CHAPTER FOUR

Social Cognition and Social Motivations in Infancy

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Humans build skyscrapers, play in symphony orchestras, use money, and show each other their vacation photos. They have thousands of different languages, participate in countless cultural rituals and practices, and attach much importance to the latest fads and fashions. Other animals, including our nearest primate relatives, chimpanzees, do none of these things. Why not? What do all of them have in common? There is something special about human social cognition – what is it?

We propose that this “something special” is shared intentionality, the skills and motivation to share goals, intentions, and other psychological states with others (Tomasello, Carpenter, Call, Behne, & Moll, 2005). Shared intentionality is what enables humans (and only humans) to engage in collaborative activities, to share experiences with each other, and to create cultural practices and institutions together. In this chapter I take a close look at human social cognition to show (a) where it is different from the social cognition of other animals and (b) by when in development this difference is apparent.

To do this we must consider social cognition from two different perspectives. First, there is social cognition, or cognition about one’s social partners. Of particular interest here is cognition about others’ cognition, especially what others want, intend, know, and believe. The other side to social cognition is social cognition, in the sense of joint cognition: one’s ability to participate in shared cognition and activities with social partners. The two sides to social cognition are related, of course – one cannot engage in any complex way with others socially without understanding something about their minds. But they are also clearly separable, as we will see below when we compare humans’ social cognition with that of apes. Furthermore, along with considering social cognition from these two perspectives, in order to get at the “something special” in humans we must also look beyond social cognition and consider social motivations, in particular the motivation to share psychological states like goals and attention with others, as well as the more general motivation to align oneself with others, and do things the way others do.
I discuss each of these three areas in turn. I start with social cognition, the understanding of others' psychological states, to make the point that infants and apes are not so different in this regard at all. I then show how a uniquely human motivation to share psychological states with others enables infants to participate in social cognition, for example joint attention, a special type of communication, and joint collaborative activities with others. Then I discuss evidence that infants and young children have the more general motivation to communicate to others that they are like them, and to conform to the way that "we" do things -- a key factor in the development of conventional practices and social norms. In each section I first review findings on human infants and then mention briefly what is known about chimpanzees and other apes. I conclude with some suggestions for future research in this area.

Social Cognition: Understanding of Others' Psychological States

One of the most active fields in developmental psychology in the last few decades has been the study of what infants and young children understand about others' minds. Historically, the general consensus was that children younger than 3-5 years of age did not understand much about mental states such as intentions, knowledge, and beliefs (e.g., Wimmer, Perner, & Perner, 1988; Wimmer & Perner, 1983). But recent advances in the design of novel, non-verbal tasks more suitable for younger children have resulted in quite a different developmental picture. These new studies suggest that the age estimates of the previous studies were off by several years -- that infants as young as 1 year of age already understand others as possessing a variety of psychological states, including goals and intentions, perception and attention, knowledge/ignorance, and even false beliefs. (Note that there were those who spoke of "theory of mind" in infants, based on natural observations of infants in social interactions, but at the time there were few positive results from experimental studies to support these claims; see, e.g., Bretherton, McNew, & Beeghly-Smith, 1981; Trevarthen, 1979.) I will briefly review some of the new experimental evidence here.

Understanding of others' goals and intentions

There are now quite a few studies that show that 1-year-old (and even younger) infants understand something about the goals underlying others' actions. The most convincing evidence comes from tasks involving failed attempts and accidents, because in those tasks there is a mismatch between the actor's goal and her behavior so infants cannot simply use observable surface behavior instead of mental goals to succeed. For example, 9-month-old and older infants respond more patiently when an adult social partner is unable to give them a toy (due to failed attempts or accidents) than when she is unwilling to give them a toy (Behne, Carpenter, Call, & Tomasello, 2005). Younger infants -- 6-month-olds -- respond actively in Behne and colleagues' test but do so indiscriminately, without regard for the adult's differing goals. Similarly, in imitation tasks in which a model
demonstrates a failed attempt, 15- and 18-month-old infants produce the action the model meant to perform instead of the action she actually did perform (Johnson, Booth, & O’Hearn, 2001; Melzoff, 1995). And 14- to 18-month-olds are more likely to copy others’ intentional actions than their accidental actions (Carpenter, Akhtar, & Tomasello, 1998; Olineck & Poulain-Dubois, 2005).

Along with an understanding of others’ goals, infants around this age may also have some understanding of others’ intentions: the means or plans for action others choose to use to achieve their goals (and why they have chosen those particular means). For example, 12- and 14-month-old infants imitate an unusual action more often when the actor freely chose to use that action than when she was forced to use the action by some constraint (Gergely, Bekkering, & Király, 2002; Schwier, van Maanen, Carpenter, & Tomasello, 2006). Tomasello et al. (2005) have taken these results as evidence that 1-year-old infants see others’ behavior as governed by rational choices of action plans (intentions) that take into account the situation and the constraints on the actor.

