In Houdé, O. & Borst, G. The Cambridge Handbook of Cognitive Development

12 Social Cognition and Moral Evaluation in Early Human Childhood

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12.1 Intro: Human Social Cognition and Developmental Psychology

Human social cognition is the human capacity to process social stimuli, to intentionally convey socially relevant information to others, and to make use of socially transmitted information. Several human social cognitive capacities are special and set humans apart from non-human animals. Thanks to these capacities, humans are unique in their ability to create, maintain, and alter large social groups within which they coordinate, cooperate, and also compete. Moreover, there are few (if any) other biological species in which groups or crowds of individuals spend as much collective effort in attacking other groups or in defending their own group from the attacks of others (Boyer, 2018; Tooby & Cosmides, 2010). Humans also appear to be unique in their capacity for stable cultural transmission over many generations and for the pervasiveness of their moral cognitive concerns.

Human social cognition is a relatively recent and highly interdisciplinary topic of investigation in the cognitive sciences, ranging from evolutionary psychology to social cognitive neuroscience to developmental psychology. For example, evolutionary psychologists who advocate the "social brain hypothesis" have highlighted the correlation between the fact that humans have an unusually large brain in relation to their body size and the fact that they live in unusually large social groups, compared to all other biological species (cf. Dunbar, 1992, 2003). Advocates of the so-called Macchiavellian intelligence hypothesis have suggested that the evolutionary arms race between the strategic demands for cooperation and competition among members of complex social groups must have placed strong selective pressures on human cognition, including the capacity to read others' minds or attribute mental states to others (cf. Byrne & Whiten, 1988; Humphrey, 1976).

This chapter focuses on a complementary body of work in developmental psychology, from the past forty years or so, devoted to the investigation of early social cognitive competencies in young human children and even in preverbal human infants. Now is a timely moment to write this chapter given that the field has undergone a recent transition in methods, that has radically changed how we understand the developmental origins of social cognition. Much early work relied on either action-based or verbal tasks, thus limiting researchers' ability to test for precocious

Département d'Etudes Cognitives receives support from Agence Nationale de la Recherche (grants ANR-10-IDEX-0001-02 PSL and ANR-17-EURE-0017 FrontCog). Andreas Falck gratefully acknowledges support from the Swedish Research Council, grant 2016-06783. Brent Strickland gratefully acknowledges support from PSL University (Aux Frontieres des Labex), grant IPFBW 2016-151. Pierre Jacob would like to acknowledge support from the European Research Council (ERC) under the European Union's Seventh Framework Program (FP7/2007-2013)/ERC Grant 609819.

abilities in pre-verbal infants. However, a shift occurred in developmental psychology in the 1980s with the advent of behavioral methods based on looking behavior. The violation-of-expectation method exploits the reliable tendency to look longer at unexpected rather than at expected events for the purpose of probing infant cognition. The anticipatory gaze method makes use of an eye-tracker to monitor infants' first gaze in anticipation of where an agent is likely to act. Though these methods were originally mainly applied to understand infants' representations of their non-social environment (e.g. their naive sense of physics and number), they have recently been applied to help reveal preverbal infants' expectations regarding their social environments.

Surprisingly, much developmental evidence suggests that early on young human children can represent both enduring (or stable) and episodic (or transient) social features of their conspecifics. For example, they can represent other people as agents, as speaking their mothers' tongue, as male or female, all of which are enduring social features likely to persist throughout an individual's lifespan. They can also attribute transient mental states to others, ranging from emotions to beliefs, most of which can change from moment to moment. In what follows, we first review developmental research into early sensitivity to, and understanding of, agency. Secondly, we review research into early theory of mind capacities to attribute mental states to others. Thirdly, we review research into early capacities to respond to cues of non-verbal communicative interactions, which are likely to play a crucial role in the process of cultural transmission. In the penultimate section, we review research into early sensitivity to in-group/out-group distinctions, including research about social essentialism in young children. Finally, we turn to the study of early moral cognition.

12.2 Early Perceptual Sensitivity to and Understanding of Agency in Human Infancy

Human infants and non-human animals display a remarkable ability to perceptually discriminate agents (i.e., living things which move about their environment autonomously) from non-agents in the earliest moments of life. For example, Vallortigara et al. (2005) showed that newly hatched chicks that had been reared in complete darkness prefer "point light displays" (i.e. displays with only minimal motion cues) which depict biological motion over those that depict closely matched but non-biological motion. Similarly, Simion et al. (2008) showed that two-day-old human infants have an ability to discriminate between equally unfamiliar biological and non-biological motion patterns, and that they have a preference to attend to displays containing biological motion.

It is important to appreciate that in these experiments the preferences for biological motion over non-biological motion are unlikely to be explained through familiarity to biological motion given both (a) the age of the participants (newborn humans or chicks) and (b) the fact that the displays in at least some conditions depicted motion patterns which are unlikely to be found in the participants' local environment (e.g., human infants being exposed to a display of a walking hen). Thus, these results strongly suggest an innate basis for "animacy detectors" within perception.

Consistent with the view that mechanisms dedicated to the ~~perception~~ detection of animacy are deeply embedded in perception, we also see evidence for such "sophisticated" perceptual mechanisms in adults. For example, Gao et al. (2009) studied the perception of chasing, a form of biological motion, in displays that involved one geometric shape pursuing another geometric shape. Participants were

asked to find the chasing figure amongst a set of otherwise identical geometric shapes. The authors demonstrated that observers' performance was systematically influenced by *chasing subtlety* (i.e., the degree to which the chaser deviated from perfectly "heat-seeking" pursuit) and *directionality* (how the shapes "face" each other), suggestive of a set of detection mechanisms with fairly specific "parameter settings," that in turn lead to predictable influences on behavior.

A separate demonstration of possible automatic mechanisms involved in the detection of animacy comes from New et al. (2007), in which adults saw repeating alternations between complex scenes and their duplicates with a single change, and were asked to spot the change. Participants were substantially better, in terms of both response time and accuracy, at detecting changes in animals relative to changes in all other categories of inanimate object. Along similar lines, Troje and Westhoff (2006) showed adults static point light displays in which the configural information (i.e., the relative positioning of the limbs) has been entirely disrupted. They found that participants were able to nevertheless accurately judge the motion direction of the figure (i.e. moving left or right). However, participants were impaired in detecting movement direction when the display was vertically inverted, suggesting that the adult visual system, like that of young infants, contains specific mechanisms for detecting animate motion and that these mechanisms are disrupted by inversion (but not by disrupting configural information).

Sensitivity to biological motion as well as socially relevant static displays is thus evident in adults' as well as infants' looking behavior. These overlapping sensitivities suggest a shared set of basic mechanisms that are present early in infancy and continue to exert an influence throughout the lifespan.

That an infant (or an adult) preferentially attends to a given type of display rather than another indicates discriminatory ability and relative interest, but says nothing regarding how they may represent different, but equally interesting displays. Some evidence for such differentiation comes from studies of infant imitation, to which we turn next.

Meltzoff and Moore (1983) offered preliminary evidence that neonates are able to imitate facial postures. Infants between one and seventy hours of age were shown an adult repeating two types of facial gestures in random order – either protruding their tongue or opening their mouth. The infants were more likely to respond to the protruding tongue with protruding their own tongue, and to the open mouth by opening their own mouth, than they were to respond with another gesture or not at all. In an earlier study (Meltzoff & Moore, 1977), slightly older infants (between twelve and seventeen days) were reported to also imitate lip protrusions and simple finger movements, in addition to tongue protrusions and mouth openings. Later in life infants could learn to imitate from reinforcement learning, for example by parents imitating the baby and then encouraging the baby when they continued doing what they just did. However, at this early age, the window for learning directly from social partners is still quite small. These results were interpreted as evidence for an early matching mechanism, whereby changes in the infants' visual inputs would be matched onto proprioceptive information from previous (in uterus) experience of their own similar movements (Meltzoff & Moore, 1997).

