

How Infants Come to Learn About the Minds of Others

GABRIELA MARKOVA

MARIA LEGERSTEE

York University, Toronto, Canada

The ability to understand the minds of others plays a significant role in our interactions with others. That is, we need to understand that others can experience and act upon emotions, desires, or thoughts if we are to explain and predict their behavior. The ability to understand others' minds is an important accomplishment of early social and cognitive development. From birth, infants demonstrate an awareness of the minds of others by the way they initiate communication and respond to others during early social interactions. Over time, the affective relationships infants

establish with their caregivers help them deepen their understanding of how people think. That is, infants develop from having an awareness of emotions and intentions to understanding desires and beliefs.

Children have an adultlike understanding of states of mind by 4 years of age. By this age, they can acknowledge different perspectives and can understand that others may have beliefs that differ from their own (Perner, 1991; Wimmer & Perner, 1983). But what do children understand about the minds of others before they are capable of such complex insights? Research has shown that 2-year-old children begin to use language to refer to their own and others' emotions (e.g., "love") and desires (e.g., "want"; Bartsch & Wellman, 1995). Even before children can verbally express themselves, they show their understanding of others' perceptions, emotions, and intentions by using communicative gestures (Legerstee & Fisher, in press). Moreover, when 10-month-old infants see a person trying unsuccessfully to carry out an action (e.g., put an object in a container), they complete the person's failed attempts

(i.e., put the object into the container themselves; Legerstee & Markova, 2008). Thus, 10-month-olds understand the intentions of others. Even earlier in the first year of life, infants reveal their understanding of others' minds by sharing emotions with them during interpersonal exchanges (Legerstee & Markova, 2007). The Affect Sharing Model (Legerstee, 2005) provides a framework to explain how infants develop the awareness of another's mind through social relationships. According to this model, infants are born with three important predispositions that allow them to learn about the minds of others: (a) the ability to recognize people as similar to them, (b) the awareness of their own and others' emotions, and (c) the recognition of the caregivers' attunement to the infants' emotions and needs. The interplay between these three predispositions results in affectively attuned relationships that are an important mechanism for infants' development of an understanding of the minds of others (Legerstee & Varghese, 2001).

Early Social Interaction

FROM BIRTH BABIES SHOW a preference for human faces and voices: Newborns prefer face like patterns (Goren, Sarty, & Wu, 1975; Johnson, Dziurawiec, Ellis, & Morton, 1991; Johnson & Morton, 1991), spend more time looking at their

mothers' than at strangers' faces (Bushnell, Sai, & Mullin, 1989; Field, Cohen, Garcia, & Greenberg, 1984), prefer human speech over other sounds, and recognize the voices of their mothers over those of female strangers (DeCasper & Fifer, 1980). Moreover, infants as young as 1 week old exchange gazes, facial expressions, vocalizations, and movements with others in a reciprocal fashion. Such interactions have been labeled proto-conversations (Bateson, 1971), because they have a turn-taking structure that very much resembles adultlike verbal communication. These proto-conversations may start by the baby examining our face. As a response we start smiling and commenting on what the baby is doing. Our behaviors may in turn encourage the baby to also start smiling and vocalizing as if in response to our acts, which then may

Abstract

The ability to understand the thoughts and feelings of others develops remarkably early in infancy. At birth, infants demonstrate an early understanding of the thoughts and feelings of others by sharing emotions with their caregivers. These early affective exchanges subsequently facilitate the development of a more complex awareness of others, such as coordinating and directing the attention of others to interesting things in the world. Thus, the quality of early social relationships plays an important role in guiding the development of how infants understand the minds of others beginning in the earliest months of life.

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evoke another response from us: “What are you saying? Are you telling me a story?”

This example suggests that not only do adults interpret infant behavior as meaningful and communicative during early social interactions, but infants also perceive the adults’ acts as meaningful and respond appropriately. Such sharing of experiences is the essence of what Trevarthen (1979) calls *intersubjectivity*; namely, the “linking of subjects who are active in transmitting their understanding to each other” (p. 347). During interactive exchanges, each person has knowledge about the mind of his or her partner (and they communicate this understanding to each other). In the first few months of life infants engage in *primary intersubjectivity* (Trevarthen, 1979), which occurs during interactions between infants and their caregivers, and which consists primarily of exchanges of emotions through gazes and vocalizations in a rhythmic turn-taking pattern, as described in the example above. Accordingly, the infant’s main goal during these early interactions is to establish connections with others.