Thus, by 9 months of age infants do not just perceive others’ bodily motions on a surface level; instead they see others as persisting past failed attempts and accidents to achieve their goals. By 12 months of age, infants in addition are beginning to understand others’ intentions, seeing others as choosing action plans for accomplishing their goals rationally in particular contexts.

Understanding of others’ perception and attention

There are many studies showing that infants can follow others’ gaze (see the chapters in Flom, Lee, & Muir, 2007, for recent reviews). However, as there is some doubt about whether the ability to follow gaze necessarily requires any understanding of others’ psychological states – adult head turns could instead simply become associated with interesting sights in that direction over time (Moore & Corkum, 1994) – it is important to note that some recent findings suggest that infants do have some understanding that the adult whose gaze they are following actually sees something. For example, if an adult looks at something that infants cannot see because from their perspective it is behind a barrier, by 12 months of age infants will locomote to a new position so that they can see what the adult sees (Moll & Tomasello, 2004). By 14 months, infants have some understanding of the mechanisms of perception, that is, that people’s eyes must be open and oriented toward things, with an unobstructed line of sight, in order for them to see things (Brooks & Melzoff, 2002; Caron, Butler, & Brooks, 2002; Dunphy-Leli & Wellman, 2004).

Along with an understanding of others’ perception, infants around this age also apparently have some understanding of others’ attention, the ability to focus on just one part of all the things in one’s visual field. For example, if an adult gesture ambiguous toward three objects together on a tray, 12-month-olds can determine which one of the three objects the adult is attending (and referring) to based on the experiences the adult has previously had with each of the three objects (Tomasello & Haberl, 2003). Older infants can even determine whether an adult is focusing on an object as a whole versus on some particular aspect of that object, again based on the adult’s prior experience with that object (Moll, Koring, Carpenter, & Tomasello, 2006).
Understanding of others’ knowledge/ignorance

Twelve-month-old infants understand not just what others can see at the moment; they also understand something about what others have and have not seen or experienced in the past: their knowledge/ignorance. For example, 12-month-olds helpfully point out the location of a fallen object more often to an adult when the adult is ignorant about the object’s location (she had not previously seen it fall) than when the adult is knowledgeable about the object’s location (she had previously seen it fall; Liszkowski, Carpenter, & Tomasello, 2008). In some circumstances (see Moll & Tomasello, 2007), 12- and 14-month-olds can also keep track of which objects are known versus unknown to an adult in the sense of being familiar or not to her (i.e., experienced or not by her in the past; Tomasello & Haberl, 2003).

Understanding of others’ false beliefs

Despite decades of research that consistently found no evidence of false-belief understanding in children under around 4 years of age (see Wellman, Cross, & Watson, 2001, for a meta-analysis), we now have evidence that even 1-year-old infants may understand something about others’ false beliefs. The first studies of infants’ understanding of false beliefs used infants’ looking time to different displays as a measure of their understanding. For example, after an object’s location was switched unknowingly to a protagonist, 15-month-old infants looked longer when the protagonist searched for the object in the new location than in the old location, where she had seen it placed originally (e.g., Onishi & Baillargeon, 2005; see also Song, Onishi, Baillargeon, & Fisher, 2008; Surian, Caldi, & Sperber, 2007). More recent evidence suggests that infants can also actively use this understanding to make sense of adults’ actions in real social interactions: by 16–18 months, infants can use an adult’s true or false belief about the contents of a box to determine what the adult needs help with when he struggles unsuccessfully to open the box (Buttelmann, Carpenter, & Tomasello, in press).

By around their first birthdays, infants thus show evidence of having some understanding of a variety of psychological states in others, from goals and intentions to perception, attention, knowledge, and even false beliefs. But, perhaps surprisingly, we now have evidence that apes understand many of these psychological states as well. They understand others’ goals and intentions (e.g., Buttelmann, Carpenter, Call, & Tomasello, 2007, 2008; Call, Hare, Carpenter, & Tomasello, 2004; Call & Tomasello, 1998), others’ perception (e.g., Bräuer, Call, & Tomasello, 2005; Kaminski, Call, & Tomasello, 2004; Tomasello, Hare, & Agnetta, 1999), and others’ knowledge/ignorance (e.g., Hare, Call, & Tomasello, 2001; Kaminski, Call, & Tomasello, 2008). However, they may have more difficulty understanding others’ focus of attention (Tomasello & Carpenter, 2005) and false beliefs (e.g., Call & Tomasello, 1999; Kaminski et al., 2008 – although see Krachun, Carpenter, Call, & Tomasello, in press, for possible, weak evidence of some implicit understanding of false beliefs in chimpanzees).