Subsequent studies, however, have called into question some of these findings, and instead suggested that neonate imitation might be limited to tongue protrusions (Anisfeld, 1996; Oostenbroek et al., 2016) and have also challenged the hypothesis that infants imitate based on some matching between their own

previously executed actions and others' seen actions. It might well be the case that the neonates stick out their tongue as an innate reflex triggered by some aspect of an observed pattern, or perhaps as a consequence of arousal due to interacting with another person (Oostenbroek et al., 2013). In a large study by Oostenbroek et al. (2016), infants were tested longitudinally at one, three, six, and nine weeks of age, and they were presented with a range of actions, including tongue protrusions. While Oostenbroek and colleagues found no clear-cut evidence for imitation of mouth opening, they found evidence for imitation of tongue protrusion, and they also found that infants are prone to stick their tongue out in response to other stimuli.

Another question that has been asked is: how well do infants distinguish goal-directed actions from other types of biological motion? A framework for studying the perception of goal-directed actions comes from an important discovery in the 1990s showing that macaque brains contain neurons that are active both when executing a specific manual action, and when observing someone (in the original study, a human) performing the same action (Gallese et al., 1996). Whereas the recording of activity of single cells is not viable in healthy humans, specific neural circuits that respond to both own and perceived actions have been identified in human brains using non-invasive neuroimaging techniques (Rizzolatti & Craighero, 2004). In infants, this "mirror neuron system" (MNS) has been primarily investigated with EEG, an electrophysiological technique that measures neural activity using electrodes mounted on the infant's head. These studies typically investigate mu- and alpha frequency band activation, previously shown in adults to correspond to MNS activity. Six-to-eight months infants' brains react differently to actions aimed at a target object, compared to actions without a clear goal (Nyström, 2008; Nyström et al., 2010). Southgate et al. (2009) identified EEG activation in the alpha band that was elicited both when nine-month-old infants performed a grasping action themselves, and when they observed someone else grasp for an object. In addition to providing direct support for "mirror"-type activity in infancy, they also found that this activity started as soon as the goal of the action could be anticipated, corroborating the specificity for goal-directed (as opposed to other) action.

Using an anticipatory gaze task, Falck-Ytter et al. (2006) investigated infants' ability to anticipate the target of a manual action. They showed that adults and twelve-month-olds, but not six-month-olds, anticipated the goal of a human agent's action by looking in advance to the place where the agent was about to place an object. In contrast, if a mechanical robot arm moved the object only adults anticipated the goal in advance, suggesting again a preference for biological motion in early perception. Moreover, action anticipation by gaze in ten-month-olds is correlated with the infants' ability to look in advance at the target of their own actions (Rosander & von Hofsten, 2011). Twelve-month-olds playing with a caregiver keep visual focus on the object being played with, regardless of whether they themselves or the adult caregiver handles the object (Yu & Smith, 2013), suggesting a close coupling between MNS activity and visual attention at this age.

A final branch of research has focused on the ways in which the neonate (and adult) visual system is attuned to human faces. Two-day-old newborns preferentially orient toward faces or face-like stimuli over similarly complex but non-face stimuli (Johnson et al., 1991; Valenza et al., 1996). Newborn infants prefer to look at an upright face than at an inverted face. But they prefer an upright face

only if the eye region exhibits a polarity contrast similar to the contrast between the dark iris and the white sclera characteristic of the human eye, not if it is reversed. This pattern has been hypothesized to reflect a bias toward potential communicative partners (Farroni et al., 2005). This selective processing of face-like stimuli has recently been suggested to be present even before birth (Reid et al., 2017). Human fetuses (eight months gestational age) turned their head more often toward a face-like configuration of dots projected onto the uterus wall than to an inverted version of the same projection. At four-to-five months infants follow an adult's gaze-shift, but only if the adult has antecedently made eye contact with them (Farroni et al., 2003).

12.3 Early Theory of Mind

What is known as *mindreading* is the cognitive capacity to attribute mental states (e.g., beliefs, desires, intentions, emotions and affective states) to self and others. In their seminal paper entitled "Does the chimpanzee have a theory of mind?," Premack and Woodruff (1978) called this capacity "theory of mind," on two grounds: first, the attributed mental states themselves are not observable. Secondly, by attributing mental states to an agent, one may understand and predict her likely observable behavior. Thus, theory of mind enables an observer to make sense of an agent's action by attributing to her a relevant desire to achieve her goal in the light of her relevant epistemic states (beliefs) about her immediate surroundings.

12.3.1 Rational Action, Goals, and Intentions

In the 1990s, the developmental investigation of infants' understanding of others' goals and motivations gave rise to three influential sets of findings, the first of which is that early on infants apply a "teleological stance" to others' goal-directed instrumental actions. In the familiarization trials of a series of studies, twelve-month-olds saw on a computer screen a goal-directed event whereby a small circle approached a larger circle by jumping over a rectangular obstacle. During the test phase, the rectangle that stood in between the two circles was removed and the infants either saw the small circle exhibit the same jumping behavior as before or approach the larger circle by moving in a straight line. The infants looked reliably longer at the same jumping action that they had already seen rather than at the novel straight-line approach that they had not seen before (Csibra et al., 1999; Gergely et al., 1995). These findings are consistent with the hypothesis that infants apply what Csibra and Gergely call the "teleological stance," namely that they attribute a goal to the agent and expect the agent to select the most efficient action as a means to fulfill his goal in the presence of local environmental constraints. Further research has shown that twelve-month-old infants are able to compute any one of the three components of the teleological stance from the other pair: the agent's goal, the agent's action-means, and the local environmental constraints (Csibra et al., 2003).

A second influential line of research was launched by Amanda Woodward's (1998, 1999) demonstration of the so-called Woodward effect. Six-month-olds were first habituated to seeing a human hand in a grasping posture repeatedly reach for and rest on the top of one of a pair of toys, e.g. the teddy bear, not the ball. In the test conditions, the toys' spatial positions were switched and the infants saw the hand either reach for the same toy (e.g. the teddy bear) at a new location or a new toy (e.g. the ball) at the previous location where the hand acted in the familiarization trials. Infants looked reliably longer

when the hand reached for the new toy at the old location than for the old toy at the new location. Early studies showed that the Woodward effect disappeared if the human hand was either replaced by a mechanical device (e.g. an inanimate rod topped with a sponge or a mechanical claw) or if, instead of seeing a human hand in a grasping posture, infants saw the back of a human hand repeatedly drop on the same toy (Woodward, 1998, 1999).

The fact that the Woodward effect disappeared in both cases has been interpreted by Woodward herself and some of her colleagues as evidence that action understanding in human infancy is achieved by mirroring or mirror neuron activity (Hamlin et al., 2008; Sommerville et al., 2005; Woodward et al., 2009). Recall from Section 12.2 that mirror neuron activity in an observer's brain is taken to rest on motor familiarity with the agent's action and to enable an observer to understand the agent's action by covertly replicating her bodily movements. On this approach, the fact that mirror neurons failed to fire when a monkey observed an experimenter grasp a peanut with pliers seems like an anticipation of the disappearance of the Woodward effect when infants see an act performed by a mechanical claw (Rizzolatti et al., 1996, 2001; Umilta et al., 2001).

Further support for the mirroring interpretation of the Woodward effect comes from studies showing that active motor experience may enhance infants' understanding of others' goal-directed actions. For example, ten-month-olds, who initially failed to exhibit the Woodward effect when they saw an agent use a tool to fetch one of two toys, exhibited the Woodward effect after being actively trained to use the tool. Three-month-olds, who are notoriously unable to reach and grasp objects accurately, have also been shown not to exhibit the classical Woodward effect. However, three-month-olds have been shown to exhibit the Woodward effect after being trained to grasp objects accurately with the use of sticking mittens, thus allowing the infants to grasp reached-for objects despite their lack of motor skill in this respect (Hamlin et al., 2008; Sommerville et al., 2005; Woodward et al., 2009).

This finding suggests that infants need some first-hand experience for the Woodward-effect to appear, thus lending support to mirror neuron accounts of the effect (Woodward et al., 2009). However, Skerry et al. (2013) have also trained a group of three-month-olds to accurately grasp a target by using sticky mittens. All infants saw an agent either efficiently reach an object by arching her arm over a barrier or inefficiently perform the same arching movements in the absence of a barrier. Only infants who had experienced sticky mittens looked longer when they saw an agent perform an inefficient action. Infants who had first-personal motor experience with mittens did not have first-personal motor experience with efficiently reaching for an object by arching their arm over a barrier. Skerry and colleagues conclude that, while motor experience with mittens might help three-month-old infants to attend to or identify the targets of others' goal-directed actions, the ability to compute the efficiency of actions must already be in place at this age. Similarly, motor experience with mittens might help three-month-old infants to better attend to the target of the agent's preference in the Woodward effect.

