not change across age—all participants rated intentional harm as more wrong than accidental harm—subjects' evaluations concerning the malevolence of the agent did. Young children considered all agents malicious, irrespective of intention and target (i.e., people or objects), but older participants perceived the perpetrator as less mean when carrying out an accidental action and when the target was an object. Ratings of deserved punishment also changed with age. As age increased, participants punished an agent who damaged an object less severely than an agent who harmed a person. Although even young children process both intentionality and target in guiding their own empathic responses and judgment of wrongness, study authors observed an age-related increased discrimination of intentionality and target (people vs. object) in determining moral culpability. This is consistent with the developmental shift in moral judgment, originally dominated by a focus on outcomes and transitioning to an integration of both intent to harm and consequences.

TOWARD A NEURODEVELOPMENTAL PERSPECTIVE OF MORALITY

Neuroscience research suggests that moral reasoning is underpinned by distinct neural networks including the amygdala, pSTS, and vmPFC (Young & Dungan, 2012). These networks support communication between computational systems underlying affective states, cognitions, and motivational processes involved in moral judgment. Developmental data echo these findings, suggesting that many individual cognitive abilities are necessary for a mature morality.

Although certain neural systems used in moral reasoning are evident early in life, changes in connectivity and regional activation over time offer fascinating developmental insights. The fact that morally laden stimuli evoke stronger empathic sadness in younger participants as well as a stronger response in neural networks that code affective saliency (brainstem and amygdala) supports the notion that emotion plays a critical role in guiding the developmental trajectory of our moral capacities. Thus, what develops is not only theory of mind but also the ability to integrate knowledge about others' thoughts with information about consequences and emotions in the context of moral judgment.

There is support for an early critical period in the development of amygdala function and its role in social cognition. Unilateral lesions of the human amygdala arising early in development, but not in adulthood, are associated with a loss of the expected superior retrieval of emotionally arousing over neutral material, as well as deficits in theory of mind (Shaw et al., 2004). A similar developmental relation between impairments and the damage to the vmPFC has been reported, with early acquisitions resulting in more pervasive moral reasoning impairments than late prefrontal cortex damage (Anderson, Bechara, Damasio, Tranel, & Damasio, 1999).

Neuroimaging studies examining youth with callous-unemotional traits further demonstrate the critical importance of affective arousal in typical moral development. For instance, Cheng, Hung, and Decety (2012) measured event-related potentials elicited by the perception of individuals being injured in incarcerated juvenile psychopaths, who scored high on callous-unemotional traits (and described as lacking guilt, empathy, and a callous use of others for personal gain), and incarcerated control participants. Juvenile psychopaths exhibited a reduced frontal N120 (peak around 120 ms poststimulus associated with negativity bias) in response to others in distress, indicating an absence of early negative arousal. Interestingly, this lack of empathic arousal was correlated with young offenders' own relative insensitivity to physical pain.

In conclusion, a neurodevelopmental perspective allows for an improved understanding of the affective and cognitive processes necessary for moral reasoning. The results of this intellectual endeavor are directly relevant to both normative and maladaptive socioemotional functioning, as they isolate both the individual networks and the interconnections that may lead to breakdowns in moral behavior. Although neuroscience research strongly indicates that emotional reactivity is a necessary process in the development of moral decision making, one should be cautious not to reduce morality to unconscious emotionally driven decisions that exclude reasoning (Turiel, 2010). Moreover, like any sociocognitive developmental ability, morality is rooted in interpersonal engagement and social experience.

Neuroscience research is critical to elucidate what systems mediate early social evaluations and behaviors, often considered a prerequisite for moral thought. For example, examining neural circuit activation and the spatiotemporal dynamics of neural processing when infants view social interactions could help us better understand the contributions of affect and cognition to early moral thought.

REFERENCES

Anderson, S. W., Bechara, A., Damasio, H., Tranel, D., & Damasio, A. R. (1999). Impairment of social and moral behavior related to early damage in human prefrontal cortex. *Nature Neuroscience*, *2*, 1032–1037.