Thus, apes, like infants, understand a variety of psychological states in others. Understanding others’ goals, intentions, perception, and knowledge allows apes to engage
in some complex social reasoning and interactions, as, in many cases, it enables them to explain others’ behavior and even to predict what others will do in novel situations. It allows them to compete with, deceive, and even help others (e.g., Hare et al., 2001; Warneken & Tomasello, 2006; Whiten & Byrne, 1988). But alone it is not enough to enable them to participate in activities involving shared intentionality, for example, truly collaborative activities with joint goals and intentions, or sharing attention, attitudes, and experiences with others in joint attentional engagement. Humans are able to join forces with and align themselves with others in these ways, even as 1-year-old infants. What makes the difference is the motivation to share psychological states such as goals and attention with others. Now we get to the unique aspects of human social cognition.

Social Cognition and the Motivation to Share Psychological States with Others

Tomasello et al. (2005) proposed that the capacity for shared intentionality is a result of the interaction of two lines of development: infants’ developing understanding of others’ psychological states and their uniquely human motivation to share those psychological states with others. That is, the motivation to share psychological states with others transforms whatever social-cognitive understanding and skills infants have at any given age into a special, shared version of that understanding and its resulting skills: if infants understand others’ emotions, they will be able and motivated to share emotions with others; if they understand others’ goals, they will be able and motivated to share goals with others in joint action; and if they understand others’ attention, they will be able and motivated to engage in joint attention. Next I will discuss three of the most important social-cognitive skills human infants acquire: joint attention, a special type of communication, and collaboration. These early-emerging skills are the foundation for most of human cultural cognition and are themselves unique to humans. For each skill, I will focus on recent studies that were designed to test the idea that infants are truly sharing psychological states with others against leaner, more egocentric explanations of the same behaviors.

Sharing attention and attitudes in joint attentional engagement

The motivation to share psychological states and activities with others is already evident very early in infancy in the delight with which young babies participate in face-to-face social interactions with their caregivers (e.g., Trevarthen, 1980). Somewhat later, by age 9 months, infants start coordinating their attention with others to objects of mutual interest outside the dyad, in joint attentional interactions (e.g., Bakeman & Adamson, 1984; Carpenter, Nagell, & Tomasello, 1998; Trevarthen & Hubley, 1978). The motivation to engage in joint attention is so strong that infants voluntarily turn away from interesting sights to engage in it – to “comment” to their partner on the sight or actively draw her attention to it so they can attend to it together.
Figure 4.1  Sequential frames from a video of a 9-month-old initiating joint attention with his mother: (a) he watches as his mother makes a rubber duck squeak; (b) he smiles at the sound of the duck.

Figure 4.1  (c) and (d) he looks to his mother's face to share attention and interest with her.

By 12 months of age, infants align their attention and attitudes with those of others in at least three ways. They look to others' faces to communicate that they are sharing attention, as in figure 4.1 (joint attentional engagement); they follow into others' focus of attention (gaze and point following); and they actively direct others to follow into their own focus of attention with communicative gestures (declarative showing and pointing) (Carpenter, Akhtar, et al., 1998). They thus seek to align themselves with others in both directions, by following into and directing others' attention. What makes all three types of behavior joint attention is that infant and adult know together that they are sharing
attention and attitudes (Tomasello, 1995). Since this “knowing together” is crucial, but is a difficult thing to observe, there have been several studies to find out whether already around 1 year of age infants truly share attention in this way. I will review one set of such studies here, and another in the next section on communication.

Infants begin pointing “declaratively” around 12 months of age (e.g., Carpenter, Akhtar, et al., 1998). Most researchers see this behavior as a clear indication of infants’ desire to share attention and interest about objects with a social partner. A leaner view, however, is that 12-month-olds do not point to share attention and interest but rather point for more egocentric reasons, simply to gain rewarding positive emotions to the self (Moore & D’Entremont, 2001). To test the rich against the lean view experimentally, Liszkowski, Carpenter, Henning, Striano, and Tomasello (2004) elicited declarative points from 12-month-old infants by having a series of puppets appear and move around from behind a screen at the far side of the room. We then manipulated the experimenter’s reaction to infants’ points to the puppets to test four different hypotheses about why infants point in this situation. To test the rich view that infants point to share attention and interest, in one condition the adult reacted by engaging in joint attention with infants about the object (i.e., alternating gaze between infants and the object and commenting about the object interestingly). To test Moore and colleagues’ view that infants simply want the adult’s attention and emotions on themselves, in another condition the adult responded with positive emotion just to infants (ignoring the object). And to test the other possibilities that infants just wanted the adult to look at the object, or wanted nothing at all from the adult and were simply pointing for themselves, in two other conditions the adult reacted by just looking at the object, or by ignoring infants’ point. Infants’ different patterns of responding across conditions indicated that they were only satisfied with the adult’s response in the joint attention condition: when she reacted in any other way, infants were more likely to repeat their point to the object within a trial, and to stop pointing altogether across trials. Their point was an invitation to share attention to the object.