Consistent with this interpretation, many subsequent studies have also provided evidence for the presence of the Woodward effect when infants lack motor familiarity with the agent's action. For example, the Woodward effect is vindicated when infants see the back of a human hand not only contact a target but also displace it (Jovanovic et al., 2007; Kiràly et al., 2003). It also emerges when the agent is

a box which provides robust cues of self-propelledness (Luo and Baillargeon, 2005) and when the agent is a rod topped with a sponge that provides robust cues of equifinal variations of behavior, whereby the rod uses different means to achieve a single goal (Biro & Leslie, 2007). Infants have even been shown to attribute a goal to an agent who performed a biologically impossible action, e.g., a human arm snaking around obstacles (Southgate et al., 2008). Thus, the agent need not exhibit any obvious perceptual similarity with a human (or even an animal) body. Nor need the agent's action be part of the infants' motor repertoire. Two conditions, however, seem necessary for the presence of the Woodward effect. First, the agent must exhibit self-propelled movements and provide evidence that they are able to produce equifinal variations of behavior. Secondly, the agent must face a choice between two competing targets. As Luo and Baillargeon (2005) have shown with five-month-olds and Luo (2011a) with three-month-olds, infants look longer when the agent approaches a new target at the old location rather than the same target at a new location, only if they first saw the agent repeatedly approach one of a pair of targets, not if there was only one target in the familiarization trials (cf. Jacob, 2012, for further discussion).

A third influential set of recent findings by Tomasello and his group has highlighted the central role of processes of so-called shared intentionality in early human children's social cognitive development. The shared-intentionality framework rests on the three following pillars. Making eye contact with an agent has been shown to trigger gaze-following in early human infancy (Farroni et al., 2003). Next, gaze-following is the basis for the early emergence of joint attention whereby two individuals are aware of attending to the same target. Finally, infants are taken to be uniquely motivated not only for joint attention, but also for forming joint goals and performing joint actions, with others (Tomasello, 2014; Tomasello et al., 2005). While Tomasello and colleagues have stressed the role of competitive interactions (especially in relation to food) among non-human apes, many of their studies have shown that, early on, young children are altruistically inclined to help an agent achieve her goal. Young children have been shown to help someone else by fetching an out-of-reach object, by sharing commodities and information with others. While Warnecken and Tomasello (2006, 2007, 2009) have shown that young children are inclined to help an agent whom they see trying and failing to achieve a goal, Liszkowski et al. (2006) offer evidence that eighteen- and even twelve-month-olds are motivated to point to objects which they believe an adult is looking for. More recently, Knudsen and Liszkowski (2012) have shown that twenty-four- and eighteen-month-olds spontaneously point to an object's location for the benefit of an agent, but only if the agent's goal is to retrieve the object and the agent has a false belief about its location, not if the agent either knows the object's location or her goal is not to retrieve it.

12.3.2 False-Belief Understanding

Following the publication and discussion of Premack and Woodruff's (1978) paper, much psychological research into the mindreading capacities of young human children, human adults, and non-human animals has focused on the capacity to attribute false beliefs to others. To be able to predict the likely action of a mistaken agent has been widely taken to show that one expects that another's action depends not merely on non-mental features of her environment, but on *her mental representation* of her environment. This research has given rise to importantly discrepant findings.

One strand of research based on verbal tasks initiated by Wimmer and Perner's (1983) paper has reliably shown that when directly asked to predict where a mistaken agent is likely to look for her toy (after the toy's location was changed in the agent's absence), most preschoolers (who know where the toy really is) incorrectly point to the toy's actual location. Most children correctly point to the empty location where the agent falsely believes her toy to be only when they are four and a half years old (Wellman et al., 2001).

Another strand of research based on non-verbal tests (including looking behavior, helping behaviour, and brain responses) has produced increasing evidence that preverbal infants expect an agent to act on the basis of the content of her true or false belief. For example, in their ground-breaking study, Onishi and Baillargeon (2005) found that fifteen-month-olds look longer when an agent looks for her toy at its actual location rather than at the empty location when she did not see the toy's change of location and they look longer when the agent looks for her toy at the empty location rather than at the toy's actual location when she saw the toy change location. Southgate and Vernetti (2014) found that the motor system of six-month-olds does not respond in the same way according to whether they are presented with an agent who falsely believes that a toy is in the box in front of her or whether she falsely believes the box to be empty. The same brain areas, the temporal-parietal junction in the right hemisphere (rTPJ), which are active when adults attribute false beliefs have been shown to be active in seven-month-old infants when they watch videos depicting an agent's action with a false belief (Hyde et al., 2018).

Luo (2011b) investigated a combination of belief and preference attribution in ten-month-olds and showed that the Woodward effect appears even in the absence of a second non-preferred object, as long as the agent believes there to be a second object available to reach for. This suggests that infants can use information about others' beliefs in order to attribute preferences. Drawing on this result, Kampis et al. (2013) used a similar design, but replaced the agent from the familiarization trials by another agent in the test event. Interestingly, they found that the infants looked longer even when this new agent reached for the non-preferred object instead of the preferred object, suggesting that the infants generalized one agent's preference to another. Kampis and colleagues suggest that ten-month-old infants might not yet attribute mental states to specific agents, but are still able to represent the contents of others' beliefs and preferences in order to learn about the world.

There is presently no consensus on how to reconcile the discrepant developmental findings about false-belief understanding in early human childhood (see Chapter 11). Some researchers take it that only findings based on verbal false-belief tasks can reliably be taken as evidence for theory of mind. Their main burden is to offer a non-mentalistic account of the infant data. Other researchers take the infant data at face value as evidence for false-belief understanding in human infancy. Their main burden is to explain why verbal false-belief tasks are so challenging for preschoolers.

12.4 Natural Pedagogy in Infancy

According to evolutionary biologists, not all interactions between pairs of animals are *communicative* (Maynard-Smith & Harper, 2003; Scott-Phillips, 2014). Only if both an agent's signal and his recipient's response have been shaped by evolution by natural selection do two animals communicate in the biological sense. For example, a vervet monkey's leopard alarm call and his recipient's escape response

count as a communicative interaction. To the leopard itself, however, the vervet's call does not count as a communicative signal: instead, it is a *cue* of the monkey's presence. If a bird is scared by the vervet's call, the call does not count as a communicative signal either: instead, it *coerces* the bird's response.

Furthermore, not every communicative interaction involves so-called *ostensive* signals. What makes an agent's behavior ostensive is that its purpose is to provide the agent's recipient (or audience) with evidence that the agent has some communicative intention to convey information relevant to her recipient. Speech is a typical ostensive signal that conveys the speaker's communicative intention. Among non-verbal ostensive signals are making eye contact and smiling. Thus, in ostensive communicative interactions, an agent (e.g., Sally) has two related intentions: first, Sally has the informative intention to cause her recipient (e.g., Bob) to acquire a new mental state (e.g., a new belief). For example, Sally, who knows both that Bob is looking for his keys and where Bob's keys are, wants to make the location of his keys manifest to Bob. Secondly, she also has the communicative intention to make her informative intention manifest to Bob. Sally could tell Bob where his keys are either using linguistic stimuli (which are intrinsically ostensive) or ostensively pointing to their location.

There is evidence that very early on infants are attuned to both visual and auditory ostensive signals. Recall from Section 12.2 that infants are preferentially sensitive to being looked at. Infants' preference for a canonical orientation of another's frontal face has been interpreted as evidence for their early preparedness to be the recipients of communicative demonstrations (Csibra, 2010). Ostensive signals also exist in the auditory modality: for example, the special intonation pattern of infant-directed speech (so-called motherese) can make it manifest that an infant is the intended recipient of speech. We know that newborns prefer speech over non-speech (Vouloumanos & Werker, 2007) and that they prefer their mother's voice over any other voice (Cooper & Aslin, 1990). By the age of four months, infants have been shown to prefer hearing their mother speak in infant-directed speech to a range of other acoustic stimulus (Csibra, 2010).