Aron, A. R., Robbins, T. W., & Poldrack, R. A. (2004). Inhibition and the right inferior frontal cortex. *Trends in Cognitive Sciences*, *8*, 170–177.

Baillargeon, R., Scott, R. M., & He, Z. (2010). False-belief understanding in infants. *Trends in Cognitive Sciences*, *14*, 110–118.

Bandstra, N. F., Chambers, C. T., McGrath, P., & Moore, C. (2011). The behavioural expression of empathy to others' pain versus others' sadness in young children. *Pain*, *152*, 1074–1082.

Bechara, A., Tranel, D., Damasio, H., & Damasio, A. R. (1996). Failure to respond autonomically to anticipated future outcomes following damage to the prefrontal cortex. *Cerebral Cortex*, *6*, 215–225.

Blakemore, S. J., Boyer, P., Pachot-Clouard, M., Meltzoff, A., Segebarth, C., & Decety, J. (2003). The detection of contingency and animacy from simple animations in the human brain. *Cerebral Cortex*, *13*, 837–844.

Blasi, A., Mercure, E., Lloyd-Fox, S., Thomson, A., Brammer, M., Sauter, D., et al. (2011). Early specialization for voice and emotion processing in the infant brain. *Current Biology*, *21*, 1–5.

Bloom, P. (2012). Moral nativism and moral psychology. In M. Mikulincer & P. R. Shaver (Eds.), *The social psychology of morality* (pp. 71–89). Washington, DC: APA.

Brody, G., & Shaffer, D. (1982). Contributions of parents and peers to children's moral socialization. *Developmental Review*, *2*, 31–75.

Carlson, S. M. (2009). Social origins of executive function development. In C. Lewis & J. I. M. Carpendale (Eds), *Social interaction and the development of executive function. New directions in child and adolescent development* (R. Larson & L. Jensen Series Eds., pp. 87–98). San Francisco, CA: Jossey-Bass.

Cheng, Y., Hung, A., & Decety, J. (2012). Dissociation between affective sharing and emotion understanding in juvenile psychopaths. *Development and Psychopathology*, *24*, 623–636.

Cheng, Y., Lee, S. Y., Chen, H. Y., Wang, P. Y., & Decety, J. (2012). Voice and emotion processing in the human neonatal brain. *Journal of Cognitive Neuroscience*, *24*, 1411–1419.

Decety, J. (2010). The neurodevelopment of empathy in humans. *Developmental Neuroscience*, *32*, 257–267.

Decety, J., & Michalska, K. J. (2010). Neurodevelopmental changes in the circuits underlying empathy and sympathy from childhood to adulthood. *Developmental Science*, *13*, 886–899.

Decety, J., Michalska, K. J., & Kinzler, K. D. (2012). The contribution of emotion and cognition to moral sensitivity: A neurodevelopmental study. *Cerebral Cortex*, *22*, 209–220.

Decety, J., & Sveltova, M. (2012). Putting together phylogenetic and ontogenetic perspectives on empathy. *Developmental Cognitive Neuroscience*, *2*, 1–24.

Drevets, W. C., Price, J. L., Simpson, J. R., Todd, R. D., Reich, T., Vannier, M., et al. (1997). Subgenual prefrontal cortex abnormalities in mood disorders. *Nature*, *386*, 824–827.

Dunn, J. (2006). Moral development in early childhood and social interaction in the family. In M. Killen & J. Smetana (Eds), *Handbook of moral development* (pp. 331–350). Mahwah, NJ: Erlbaum.

Farroni, T., Menon, E., Rigato, S., & Johnson, M. H. (2007). The perception of facial expressions in newborns. *European Journal of Developmental Psychology*, *4*, 2–13.

Hamlin, J. K., & Wynn, K. (2011). Five- and 9-month-old infants prefer prosocial to antisocial others. *Cognitive Development*, *26*, 30–39.