A further study by Liszkowski, Carpenter, and Tomasello (2007b) supports this interpretation by showing that it is important to infants both that the adult shares attention to the specific referent they are pointing to – not to some other random object in that general direction – and also that the adult shares their own attitude of interest to that object. In that study, if the adult misunderstood the referent of infants’ point and “shared” to a different object nearby, infants repeated their point to the original referent. If the adult reacted in an uninterested way, infants stopped pointing altogether. Evidence that all this takes place on a mental level, about mutually imagined objects, comes from the finding that 12-month-old infants can point declaratively about absent referents – objects that were previously present but which have now disappeared – and that they do so selectively depending both on whether the adult knew about (had previously seen) the objects and how she had previously reacted to them (Liszkowski, Carpenter, & Tomasello, 2007a).

Apes do not share attention and interest with others in joint attentional engagement (e.g., Bard & Vauclair, 1984; Tomasello & Carpenter, 2005; Tomonaga et al., 2004), and they do not gesture declaratively to point out interesting objects or events for others (e.g., Gómez, Sarriá, & Tamarit, 1993; Tomasello & Carpenter, 2005). (They also do not point to make reference to absent referents, even imperatively; Liszkowski, Schäfer,
Carpenter, & Tomasello, in press.) They do follow others’ gaze (e.g., Bräuer et al., 2005). However, although gaze following is often called “joint visual attention,” it does not have to involve any “jointness” – any real coordination of attention – at all. Instead, it can be done in an exploitative manner, with the looker not even being aware that someone is following his gaze. In this type of gaze following, looker and follower end up looking at the same object but they do not necessarily know together that they are doing this. It can be difficult to distinguish between these two possibilities in gaze following but since apes do not participate in the other two types of joint attention at all we think it likely that gaze following reflects apes’ desire to see what others see, not to see what others see and know this together. Thus, whereas already by their first birthdays infants show three different types of joint attentional behavior, there is little if any evidence of true joint attention in apes.

Use of shared experience in communication

Clark (1996) has pointed out that language is a type of joint action, one which relies on the common ground or knowledge the speaker and listener share in order to succeed. We would argue that the same can be said about prelinguistic communication as well, at least by 12–14 months of age – that human communication even in infancy is based on shared intentionality (Tomasello, Carpenter, & Liszkowski, 2007; Tomasello, 2008). The best evidence comes from infants’ comprehension and production of the pointing gesture. For instance, by 14 months of age, when an adult points for infants, infants do not simply follow the point and make their own conclusions as to what the adult is trying to tell them based on whatever happens to grab their attention there. Instead, they take the adult as trying to tell them something relevant to their shared experience or common ground. For example, in one study, Liebal, Behne, Carpenter, and Tomasello (2009) had 14-month-old infants share a cleaning-up game with one adult, E1 (i.e., they threw a series of objects into a basket together), then that adult pointed to another target object and simply said, “There!” Infants picked up that object and threw it into the basket as well, apparently seeing E1’s point as related to their joint activity. Infants’ responses in a control condition ruled out the possibility that infants were responding egocentrically, based on what they themselves were doing, instead of what they were doing jointly with E1. In this condition, infants participated in the cleaning-up game with E1, exactly as before, but then another adult, E2, pointed at the target object instead. Infants rarely cleaned up the target object in this condition.

In another study, Moll, Richter, Carpenter, and Tomasello (2008) had 14-month-olds share (i.e., interact excitedly about) three objects with an adult in sequence, one of them in a special way (they encountered it several times on the way to the testing room). When later the adult gestured excitedly toward the three objects together on a tray and ambiguously requested, “Wow, look, can you give it to me please?”, infants gave her the object they had shared in a special way. To test the possibility that infants simply gave her that object because it was special for them, individually (not because it was the one they had shared together), Moll et al. included a control condition in which infants shared the three objects with the adult exactly as before, one in a special way, but then a different
adult ambiguously requested one of the objects. If infants were just choosing the special object because it was most interesting to them, they should have chosen it in this condition too, but they did not—they chose that object at chance levels. To test the possibility that infants gave the adult the special object because it was the object that was special for her (not because it was the one they had shared together in a special way), in another control condition infants watched as the adult experienced the objects individually (again, one in a special way) and then requested one of the objects from them ambiguously. Again, in this condition infants chose the special object at chance levels. In summary, infants responded not based on what they themselves knew individually about the objects, nor on what the adult knew individually, but instead on what they knew together. Thus infants use the common ground they share with others to interpret their communication. When they had not shared any relevant experiences with the requesting adult, they could not disambiguate her request (see also Saylor & Ganea, 2007, for another study on infants’ use of common ground to interpret others’ communication).

By 18 months of age, if not before (see the studies on declarative pointing by Liszkowski and colleagues discussed above), infants also tailor their own communication for others based on the common ground they share with them. Liebal, Carpenter, and Tomasello (2009) found that infants point differently for others depending on what particular experiences they have recently shared with the particular person for whom they are pointing.