Since young infants follow gaze only after being looked at first (cf. Section 12.2), most if not all of their early learning from others' gaze takes place in communicative contexts. Six-month-olds have been shown to follow an adult's gaze to an object only if the adult first made eye contact with them or greeted them in motherese, not otherwise (Senju & Csibra, 2008). In a study by Csibra and Volein (2008), eight-month-olds first saw on a computer screen an adult ostensively greet them and make eye contact with them. Then the infants saw the adult shift her gaze toward one of two opaque barriers. Finally, an object was revealed behind the targeted or the non-targeted barrier. Infants' looking time indicated that they expected to find an object behind the barrier toward which the agent had shifted her gaze. Furthermore, in a detection study by Yoon et al. (2008), nine-month-olds were introduced to an object that an agent was either reaching for or ostensively pointing to. After the object was occluded for five seconds, the infants detected a change of its location, but not its visual properties, in the reaching context. The infants detected a change of the object's visual properties, but not its location, in the ostensive communicative context. This last finding has been interpreted as evidence that when infants perceive a novel object as the referent of an ostensive communicative act, they encode and remember better its enduring properties (e.g., its shape and color) than its transient properties,

such as its location. In contrast, when infants' attention is drawn to the same object as the target of an agent's instrumental goal-directed action, they focus on its episodic location at the expense of its enduring visual features.

In a seminal study by Gergely et al. (2002), inspired by an earlier imitation study by Meltzoff (1988), fourteen-month-olds saw a model perform an odd action whereby she used her head rather than one of her hands in order to turn on a light box in front of her in two different conditions. In the so-called hands-occupied condition, the model used her hands to wrap herself within a shawl and hold the shawl around her shoulders. In the "hands-free" condition, she ostensibly placed her free hands on the table. Before performing her odd action, the model ostensively greeted the children. Like in Meltzoff's original study, Gergely and colleagues found that, while 69 percent of the children re-enacted the model's head action in the hands-free condition, only 21 percent did in the hands-occupied condition. Arguably, in the hands-occupied condition, the agent's choice of the head action looked to the children like an efficient means to achieve her goal of turning the light on. So most of the children selected their own hands, which were not occupied, as a means to turning the light on. But in the hands-free condition, the agent's choice of the head action must have looked opaque, as she might have used her hands, but she did not. So in the teleologically more opaque condition, most children decided to replicate the model's head-action. As reported in a later study, when the agent did not ostensively greet the children, the asymmetrical replication of the model's head-action in the hands-occupied and the hands-free condition disappeared (Király et al., 2003). These findings suggest that when the application of the teleological stance to an agent's instrumental action fails to make the action intelligible to young children, they turn to what Csibra and Gergely (2009) call "natural pedagogy," whereby they assume that the agent's action is a non-verbal teaching demonstration from which they can expect to acquire some novel generic information.

Several studies further suggest that in the context of a non-verbal ostensive communicative interaction with an adult, toddlers, and even infants can encode not just episodic (or transient) but generic (or enduring) information. For example, eighteen-month-olds saw an agent display a positive emotional expression toward one object and a negative emotional expression toward another object, either in the context of ostensive signals or not. In both contexts, upon request by the same agent, the infants reliably gave her the object that had been the target of her earlier positive emotional display. But when a new agent requested an object, the infants also gave her the object that had been the target of the first agent's earlier positive emotional display in the ostensive context, but they were at chance in the non-ostensive context (Egyed et al., 2013).

A third study by Futó et al. (2010) shows how ostensive signals are likely to contribute to young children's acquisition of general (or generic) knowledge. In the familiarization trials of the first of three experiments by Futo et al. (2010), based on Xu and Carey's (1996) paradigm for investigating the capacity for object-individuation in infants, ten-month-olds were exposed to a non-verbal demonstration of the functions of a pair of toys. After the infants had been ostensively greeted in motherese, they first saw a human hand demonstrate the function of one toy on one side of a screen and the distinct function of a different toy on the other side of the screen, while the infants never saw the two toys together. After the screen was removed, the infants saw either both objects or only one of them. They looked reliably longer when they saw only one object rather than two. Further evidence showed that

the effect of function demonstration on object-individuation depends on both the presence of ostensive signals and on an agent's manipulation of the toys. Finally, the infants saw exactly the same sequence of events as before except that they saw two functions being demonstrated with a single more complex toy (rather than two). Infants looked longer after the screen was removed and they discovered the single toy that they had actually seen, rather than the two distinct toys used in the first experiment. In other words, these infants experienced an illusion of being presented with two objects when in fact they saw only one.

Butler and Markman (2012) have further explored the cognitive mechanisms enabling young children to acquire generic information from the ostensive communicative demonstration of teachers. Four-year-olds were presented with eleven wooden blocks and taught that their name was "blicket." Only one out of eleven blickets had a (non-visible) magnetic tape on one end. The children were shown the unexpected property of the magnetic blicket: by applying the blicket with magnetic tape to paper clips, the experimenter picked up the paper clips, in three distinct conditions. In the pedagogical condition, the children were informed that they would be taught something novel and interesting before the magnetic property of the blicket was demonstrated. In the accidental condition, the experimenter accidentally dropped the magnetic blicket onto the paper clips. In the intentional condition, the experimenter deliberately placed the magnetic blicket onto the paper clips without ostensively addressing the infants. In all three conditions, after her demonstration, the experimenter placed all eleven blickets on the table and encouraged the children to play with them. Butler and Markman (2012) found that children's persistence in exploring the magnetic property of blickets in the face of mounting negative evidence was remarkably stronger in the pedagogical than in either the accidental or the intentional condition. Butler and Markman argue that children assumed that they had been ostensively taught something about the *kind* of things called "blicket," not to be dismissed easily on the basis of counter-examples.

What the last findings strongly suggest is that in the presence of verbal or non-verbal ostensive communicative demonstrations young human children seem prone to a kind of cheap generalization which is reflected by generic sentences in natural languages, such as "ducks lay eggs," "tigers are striped," or "ticks carry Lyme disease" (which have long been studied by linguists and philosophers, Brandone et al., 2012; Leslie, 2007, 2008). What matters primarily to such generalizations is that they fit with psychological essentialism in that they provide general information about *kinds*, not just particulars. The propositional contents of such generic sentences, which are widely taken to be true by human adults, are clearly different from the contents of universally quantified sentences such as "all ducks lay eggs," "all tigers are striped," or "all ticks carry Lyme disease," which would be widely taken to be false. A single counterexample is sufficient to refute a universal generalization, but not the proposition expressed by a sentence with generic content. Despite the obvious fact that a majority of ducks, including males and infertile females, do not lay eggs, most adults would accept as true an utterance of the generic sentence "ducks lay eggs." Despite the known fact that a minute percentage of ticks actually carry Lyme disease, most adults would also accept as true an utterance of the generic sentence "ticks carry Lyme disease." Even for human adults who have acquired a natural language that makes them able to form other generalizations (e.g., universal ones) generics may be the default kind of human generalization. It

may be the signature of preverbal infants' way of generalizing in response to non-verbal ostensive communicative demonstrations.

12.5 Early Understanding of Groups

Human social cognition also faces demands arising from the size and role of social groups in human social life. Humans benefit from in-group support, affiliation, and solidarity because they are unique among other biological species in depending on others not only for relevant information about their environment, but also for performing joint and collective actions that require coordination, cooperation, and communication. Coordination, cooperation, and communication among humans apply to kin and non-kin as well. Human adults have long been shown to display a preference for members of their own in-group at the expense of out-group members, even if the grouping is based on the flimsiest and most arbitrary criteria, such as the color of a scarf (Brewer, 1979; Tajfel et al., 1971). Similar phenomena have been demonstrated in three-year-old human children (Plötner et al., 2015). Like many other social animals, humans must attend to the costs and benefits of dominance hierarchies in their own social groups. More than any other social animals, they are also likely to suffer from racial prejudice, in-group bias, ethnic identity, xenophobia, nationalism,l and group conflicts ranging from civil wars to genocides (Boyer, 2018).

Contemporary humans in different parts of the world are known to speak approximately 6,500 different natural languages. One of the strongest cues of group membership in humans is therefore spoken native language. Moreover, which language an individual can speak is likely to be an enduring or stable social feature of the individual, thus increasing the possible value of keeping track of this information.