Hamlin, J. K., Wynn, K., & Bloom, P. (2007). Social evaluation by preverbal infants. *Nature*, *450*, 557–559.

Hamlin, J. K., Wynn, K., & Bloom, P. (2010). 3-month-olds show a negativity bias in social evaluation. *Developmental Science*, *13*, 923–939.

Hurliman, E., Nagode, J. C., & Pardo, J. V. (2005). Double dissociation of exteroceptive and interoceptive feedback systems in the orbital and ventromedial prefrontal cortex of humans. *Journal of Neuroscience*, *25*, 4641–4648.

Killen, M., & Rutland, A. (2011). *Children and social exclusion: Morality, prejudice, and group identity* (pp. 480–481). New York: Wiley-Blackwell.

Kochanska, G., Murray, K. T., & Harlan, E. (2000). Effortful control in early childhood: Continuity and change, antecedents, and implications for social development. *Developmental Psychology*, *36*, 220–232.

Kohlberg, L. (1984). *Essays in moral development: Vol. 2. The psychology of moral development*. New York: Harper & Row.

Laible, D. J., & Thompson, R. A. (2002). Mother-child conflict in the toddler years: Lessons in emotion, morality, and relationships. *Child Development*, *73*, 1187–1203.

Leslie, A., Knobe, J., & Cohen, A. (2006). Acting intentionally and the side-effect: Theory of mind and moral judgment. *Psychological Science*, *17*, 421–427.

Main, M., & George, C. (1985). Responses of young abused and disadvantaged toddlers to distress in agemates. *Developmental Psychology*, *21*, 407–412.

McGuigan, N., & Nunez, M. (2006). Executive functioning by 18–24-month-old children: Effects of inhibition, working memory demands, and narrative in a novel detour-reaching task. *Infant and Child Development*, *15*, 519–542.

Paus, T. (2011). Brain development during childhood and adolescence. In J. Decety & J. T. Cacioppo (Eds), *The Oxford handbook of social neuroscience* (pp. 293–313). New York: Oxford University Press.

Roth-Hanania, R., Davidov, M., & Zahn-Waxler, C. (2011). Empathy development from 8 to 16 months: Early signs of concern for others. *Infant Behavior and Development*, *34*, 447–458.

Sander, D., Grafman, J., & Zalla, T. (2003). The human amygdala: An evolved system for relevance detection. *Reviews in the Neurosciences*, *14*, 303–316.

Schmidt, M., & Sommerville, J. A. (2011). Fairness expectations and altruistic sharing in 15-month-old human infants. *PLoS ONE*, *6*, e23223.

Shaw, P., Lawrence, E. J., Radbourne, C., Bramham, J., Polkey, C. E., & David, A. S. (2004). The impact of early and late damage to the human amygdala on theory of mind reasoning. *Brain*, *127*, 1535–1548.

Smetana, J. G. (1999). The role of parents in moral development: A social domain analysis. *Journal of Moral Education*, *28*, 211–321.

Turiel, E. (2010). The relevance of moral epistemology and psychology for neuroscience. In P. D. Zelazo, M. Chandler, & E. Crone (Eds.), *Developmental social cognitive neuroscience* (pp. 313–331). New York: Psychology Press.

Vaish, A., & Warneken, F. (2012). Social-cognitive contributors to young children's empathic and prosocial behavior. In J. Decety (Ed.), *Empathy—From bench to bedside* (pp. 131–146). Cambridge, MA: MIT Press.

Wynn, K. (2008). Some innate foundations of social and moral cognition. In P. Carruthers, S. Laurence, & S. Stich (Eds.), *The innate mind* (Vol. 3, pp. 330–346). New York: Oxford University Press.

Young, L., & Dungan, J. (2012). Where in the brain is morality? Everywhere and maybe nowhere. *Social Neuroscience*, *7*(1–2), 1–10.