Infants thus not only share attention and interest with others in joint attentional interactions, as we have seen above, they also keep track of the knowledge and experiences they have shared with others in the past, and use this common ground both to make sense of others’ communication and to choose what to communicate about for others themselves. They know what “we” know together, and comprehend and produce communicative gestures with this in mind. A series of studies suggests that apes do not use common ground in this way. When, in the context of a hiding-finding game, a human points to a container containing hidden food, apes typically do not understand that the human is trying to tell them the food is there (see Call & Tomasello, 2005, and Miklósi & Soproni, 2006, for reviews). Human infants make this inference by age 14 months (Behne, Carpenter, & Tomasello, 2005). However, apes do succeed in a similar situation when non-communicative cues are provided—when the human simply reaches unsuccessfully for the food for himself (Hare & Tomasello, 2004). Tomasello (2006) suggests that apes’ difficulty with the communicative version of this task is due in large part to their inability to take into account their common ground with the human when interpreting his point. Thus, whereas apes understand what others know, there is currently no evidence that they understand or use in communication what “we” know together.

**Sharing goals in joint collaborative activities**

Once infants are capable of understanding others’ goals and intentions, they are able and motivated to pursue shared goals with others in joint collaborative activities. Methodologically, it is a challenge to identify instances of group activity that involve
shared goals and intentions. True joint action is not just acting together, it is acting together with the mutual knowledge of a shared goal (e.g., Bratman, 1992; Tomasello et al., 2005) and a joint commitment to see the activity through (Gilbert, 1990). Next I discuss a series of studies designed to determine whether infants and young children participate in true joint action of this type.

In an initial study, Warneken, Chen, and Tomasello (2006) presented 18- and 24-month-old children with four tasks in which collaboration was needed in order to achieve a goal. Two of the tasks involved instrumental problem-solving (retrieving an object from an apparatus) and two were social games (e.g., bouncing a block on a small trampoline together). In the middle of each task, the adult partner suddenly stopped playing his role, and Warneken et al. coded communicative attempts by children to re-engage the adult in the activity. These adult interruption periods were included to see how joint children considered the activity to be: if children had formed a joint goal with the adult, and understood the commitment this entailed, then they should try to persuade the adult to recommit to the joint goal when he stopped instead of disengaging from the task or attempting to perform the activity individually. Warneken et al. also coded how well children coordinated actions with the adult before and after the interruption periods, during the joint activities.

They found that children at both ages succeeded in coordinating with the adult in at least some of the tasks, although 24-month-olds did this more skillfully than 18-month-olds. During the interruption periods, in about half the trials, children’s predominate response was either to wait for the adult or to try to re-engage him communicatively (e.g., by pointing to the apparatus or pushing it toward the adult), and across trials all children at both ages attempted to re-engage the adult at least once. This suggests that children knew they had a shared goal with the adult, and that since the adult was committed to the shared goal, children had a right to expect that he would continue playing. Warneken and colleagues also noted two other findings that speak to the motivation children had to cooperate: (a) children participated enthusiastically in the social games, in which there was no material reward, and (b) once they had successfully retrieved the object from the apparatus in the problem-solving tasks, almost all the children replaced the object at some point and repeated the task. These findings indicate that the collaborative activity was an end in itself, not just a means to obtaining some material reward.

Warneken and Tomasello (2007) subsequently tested 14-month-old infants on two of the same tasks and found that they, too, showed some evidence both of coordination of actions and of re-engagement attempts during the interruption periods (see also, e.g., Brownell & Carriker, 1990; Eckerman & Didow, 1989; Hay, 1979; and Ross & Lollis, 1987, for other studies of collaboration in infants).

However, although the findings of Warneken et al. (2006) are consistent with the idea that children were engaging in truly joint action with shared goals and mutual commitments, this was not directly tested in their study. Because all the activities in their study required two players, it is possible that children re-engaged the adult simply as a means to achieving an individual goal, not a shared goal. That is, children could simply have wanted to achieve the effect (e.g., retrieving the object or seeing the block bounce) and needed the adult as a sort of "social tool" to make this happen. In two further studies we thus focused more directly on children’s understanding of shared goals and joint
commitments, while attempting to rule out the alternative “social tool” explanation of children’s behavior.

In the first study, Gräfenhain, Behne, Carpenter, and Tomasello (in press, Study 1) tested 2- and 3-year-olds on a series of games which all could be played either jointly or individually. For example, in one game, each player could use a tool to press one of two levers to make two toy rabbits hop up inside a box, or else a single player could press the lever(s) individually. After the experimenter and an assistant demonstrated the games to children both jointly and individually, children were allowed to play the games too, in one of two ways. In the commitment condition, the experimenter invited children to play the game with her (and waited for them to accept her invitation), then played in a joint manner, making eye contact with children and playing contingently with them. In the no commitment condition, in contrast, children were told by the assistant that they could play the game; then as soon as they started playing, the experimenter approached and played in parallel with them on the same apparatus. After this brief play period, in both conditions there was an interruption period, as in Wuneken and colleagues’ (2006) study. We coded for waiting and re-engagement attempts during these interruption periods, expecting that children would show these behaviors more often in the commitment condition, in which there was a shared goal, than in the no commitment condition in which there was no shared goal.