Given that infants are embedded in speech communities and speech patterns bear meaningful information about social relationships, it is perhaps no surprise that their preferences about who to attend to and who to interact with are informed by speech. Newborn human infants have been shown to have an early preference for listening to speech over non-speech that has been compared to birds' predisposition to attend to the vocalizations of conspecifics. In particular, they have been shown to exhibit a preference for the sound of their mother's voice and for their native language (Gervain & Mehler, 2010). Infants are the recipients of many of their caretakers' utterances. But they also process many verbal exchanges from a third-person perspective and there is evidence that they understand very early on the role of speech in communicative interactions, of which they are not the recipient (Martin et al., 2012).

Not only do they discriminate speech from non-speech, but they also understand that speech serves a communicative function. Infants' social preferences are also highly informed by speech patterns, consistent with their using speech type as a cue to group membership. Six-month-olds display a preference for a speaker of their native language by looking reliably longer at a person whose speech was a regular sequence of words from their native tongue rather than at a person whose speech was a sequence of words from their native tongue played backwards. Same age infants have been shown to prefer to receive a toy from a speaker of their native tongue rather than from a speaker of a foreign language (Kinzler et al., 2007) or to reach for a toy held and manipulated by a speaker of their native tongue rather than a foreign speaker (Kinzler et al., 2012). Twelve-month-olds have been shown to prefer a piece of food toward which a speaker of their native language had displayed positive affect over food toward

which a speaker of a foreign language speaker has displayed either a negative of a positive affect (Shutts et al., 2009).

Accent is also likely to be a cue of group membership. Older five-year-old children have been shown to choose to be friends with native speakers of their native language rather than with foreign-language or foreign-accented speakers, when presented with photographs and voice recordings of novel children (Kinzler et al., 2009). Five-to-six-year-olds have also been shown to prefer foreign-accented and pro-social (or nice) agents over native-accented and anti-social (or mean) agents (Kinzler & DeJesus, 2013). Accent has also been shown to trump race in five-year-olds: in a similar paradigm, children robustly used native accent, rather than race, to guide their social preferences (Kinzler et al., 2009).

Incipient group cognition is likely to interact with natural pedagogy in human infancy along the following lines. Recall from Section 12.2 that the role of the polarity contrast in infants' preference for an upright face has been interpreted as a bias toward potential communicative partners (Farroni et al., 2005). In a recent study, Begus et al. (2016) used electroencephalography (EEG) techniques in eleven-month-olds to record so-called *theta* activity, a neural rhythm in the brain shown to index active and selective preparation for encoding information in adults. In one experiment, infants were familiarized with a pair of agents and a set of objects: the infants saw one agent (the informant) label the objects, while the other (non-informant) agent pointed to the objects without labeling them. In the second experiment, the infants saw the informant agent demonstrate the objects' functions, while the non-informant agent reached for the objects. In the third experiment, the infants saw one agent label objects in the infants' native tongue and the other agent label the same objects in a foreign language. At test, in the so-called anticipation phase, just before either agent interacted with objects, the experimenters recorded theta activity and found that it was reliably stronger when infants faced the informant agent from whom they were most likely to receive useful information rather than the non-informant agent. This finding suggests that very early on infants are cognitively attuned to selecting the right opportunities to learn from informative others.

Human adults and older children uniquely derive much of their knowledge of the world from the verbal testimony of others, which can be either truthful or not. While infants do not have much of a choice about whether or not to trust their caretakers, older children must learn to selectively allocate their trust to others. On the one hand, confronted with a pair of informants, one of whom systematically mislabeled familiar objects, most three-to-four-year-olds have been shown to reliably discard the testimony of even a reliable source if it conflicts with their own perceptual experience (Clément et al., 2004). In the same situation, four-year-olds have also been shown to prefer the reliable, over the unreliable, source's label in relation to unfamiliar objects (Clément et al., 2004). On the other hand, although young children understand the contrast between a benevolent and a malevolent agent, they find it quite hard to detect a straight lie that is addressed to them. For example, when their task was to infer the falsity of a speaker's utterance from their understanding of the speaker's deceptive intent, most four-year-olds have been shown to fail (Mascaro and Sperber, 2009).

In the studies reviewed so far showing how language is a cue to group membership, young children and infants were the recipients of linguistic communicative signals. Nine-month-olds, however, have also been shown to be able to infer social affiliation on the basis of third-party linguistic exchanges, according to

whether the partners spoke the same language or not (Liberman et al., 2017). Moreover, unlike other primates, humans seem to have uniquely multimodal imitative capacities, including especially the capacity for vocal imitation, without which human infants would be unlikely to learn a shared and arbitrary lexicon (Hauser et al., 2002). Thus, infants' understanding of imitation (or replicative behavior) has turned out to be a fruitful way to investigate their early understanding of third-party social affiliation.

In a first set of studies by Powell and Spelke (2013), seven- and eight-month-olds were shown to expect members of a group to act alike. Seven- and eight-month-olds were shown videos depicting two groups of identical geometrical objects with a pair of eyes, one comprised of three orange stars and the other comprised of three purple trapezoids. Infants were first familiarized to seeing members of each group perform a typical sequence of dancing motions and sounds. Before the test trials, two members of each group displayed a type of action distinctive of their group (either jump or slide) accompanied by a sound also distinctive of their group. In the test trials, each member of each group performed the same action: half the infants saw both agents perform the action distinctive of one group. Half saw both agents perform the action distinctive of the other group. Every member of the pair of agents seen by all the infants performed an action (jump or slide) either congruent with that of its group (consistent trial) or incongruent with that of its group (inconsistent trial). Infants looked reliably longer at inconsistent than at consistent trials. In a second set of studies by Powell and Spelke (2018), also involving geometrical objects, infants saw one agent replicate the behavior of members of one group of two individuals, but not the behavior of members of a second group of two individuals. Four-month-olds were more surprised and looked longer when the imitators approached and thereby affiliated with the group of agents that they had not imitated rather than those they had imitated. Infants did not have the converse expectation that the models would exhibit affiliative behavior toward the imitators. Powell and Spelke (2018) found that when presented with an imitator and a non-imitator, twelve-month-olds were significantly more likely to reach for the former than the latter.

To the extent that dominance is a fairly stable relation, members of a group must be able to keep track of dominance relations. In the familiarization trials of a study by Mascaro and Csibra (2012), twelve-month-olds saw a dominant agent prevail over a subordinate agent in a competitive situation. At test, infants were more surprised and looked longer when the expected subordinate agent was shown to prevail over the expected dominant agent. When they were familiarized to one sample of behavior displayed by one dominant agent over a subordinate, fifteen-month-olds (but not twelve-month-olds) were found to expect this pattern to generalize to other behavioral patterns involving the same agents. Infants were not shown to expect an agent who had already prevailed over one subordinate to prevail over a novel agent. Finally, fifteen-month-olds were familiarized to a transitive dominance relation involving three agents, such that B dominated A and C dominated B. The findings show that fifteen-month-olds did not extend their expectations of dominance to unobserved relationships (e.g., between C and A), even when they could have been established by transitive inference.

It has been recently argued that adult human psychology must include evolved cognitive mechanisms designed to garner support from other individuals, organize and maintain alliances, measure potential support from group members, and manage intergroup relations and

conflicts (Boyer, 2018; Tooby & Cosmides, 2010). Kurzban and colleagues have further argued that in adults the encoding of others' racial or ethnic features might be a by-product of the cognitive machinery that evolved to detect coalitional alliances (Cosmides et al.,; Kurzban et al., 2001). There is some evidence for early sensitivity to ethnic differences in young children and even in infants. For example, three-month-old infants, but not one-month-olds, have been shown to discriminate their own, more commonly encountered, race, from other, less encountered, races (Kelly et al., 2005). Much work has shown the importance of psychological essentialism in young human children, that is, the belief that members of a category share a deep underlying nature or essence in virtue of which they are, and are likely to remain, fundamentally similar to one another. Psychological essentialism in young human children has been well documented in the biological, mentalistic, and social cognitive domains. For example, young children have been shown to assume that all exemplars of a biological species share hidden features (cf. Atran, 1995; Carey, 1995; Hirschfeld, 1995b for discussion), all humans have minds and mental states (cf. Section 12.3), and all members of social groups exemplify some common social categories (e.g., profession or race) (Gelman & Hirschfeld, 1999). Some evidence shows that pre-schoolers reason about race even if they do not readily exploit visually encoded information about it (Hirschfeld, 1995a).

Much coalitional psychology comprises inferences about in- and out-group membership. In a set of studies by Jin and Baillargeon (2017), seventeen-month-olds gave evidence that they entertained an abstract expectation of in-group support. When they saw live events in which a woman needed instrumental assistance to achieve her goal, they expected another woman to provide the necessary assistance (and were surprised if the latter did not help the former), only if they were aware that the two women were members of the same minimal group (see Section 12.6 for further discussion). In a study by Pietraszewski and German (2013), four-to-five-year-olds have been shown to understand the significance of "indirect social consequences," whereby the consequences of an observed interaction between a pair of human agents may extend far beyond the two interacting individuals. For instance, only the victim of a physical aggression is likely to feel pain. Friends of the victim uninvolved in the interaction are not likely to feel the victim's physical pain. But both the victim and his uninvolved friends are likely to feel anger at the aggressor. Pietraszewski and German (2013) found that preschoolers expected an uninvolved individual to feel anger if their friend had been the victim of an aggression, but not dizziness if their friend had endured a dizziness-inducing event. But Pietraszewski and German (2013) also found an interesting difference between adults and preschoolers: preschoolers expected, but adults did not expect, uninvolved friends of the aggressor and uninvolved friends of the victim to be angry to the same degree.

12.6 Early Moral Cognition

Historically speaking, moral philosophy has preceded the psychological investigation of human moral cognition in human adults and human children. Moral philosophy was mostly devoted to semantic, ontological, and epistemological issues: Do moral thoughts and utterances have truth-conditions? Do moral values fit in a naturalistic (causal) picture of the world? Can there be knowledge of moral values?

Research into moral psychology (including developmental psychology) of the past fifty or

so years can be broken down along four dimensions: the contrast between a nativist and a non-nativist approach to the moral sense; the contrast between a rationalist and an emotivist approach to moral cognitive processes; the contrast between the capacity respectively for intuitive moral judgments and for moral justifications; and the role of cross-cultural studies of moral values for the study of human moral cognition.

Nativist views (e.g., Darwin, 1871) hold that humans' sense of morality is innately defined, be it innately good or innately evil. On the other hand, non-nativist views hold that our grasp of moral rules is a product of our experience with the world. For example, one popular non-nativist view was John Locke's empiricism (Locke, 1793) that claimed that children were essentially blank slates and only acquired their grasp of moral rules through experience provided by elders in their communities and households.

The second dimension along which we can categorize moral theories is the rational versus emotional divide. According to rationalist views (e.g., Kant, 1785), coming to understand and accept moral norms is the result of a rational or reason-based process. On the other hand, emotional views of morality (e.g., Hume, 1738) have claimed that our sense of right and wrong emerges primarily from our emotions and affective experiences (Buon et al., 2016).

The earliest work in cognitive psychology focusing on the development of morality (Kohlberg, 1976; Piaget, 1932) took a rationalist and non-nativist view of cognitive development. These theories asserted that moral understanding was "self-constructed." In other words, an understanding of moral norms is not given at birth, nor is it a product of mere learning from one's community. Instead children figure moral norms out for themselves, but only when they are capable of the appropriate forms of reasoning. The forms of reasoning that children are capable of are defined by various cognitive "stages."

The most influential "constructivist" view of moral development has been Kohlberg's (1976). Kohlberg's method was to present children with a narrated complex moral dilemma, for example, a husband steals a drug (which is wrong) in order to save his wife from cancer (which is right). Children are then asked to explain or justify their moral evaluation of the action. In the so-called pre-conventional stages of moral development, children were taken to reason only about consequences in deciding whether an action was right or wrong. So, for example, children might reason that stealing is wrong because they would get punished for it. Then around elementary school ages, children were taken to enter the so-called conventional stages in which they would reason from authority and normal behavior. So, for example, a child might reason that stealing is wrong because their teacher said it was wrong or because it is against the rules. One aspect of Kohlberg's view is that the child is expected to treat merely conventional rules (e.g., rules about what to wear to school) as moral rules: both are supposed to be processed as conventions using the same set of processes. Finally, in so-called post-conventional stages (which arrive after puberty), Kohlberg found that adolescents began to think for themselves about the underlying principles behind conventional rules, and he postulated that children were like ethicists capable of working out coherent ethical systems for themselves (Haidt, 2012). In these stages, children are taken to be capable of justifying a local dishonest act (e.g., stealing medicine) in pursuit of a higher good (e.g., saving a life).

This stage level view has been criticized on multiple grounds. First, children are often inconsistent in the types of responses they provide, and sometimes giving responses that span

four or more stages (Krebs & Denton, 2005). Moreover, even very young children sometimes showed responses that were compatible with those one would only expect to find in the most advanced stages. Thus, Kohlberg's stages turned out not to be as clear-cut as they were meant to be (Keil, 2014). Secondly, Kohlberg's theory has been criticized on cross-cultural grounds. His theory was meant to be a universal theory regarding the stages of development for moral thought. However, if one were to use Kohlberg's methods to assess non-Western populations, one would conclude that some never make it past the pre-conventional stages (Keil, 2014; Kurtines & Greif, 1974). Instead, Kohlberg's system appears to be systematically biased in favor of Western moral systems that place a high priority on fairness, preventing harm, and the ability to question authority at the expense of loyalty, respect for authority, and purity, which have been shown to be important values in some cultures.

Thirdly, Kohlberg's system can be criticized on methodological grounds. Essentially Kohlberg's method assesses children's developing capacity to verbally justify and explain their own moral evaluations prompted by reflection on complex moral dilemmas, not their intuitive moral judgments. The main scientific question is the extent to which young human children's capacity for moral evaluation of human social interactions are correctly appraised by tasks that require them to verbally justify and explain their moral judgments. Recent developmental work in both social and non-social cognitive domains strongly suggests that the moral cognitive capacities of young human children (including preverbal infants) might be under-estimated by focusing on verbal tasks of justification.

A new fundamental step was taken by Turiel (1983; Turiel et al., 1987), who developed a verbal technique that bypassed some of these methodological problems by describing a scenario and asking young children simple "yes/no" questions (instead of asking them to generate complex explanations and justifications). Using this technique, Turiel et al. observed that, contrary to what Piaget and Kohlberg claimed, young children (as young as five years old) reason differently about moral norms and mere conventions. For example, children were told a story about another child going to school wearing pajamas whereas the school requires children to wear a uniform. Children were first asked: "Was it ok for the boy to do what he did?" Most children responded "No." Secondly, children were probed with a follow-up question: "What if the teacher said it was OK for the boy to wear pajamas? Would it be ok then?" Most answered "Yes." Finally, they were asked: "What if the boy were to wear pajamas in another school where this was allowed? Would it be ok then?" Most children also answered "Yes." Thus, children who respond in this way recognize that rules regarding clothing are mere social conventions. If, however, the questions were about harming others (as opposed to wearing clothes) and even if an adult says it is ok or if harming others is tolerated in a specific school, children judge that the harming is wrong. Thus, contrarily to what Kohlberg and Piaget postulated, children actually do treat conventional norms in a categorically different way from truly moral norms (where "moral" for Turiel et al. was operationally defined as "relating to harm").

So Turiel et al.'s methods illustrated major shortcomings in the more traditional psychological method based on assessing children's moral development by requesting them to offer verbal explanations and justifications of their moral evaluations. Nevertheless, this approach can still be criticized on two grounds (Haidt, 2012). First, like Kohlberg, the theory of human morality that emerged from this work appears to be biased toward secular

Western moral systems that place a high priority on preventing harm at the expense of other moral norms. Empirical psychological work on human moral cognition should take into account a wide range of moral values spread across different cultural and religious systems. These include things like respect for authority, patriotism, loyalty to family, honor, and purity. Consider for example the Hua of New Guinea who have a system of elaborate taboos pertaining to what men and women can eat (Haidt, 2012), These taboos stem from notions of bodily purity, which the Hua take to be moral (not conventional) rules that form the basis of judgments about others, duties, and relationships. Turiel et al., however, would classify these as mere social norms because food taboos do not relate to harm.