The 3-year-olds showed the expected pattern of results: in the commitment condition, most children either waited for the experimenter or attempted to re-engage her into the game communicatively, whereas in the no commitment condition children mostly played the game alone. The fact that children waited for or attempted to re-engage the adult in the commitment condition, even in these types of games, when they could just as easily have played the games alone, suggests that they were not merely using the adult as a social tool to achieve their own individual ends – that instead they saw the game as a joint, committed activity.

The 2-year-olds also often waited for or attempted to re-engage the adult but, unexpectedly, they did this in both conditions. It is unclear whether these younger children do understand something about shared goals and joint commitments, but just over-attributed them in the no commitment condition, or whether instead in both conditions they simply preferred playing with a partner, even if they were only playing in parallel, and this is why they waited for or attempted to re-engage the adult. More research is needed on very young children’s understanding of joint commitments in joint action.

To investigate the extent of the older children’s understanding of joint commitments, Gräfenhain et al. (in press) conducted a second study in which we tested whether children themselves feel an obligation to their partner in a joint activity. In this study we measured how children took leave of a committed joint activity when they were done participating. In the commitment condition, 3- and 4-year-olds were encouraged to invite the experimenter to play a game with them, and the experimenter accepted their invitation and began to play (basically in parallel to children, but with a verbal reminder halfway through that they were playing together). In the no commitment condition, the experimenter simply announced that she would like to play and started playing in parallel to children. After 30 seconds of play, the response period began: across the room, an assistant began
playing another, highly attractive, game by herself. She gradually attempted to entice children to come play with her, first by simply playing loudly on her own, and eventually by asking children if they wanted to play too. The main measure was whether, upon leaving the first game for the second one, children would spontaneously acknowledge their leaving to the experimenter, their partner in the first game, for example by giving her the tool they had used in the game or telling her they wanted to leave.

We found that both 3- and 4-year-olds acknowledged their leaving to the experimenter significantly more often in the commitment condition than in the no commitment condition. Together, these studies show that by 3 years of age children are both sensitive to whether they are in a committed joint activity and also are beginning to know what obligations such committed activities engender.

By 14 to 18 months, infants are thus beginning to be able to coordinate actions with others in joint collaborative activities. There is evidence that is consistent with the idea that infants know they have a shared goal with their partner at this age, with much clearer evidence following by 3 years of age. By that age, children are also beginning to engage in much more complex—and even imaginary—joint actions, in their joint pretense with others. This sets the stage for some of the “bigger” uniquely human joint activities like social institutions and other forms of collective intentionality (Rakoczy, 2007).

There are many reports of cooperation in chimpanzees (e.g., Boesch, 2005; Melis, Hare, & Tomasello, 2006), but little if any evidence for shared goals (indeed see Warneken et al., 2006, for evidence against the idea that chimpanzees have shared goals with others). It appears that ape cooperation consists of apes simply using each other as social tools to obtain food that they cannot obtain on their own, or else accidental coordination of behavior when multiple apes pursue the same individual goal (Tomasello et al., 2005). Whereas human infants see collaboration as an end in itself, apes apparently see it only as a means to an individual goal.

Joint attention, communication about shared experiences, and true joint action all rely on a motivation to share psychological states and experiences together—a motivation that appears to be unique to humans. Together, these skills make possible a huge range of joint activities. However, to explain another set of uniquely human behaviors another social motivation is needed, as we will see next.

Broader Social Motivations

Beyond the motivation to share psychological states with others there is another strong social motivation in humans: the motivation to do things like others do—to be like others, and to let them know that “I am one of you.” This tendency for humans to align themselves with group members, along with a complementary social pressure coming from the group to conform, ensures cultural transmission of conventional knowledge and shared values, and compliance with social norms. Since norms are, in effect, collectively shared beliefs about the “right” way to do things, again shared intentionality plays a major role in their formation. In the following section I review some evidence suggesting that these types of social motivations, too, are evident in infancy and early childhood.
Communicating mutuality and belongingness in social imitation

Engaging in joint attention is one way to communicate to others that you are sharing or want to share an experience with them. There is another way in which infants can communicate mutuality with others: by imitating them. Uzgiris (1981, 1984) identified two functions of imitation in infancy: an instrumental function in which the infant learns something about the object or action in the demonstration, and a social function in which the focus is on the dyad and its interpersonal interaction. According to Uzgiris, social imitation can communicate “mutuality or sharing of a feeling, understanding, or goal” and serves to “affirm a shared state” (Uzgiris, 1984, p. 25; see also work by Nadel and colleagues, e.g., Nadel, Guérini, Pezé, & Rivet, 1999, for a similar view). Not only does it show that imitators understand that “you are like me” (Meltzoff, e.g., 2005), importantly, it also directly contributes to the model the message that “I am like you” (Carpenter & Call, in press). Indeed, children’s copying of others’ actions is related to their tendency to engage in joint attention with others, suggesting a common underlying motivation to communicatively share experiences with others (Carpenter, Tomasello, & Savage-Rumbaugh, 1995; Hobson & Meyer, 2006).

The social function of imitation is seen most clearly when children copy the particular way someone does something, even when that particular way is clearly not necessary to achieve the same effect. One can do this “in the moment,” so to speak, just to convey to one’s partner “I am like you,” at a dyadic level. And one can also do it more lastingly and collectively, when one takes a modeled action to be a conventional action and thus learns it normatively as “this is the way we (as a group) do this.” On the level of the dyad and its members’ relationship, there is evidence that by 18–24 months of age, infants and toddlers often go out of their way to copy others’ actions on objects closely, and do so more often in social than non-social situations (e.g., Nielsen, 2006; Nielsen, Simcock, & Jenkins, 2008; Tennie, Call, & Tomasello, 2006). Around the same age, infants also begin using imitations as a strategy to initiate and maintain communicative and socially coordinated interactions with peers (Eckerman, Davis, & Didow, 1989; Nadel, 2002). When they get older, children increase their copying behavior when their motivation to affiliate with others is heightened: 5-year-old children who have been primed with social exclusion (by watching videos in which one shape is ostracized by a group of other shapes) subsequently imitate a demonstrator’s actions significantly more closely than children who have not been primed with social exclusion (Over & Carpenter, 2009) – reminiscent of findings in the adult social psychology literature showing that adults subconsciously mimic others when they have a goal to affiliate (e.g., Lakin & Chartrand, 2003).

On the level of conventional, normative understanding, at least by 2–3 years of age it is clear that children have a sense that when someone shows them something in a particular way, it marks the action as generalizable, cultural knowledge (see Gergely & Csibra, 2006). For example, when 2- and 3-year-olds are shown how to play a novel rule game, they learn it normatively, as “this is the way one must do this.” They demonstrate this when they go so far as to protest when a puppet then comes in and performs the actions of the game in a different way – they enforce the norm (Rakoczy, Warneken, & Tomasello, 2008). This study, and the one on social exclusion above, thus go somewhat beyond the
motivation to be like others and highlight the social pressure children feel to belong to the group, and to do things the way others do. Further evidence of this pressure comes from conformity studies: by 3 years of age, children often conform to majority opinions even when these opinions are clearly incorrect (e.g., Walker & Andrade, 1996).

It is unclear whether children younger than 2–3 years of age have this sense of social pressure to belong to the group, but they are sensitive to some aspects of group membership and affiliation. For example, even young infants have a preference for in-group members, at least in terms of people who speak their native language (Kinzler, Dupoux, & Spelke, 2007). And by 18 months, there are connections between affiliation and prosocial behavior: 18-month-old infants who are primed with affiliation (i.e., shown photographs of familiar household objects with two small dolls standing close to each other in the background) are significantly more likely to help an adult pick up her dropped belongings than infants who were primed with individuality (i.e., shown the same photographs but with only one doll in the background, or with the two dolls standing back-to-back; Over & Carpenter, in press).

A large literature has accumulated showing that apes typically do not copy others’ actions — instead they learn something about the goal or results of the demonstration and achieve the goal or results using their own means, by emulation (see, e.g., Carpenter & Call, in press, for a review). It is thus likely that whereas children imitate for both social and instrumental functions (Ugiris, 1981), apes’ “imitation” is only instrumental. This appears to be a matter of motivation rather than competence. For example, apes who have been trained to imitate can do so on command, but they do not then spontaneously imitate in novel contexts (Call & Tomasello, 1995; see Carpenter & Call, in press, and Nielsen, in press, for more on this). Finally, although much has been made recently of “ape culture,” the tendency for different groups of apes to do things in different ways (e.g., van Schaik et al., 2003; Whiten et al., 1999), there are studies that suggest that at least some of these differences are simply due to differences in the ecological conditions of the different groups (e.g., Humle & Matsuzawa, 2002). There are also few reports of group differences in arbitrary behaviors like gestures — behaviors that can only be spread by convention (Carpenter & Call, in press). Thus, whereas apes, like all social animals, have a social motivation to be with others — to share company and simple activities with each other (grooming, rough-and-tumble play, etc.) — we currently have little clear evidence that they have the social motivation to be like others (see Carpenter, 2006, and Carpenter & Call, in press, for more on shared intentionality in infant and ape imitation).