Secondly, despite the fact that Turiel et al.'s methods seem to be an improvement on Kohlberg's, they still fall short in the sense that they are meant to measure explicit, reason-based forms of morality. While explicit moral systems and deep reflection certainly plays a role in full mature moral thinking, more recent work has shown that the capacity for simple moral judgments might be dissociated from the capacity for higher-order moral justifications. In particular, "moral dumbfounding" scenarios (Haidt, 2001;[1] though see Royzman et al., 2015 for a critique) illustrate cases where people have an intuitive moral sense that some action is right or wrong, but in which they lack (and often come to recognize that they lack) good reasons to justify these moral judgments.

Consider the scenario from Figure 12.1, which is an example of an act that violates a conventional and harmless taboo, that is, taboo by a conventional norm but involves no harm to either actor in the event. Participants would read a passage like this, and were then required to judge whether the action was acceptable. In the story in Figure 12.1, most (though not all) participants indicated that it was not acceptable for the brother and sister to make love. Participants would then be asked to justify why they thought it was wrong. People might then, for example, respond that if a pregnancy results from an incest, then the kid will likely be handicapped or deformed. At this point, the experimenter would push back and remind the participant that the couple took extra precautions to avoid a pregnancy, making it nearly impossible for the sister to become pregnant. In a similar fashion, the experimenter was able to "defeat" many other reasons provided by the participant until, ultimately, they were left with no good explanation as to why the act was not acceptable. But even in such circumstances, most participants still clung to the judgment that the act was wrong. These results thus show that moral intuitions (at least in some cases) fall short of, and precede, moral justifications and rationalizations. Haidt et al. (unpublished, see fn. 1) famously called "moral dumbfounding" the phenomenon whereby human adults are shown to have strong moral intuitions for which they cannot offer adequate justifications. According to Haidt and colleagues, these intuitions stem from certain categories of acts relating to the basic moral foundations of harm, fairness, loyalty, authority, and purity eliciting specific types of emotion (such as disgust), which serve to create moral intuitions.

On the basis of moral dumbfounding, Haidt (2001) put forward an influential "social intuitionist" model of moral reasoning in human adults, according to which intuitive moral judgments are mostly driven by emotional responses to a situation and the basic purpose of moral reasoning is to justify intuitive moral

[1] See also, Haidt, J., Björklund, F., & Murphy, S. (2000). Moral Dumbfounding: When Intuition Finds no Reason. Unpublished Manuscript.

Moral Dilemma (Incest)

Julie and Mark are brother and sister. They are travelling together in France on summer vacation from college. One night, they are staying alone in a cabin near the beach. They decide it would be interesting and fun if they tried making love. At the very least it would be a new experience for each of them. Julie was already taking birth control pills, but Mark uses a condom too just to be safe. They both enjoy making love, but they decide not to do it again. They keep that night as a special secret, which makes them feel even closer to each other. What do you think about that? Was it ok for them to make love?

Haidt, 2001

Figure 12.1 Example of a moral dilemma used by Haidt and colleagues in their "moral dumbfounding" experiments. Participants insist in upholding the taboo without being able to produce clear rational arguments for doing so, suggesting that intuitions play a larger role in our moral faculty than Kohlberg and others have argued

judgments. Haidt's work was very influential in that it helped spur a paradigm shift in developmental psychology, as more and more attention turned to the origins of moral intuitions in development. One clear example is the work of Hamlin et al., (2007). In this study the experimenters presented six- and ten-month-old infants with a social scenario involving an agent (in the form of a simple geometric object with eyes) trying to get up a hill. The agent could be either helped up the hill by a "helper" or, in other conditions, prevented from going up the hill by a "hinderer." The authors found that, after habituation to such scenes, infants preferred to grab a helper over a neutral character but preferred the neutral character to hinderers, and they also directly preferred to play with a helper over a hinderer. Subsequent studies have replicated and extended these findings using different types of displays and agent goals (e.g., trying to open a box instead of trying to get up a hill; Hamlin & Wynn, 2012; though see Salvadori et al., 2015 for a non-replication in a similar experimental paradigm), and on a younger age group, with infants preferring helpers at three-months in a looking preference paradigm.

These results could be interpreted as showing that pre-verbal infants possess moral intuitions that guide the evaluation of certain social scenarios. Crucially in many of Hamlin's experiments (e.g. Hamlin et al., 2007), the results cannot be explained merely in terms of infant preferences for certain types of causal outcomes or interactions, as Piaget or Kohlberg might have predicted. This is due to the fact that the experimenters were careful to compare infants' looking time patterns in virtually identical "non-social" situations in which the helpers or hinderers moved and looked like simple inanimate objects. In these conditions, infant failed to prefer the inanimate objects that facilitated or prevented the main character from making their way up the hill. This detail is important because it suggests that the best explanation of the primary results is that infants evaluate the relationship between the agent's goals (i.e., to go up the hill) and the actions of the helpers or hinderers instead of merely focusing on purely causal (i.e. non-social) outcomes. In short, findings by Hamlin and colleagues about early infants' preferences for helpers over hinderers provides evidence that infants have an early sensitivity

to harmful agents on the assumption that to prevent an agent to achieve her goal is to harm the agent.

Much further work on adults' responses to harmful actions has focused on the so-called trolley dilemmas, in which participants are asked whether it is licit to flip a switch to divert a trolley so as to sacrifice one individual for the sake of saving five. Findings in this paradigm have been interpreted as evidence for a two-systems approach to human moral cognition: while one so-called deontological system is taken to deliver emotional responses, the other system is taken to deliver utilitarian responses (Cushman et al., 2006; Greene et al., 2004; Mikhail, 2007). One robust finding in the developmental investigation of children's evaluation of harmful actions (between the ages of three and eight) has also been taken as evidence for the presence of a two-systems approach to children's moral cognition. Young children have been consistently shown to primarily attend to the causal role of harmful agents and to condemn agents that cause harm on the basis of the negative outcome of the agent's action. It takes time before children can take into account the agent's intention for the purpose of drawing relevant distinctions between intended harm, accidental harm, and attempted harm, and become able to both exculpate accidental harmful agents and to blame agents of merely attempted harmful actions. These findings have been taken as evidence for the dissociability between an early-emerging system for evaluating harm, on the basis of the agent's causal role, and a later-emerging system for evaluating harm based on the agent's intent (cf. Buon et al., 2013; Cushman et al., 2013).

Other, more recent work, has focused on other foundations. Buyukozer Dawkins et al. (2019) found that, in very simple contexts, nine-month-old infants expected an equal distribution of desirable resources (e.g., cookies) amongst similar characters, suggestion a precursor to the Haidtian foundation of fairness and equality. Bian et al. (2018) found, however, that these expectations were mitigated in one and a half-to-two and a half-year-olds by "in-group"/"out-group" affiliation. Thus, when an unequal amount of resources were present, toddlers expected that a character would give out a greater number to a member of their own group (as indicated by the puppets being the same or different kind of animal) than to a member of a different group (see also Jin & Baillargeon, 2017 for related findings). A number of papers also suggest that, just as infants expect others to show an in-group preference, they themselves prefer members of their own social group (Kelly et al., 2005; Kinzler et al., 2007).

12.7 Concluding Remarks

In the following concluding remarks, we briefly reflect on three outstanding issues raised by the recent experimental investigation of early human social cognition. First, it is controversial to what extent early social cognition is shaped by imitation and the activity of mirror neurons. Second, we shall reflect on the puzzle of the discrepant developmental findings about false-belief understanding and theory of mind in human childhood. Finally, we shall consider the puzzling developmental discrepancy between infants' moral intuitions and the immoral behavior of older children.

12.7.1 Imitation

In several influential papers, Meltzoff (2002, 2005, 2007) has proposed that imitation is a central mechanism for the development of early social cognition, including empathy and

theory of mind. Broadly speaking, imitation involves the topographic resemblance between a model's observed behavior and the imitator's. But this topographic resemblance may be unobservable to the imitator who can rarely see her own relevant bodily parts (Heyes, 2018). On behalf of his "Like-me" framework, Meltzoff (2005, 2007) has suggested that infants are innately prepared to imitate others' actions, that mirror neuron activity underlies infants' imitative capacities, which in turn promote children's understanding of other minds. However, "imitation" does not refer to a single psychological mechanism. As a result, Meltzoff's influential framework raises at least three kinds of intriguing problems.