Some questions for future research

The development of shared intentionality. Throughout this chapter I have focused on infants around 1 year of age, because that is when we have some of the strongest early evidence for each of the uniquely human skills and motivations I have discussed. Indeed, we think it is no coincidence that these behaviors all emerge at around the same time in development, as we see them as all related, and a result of the interweaving of the “sharing” and “understanding” lines of development at this age (Tomasello et al., 2005).
However, there are clearly precursors to these abilities in even younger infants, both in terms of social motivations and the two types of social cognition. For example, infants younger than 9 months of age may have some basic understanding of others’ goals (e.g., Kamewari, Kato, Kanda, Ishiguro, & Hiraki, 2005; Woodward, 1998) and may be able to engage in some joint attention (Striano & Bertin, 2005). They also show some coordination (e.g., turn-taking and synchronization) in their interactions with adults (e.g., Trevarthen, 1980), and show responses to interruptions in social activity (the so-called “still-face effect”) that at least on the surface have some commonalities with older children’s waiting and re-engagement attempts in collaborative activities (see Adamson & Frick, 2003, for a review). It remains to be seen whether these early behaviors are already evidence of some early form of shared intentionality. For example, is early “joint attention” true coordination of attention or just alternation of attention between two interesting sights? Is the still-face effect evidence of babies’ understanding of shared goals and joint commitments or just an expectation of contingency and a desire for social interaction? And does neonatal imitation (see, e.g., Melzoff & Moore, 1983) already reflect infants’ desire to be like others or is it even imitation at all (Jones, 1996)? More work needs to be done on the developmental emergence of all the uniquely human skills discussed here, as well as on interrelations among the different skills.

The neuropsychology of shared intentionality. There is currently much interest in the “social brain.” From theory of mind to joint attention and joint action to empathy to mirror neurons, much research is currently focusing on the neuroscience of social cognition from both the perspectives discussed above: how we understand others’ psychological states and how we share psychological states and activities with others. A detailed discussion of these topics is beyond the scope of this chapter (and my expertise); luckily there are many recent reviews of relevant literature, for example by Saxe (2006), Grossmann and Johnson (2007), Carrington and Bailey (in press), and Iacoboni and Dapretto (2006). All I wish to do here is bring up some suggestions for possible future directions in this area.

One suggestion is that it would be very helpful for neuroscientists to (somehow) target precisely what makes joint attention and joint action truly joint (and, apparently, unique to humans): the “knowing together” component. For example, several studies have used gaze following or gaze coordination procedures to attempt to investigate the neuropsychology of joint attention (e.g., Striano, Reid, & Hoehl, 2006; Williams, Waite, Perria, Perrett, & Whitten, 2005). However, the “knowing together” component seems missing from these studies. In the Williams et al. (2005) study there is no indication of it and in the Striano et al. (2006) study it is not clear that it is there: the eye contact before the experimenter’s head turn in the “joint attention” condition in that study likely serves as an attention getter or signal of communicative intent instead of a joint attention (“sharing”) look. A simple first step that would help move these studies closer to investigating true joint attention might be to add or move the eye contact to after the participant and experimenter have looked at the same object. This might help “close” the joint attentional triangle (see figure 4.2) and evoke feelings of joint attention. It would also be interesting to look for relations between joint attention and joint action, as well as relations between these processes and motivation/reward centers of the brain (see, e.g., Henderson, Yoder,
Yale, & McDuffie, 2002, and forthcoming work by Leonhard Schilbach and colleagues). I would also predict that both joint attention and joint action should have something to do with basic communication areas, as to be sure that one is attending or acting jointly with someone else this must be communicated, even if just with a knowing look to the other.

Neuropsychological studies that investigate social cognition developmentally would also be helpful. For example, do 1-year-old infants who pass false-belief tests (see, e.g., Busselmann et al., in press; Onishi & Baillargeon, 2005) do so using the same brain areas as 5-year-olds passing similar non-verbal tests? Do infants before and after the “social-cognitive revolution” at 9–12 months (Tomasello, 1995) process gaze, imitation, and other social interactions in the same way (see related questions above)? And are there brain explanations for developmental differences in social imitation (e.g., Nielson, 2006) and automatic mimicry (e.g., Anderson & Meno, 2003)?

Finally, there are many, far-reaching claims concerning the extensive role that mirror neurons are thought to play in various aspects of human social cognition, for example in imitation, empathy, theory of mind, cooperation, and language (see, e.g., Iacoboni & Dapretto, 2006). However, on both theoretical and methodological grounds, an
increasing number of researchers are starting to question these claims (see, e.g., Csibra, 2007; Dinse, Thomas, Behrmann, & Heeger, 2008; Jacob, 2008; Nielsen & Carpenter, 2008; Southgate, Gergely, & Csibra, 2008; Turella, Pierno, Tubaldi, & Castiello, 2009). It will be interesting to see whether these claims will stand the test of close empirical scrutiny.

Conclusion

Human social cognition is special. Humans, from very early in life, have a strong motivation to share experiences and activities with others, and to align themselves with and be like others. This motivation is what turns gaze following into joint attention, egocentric communication into communication about shared experiences, group activity into joint action, and social learning into conventional, cultural learning (Tomasello & Carpenter, 2007). It thus transforms individualistic skills (like those of chimpanzees) into the more collective counterparts of those skills which are the foundation for everything from declarative pointing and simple collaborative activities to fads and fashions, cultural practices, and social norms and institutions. This motivation for shared intentionality is so important, yet so basic it is seen in infants before they can walk. In infants' social cognition and social motivations, we see the social origins of cultural cognition.

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