First of all, newborns' imitation is arguably best construed as a case of automatic motor mimicry (or contagion), not as the intentional replication of adults' facial expressions. But as discussed in detail in Section 12.1, the recent huge longitudinal study by Oostenbroek et al. (2016) has cast doubts on Meltzoff's hypothesis that human infants might be innately wired for imitation. Of the eleven movements demonstrated by adults to be replicated by infants, only tongue protrusion stood out as a possible candidate for infant imitation. It is presently an open question whether infants stick out their tongue as a specific imitative response or else in response to a wide range of arousing stimuli (for a response to Oostenbroek et al., 2016, see Meltzoff et al., 2018).

Secondly, Meltzoff's and Moore's (1977, 1983) reports of neonatal imitation of facial gestures have been taken as evidence for mirror neuron activity in newborns. However, the major problem for this hypothesis is that mirror neurons were first discovered in the brains of non-human primates and overt imitative behavior is far less common among non-human primates than among humans. Nonhuman primates are widely taken to understand and emulate others' goals but rarely to faithfully replicate the exact action-means by which the agent achieved her goal (Tomasello, 2008).

Finally, while this is consistent with the view that mirror neurons in monkeys code an agent's goal (Rizzolatti & Sinigaglia, 2010), it undermines the hypothesis that mirror neuron activity is the neural basis of human imitative learning, that is, learning a new behavior from seeing another perform it. After being ostensively greeted by an adult model, human toddlers have been shown to emulate the model's goal when the efficiency of the model's action was manifest and to faithfully reproduce an agent's inefficient motor sequence when the teleological structure of the model's action was opaque (cf. Section 12.5). Thus, the capacity for ostensive communicative interactions, not mirror neuron activity, seems to underlie the faithful replication of a model's motor sequence, which in turn is central to human imitative learning (e.g., the cultural transmission of artistic skills). In short, whatever the strength of the evidence for automatic mimicry of facial expressions in newborns, there is a gap between it and the kind of imitative learning in toddlers, children, and adults that matters primarily for human cultural transmission.

12.7.2 Theory of Mind

We turn to the outstanding puzzle of the discrepant developmental findings about false-belief understanding, that is, the capacity to attribute true and false beliefs to others, in human childhood. In a nutshell, most preschoolers have been shown to fail verbal false-belief tests and point to the toy's actual location when asked to predict a mistaken agent's action. But findings based on non-

verbal tests have been taken to show that preverbal infants expect an agent to act in accordance with the content of her true or false belief about an object's location.[2]

How to reconcile these discrepant developmental findings? The following crucial dilemma arises: do findings based on non-verbal false-belief tests provide sufficient evidence for genuine false-belief attribution, and hence for theory-of-mind, in human infancy? Or else, is success on verbal false-belief tasks necessary? Furthermore, if findings based on non-verbal tests do not reflect genuine false-belief attribution, then how should infants' responses to these tests be interpreted?

Whereas most psychologists agree that success on verbal false-belief tasks counts as evidence for genuine false-belief attribution, many find it ludicrous that preverbal infants might be able to attribute mental states (including false beliefs) to others. Their main burden is to explain the infant data by appealing to non-mentalistic processes. They have appealed to three-way associations, behavioral rules (e.g., Perner & Ruffman, 2005), and perceptual novelty (Heyes, 2014). According to another alternative, the "two-systems" approach, a minimal, efficient, but inflexible mindreading system enables infants to attribute registrations, which are not genuine beliefs, but belief-like states. Minimal mindreading is taken to be sufficient to account for the infant data. The more flexible full-blown mindreading system, which develops later, is taken to be necessary for success on verbal false-belief tests (Apperly & Butterfill, 2009). According to a recent so-called altercentric proposal, if an agent is present, infants in their first year spontaneously encode events, not from their own perspective, but from this agent's perspective (Southgate, 2020). This is in line with the suggestion by Kampis et al. (2013), based on their findings, that ten-month-olds may represent an agent's belief without attributing it to anyone. This suggests that the capacity to represent the content of an agent's belief may precede the full mindreading capacity to attribute beliefs to others.

Given that understanding the question asked by the experimenter is necessary for success on verbal false-belief tasks, false-belief-attribution cannot in and of itself be sufficient for success on verbal false-belief tasks. If so, then success on verbal false-belief tasks cannot be necessary for false-belief attribution. Following this line of thought, several psychologists have proposed to try and reconcile the discrepant developmental findings on the assumption that findings based on non-verbal tests provide evidence that infants can attribute genuine false-beliefs to others. Their main burden is to explain why verbal false-belief tasks are so challenging for preschoolers (see Chapter 11).

One possible explanation is the pragmatic account: in verbal false-belief tasks, not only are the children directly asked to predict the mistaken agent's likely action, but they are also provided with information that is ostensively communicated to them by the experimenter. To the extent that this information is ostensively communicated to them, children are likely to take it as relevant to answering the prediction question. But not all of this information is actually relevant to this task: in particular, the fact that Anne moves Sally's marble from the basket (where Sally placed it) to the box is irrelevant to predicting where Sally will look for her marble when she returns. The only relevant information is where Sally last placed her marble: this is

[2] Some recent studies have cast doubt on the replicability of some of the earlier results based on non-verbal false-belief tests (e.g., Dörrenberg et al., 2018). Further investigation is needed to explore the possible sources of the failure to replicate some of the non-verbal false-belief tests.

where she will look for it when she returns, whatever happened to the marble after she left the room. One possible way children may try to make the irrelevant information about the marble's actual location relevant is by turning the prediction question into the normative question "where should Sally look for her marble?" The correct answer to this normative question is the marble's actual location, which is where most preschoolers point to in response to the experimenter's question.

Further progress into the developmental investigation of mindreading is likely to emerge from the combination of three complementary sources: the investigation of phylogenetic precursors of the full human mindreading capacity in non-human primates; the potential role of social, linguistic, and cultural inputs to the ontogenetic development of mindreading in human children; and the application of non-intrusive brain imaging methods to human infants' brains.

12.7.3 Moral Competence and Immoral Behavior

Some fifty years ago the developmental investigation of moral cognition in the hands of Piaget and Kohlberg focused mostly on children's capacity to justify moral judgments at the expense of early moral intuitions. Until recently, most developmental psychologists took it for granted that moral competence is laboriously taught to naïve children by knowledgeable adults via a process of enculturation supported by language acquisition.

New experimental methods (based in particular on infants' looking time) have shown not only that preverbal infants and toddlers have robust moral intuitions about third-party harmful interactions and unfair allocation of resources, but also that they strongly prefer an agent who helped another achieve her goal rather than one who interfered with another's goal (Hamlin, 2013; Hamlin et al., 2013; Kuhlmeier et al., 2003; Premack & Premack, 1997; Sloane et al., 2012).

However, it takes several years before children exhibit a moral behavior that is congruent with the moral competence displayed by infants' evaluation of others' social interactions. Young children have been shown to dislike receiving less than others, but not to mind others' receiving less than themselves. They have been shown to be willing to undertake costly actions in order to avoid such relative disadvantages for themselves. Furthermore, while three-year-olds have been shown not to be willing to share resources equally with other children, most five-year-olds have been shown to select a spiteful distribution over a fair distribution and only most nine-year-olds have been shown to share equally with others and to select a fair distribution (Sheshkin et al., 2014).

Sheskin et al. (2014) have recently argued that so-called life-history theory (an evolutionary approach to the costs and benefits of social cognition and behavior) sheds light on the discrepancy between infants' moral competence and children's immoral behavior. The basic assumption of life-history theory is that moral competence and moral behavior have different cost-benefit trade-offs. Arguably, the capacity for the moral evaluation of others' behavior is free from motivational costs. If so, then natural selection may have favored individuals who had early capacity for socially evaluating others. However, engaging in moral behavior is motivationally costly in the sense that any behavior requires some motivation. Furthermore, as argued by Baumard et al. (2013), moral behavior can be beneficial to an individual when the short-term costs of performing moral (e.g., altruistic) acts are outweighted by the long-term benefits derivable from mutualistic cooperation with others. In particular, in a relatively free market of

cooperating partners, people are likely to select partners on the basis of their moral reputation, which in turn reflects their past moral behavior. Human life-history is characterized by an extended period of juvenile dependence restricted to resource transfers from kin. Only late in development do humans cooperate with non-kin. Only then does moral reputation become a relevant factor in partner selection for mutualistic interactions.

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