Developing Connections With Others

THERE ARE DIFFERENT OPINIONS about the way infants develop interpersonal relationships with others. For example, some theorists argue that intersubjectivity is a result of infants’ perception of social contingencies. Specifically, these authors propose that from birth infants are able to detect only the effect their own actions have in the world, which is important for the development of an awareness of the self (e.g., by kicking the sides of the crib I become aware of my feet), but it is not until 3 months of age that infants begin to be sensitive to the type of contingent interactions provided by others (Gergely & Watson, 1999). According to these theorists, infants do not orient toward people before the age of 3 months, and thus are not able to establish interpersonal connections with others for the first few months of life.

Other theorists propose that infants establish intersubjective connections with people by detecting similarities between own and others’ actions (Meltzoff & Moore, 1997, 1999). For example, even newborn babies are able to imitate simple actions they see others perform, such as opening the mouth or sticking the tongue out (Meltzoff & Moore, 1977). These imitative games that infants play with people are exciting for the infants. Meltzoff and Moore (1977) argued that imitation is an “attention getter” and through it infants begin to perceive others to be “like me.” These authors argued that the infant’s ability to recognize people as similar through imitation is part of a reciprocal communica-



Ten-month-old infant completes the unsuccessful action of an adult.

tion system that allows them to understand and sympathize with others, and thus lays the foundation for understanding others’ minds (Meltzoff & Moore, 1997).

We propose that infants’ connections with the social world develop through sharing experiences, such as emotions, with sympathetic adults. When infants’ communicative behaviors are reciprocated, infants perceive the relationship as attuned and they distinguish that the adult is not only “like me” but also “with me.” It is through this recognition that infants develop an understanding of others’ minds (Legerstee, 2005).

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We have recently conducted a study that tested these different theoretical approaches (see sidebar on the *Foundations of Early Intersubjectivity*) and found that infants connect with others from birth by sharing emotions with them. Most important, our findings support the Affect Sharing Model (Legerstee, 2005), which predicted that infants’ early intersubjective capacities are facilitated by mothers who are attuned to the infants’ com-

municative behaviors. Thus, warm, responsive, and nurturing relationships with caregivers who harmonize their own behaviors with those of their infants enable infants to appreciate that others are similar to, responsive to, and engaged with them.

If infants connect with others through the sharing of emotions during attuned interactions, then the question arises of what infants understand about others’ behaviors during these early exchanges. In fact, very early in life infants develop expectations about their partners’ responses during social interactions. That is, infants expect people to communicate with them when mutual gaze is established. Evidence for this expectation is best revealed in a situation where the infants’ interactive partners suddenly stop communicating with them for no apparent reason. In a classic experimental situation, referred to as the still-face experiment, the adult maintains eye contact with the baby and continues to display a friendly face, but does not react in any way to the infant’s acts (Tronick, Als, & Adamson, 1979). Infants’ reactions to the still-face are quite consistent—they try to re-engage the adult with gazes, smiles, and vocalizations, but when their repeated attempts at engagement fail they become sad and turn away from the nonresponding adult.

However, in some real-life situations adults are unable to engage with infants. For example, mothers may be preoccupied or distracted by housework, the telephone, or older siblings. If infants are able to differentiate between situations where adults are not willing and where they are simply unable to interact with them, then they understand that

FOUNDATIONS OF EARLY INTERSUBJECTIVITY

We observed infants at 5 and 13 weeks of age in three conditions: (a) a natural interaction in which mothers interacted with their babies as they usually did at home; (b) an imitative interaction in which mothers were asked to imitate all behaviors of their infants; and (c) a random interaction in which mothers listened to their previous interaction with their baby through headphones and were asked to repeat what they had said and re-enact how they may have acted in that interaction.

We observed infants' gazes, smiles, and vocalizations as measures of their ability to discriminate between these three conditions. In addition, we assessed maternal attunement to the infants' behaviors during the natural mother–infant interactions and classified infants into high and low attuned groups.

Results showed that—at both ages—infants of mothers who were highly attuned to their children gazed, smiled, and vocalized more during the natural interaction than during imitative and random interactions. Overall, infants of low attuned mothers did not behave differently in the three interactions. (Markova & Legerstee, 2006)

intentions guide the behaviors of others. We examined this question in a study in which we manipulated mothers' intentions to interact with their 3-month-, 6-month-, or 9-month-old infants (see sidebar: *Intentions Make a Difference*). We found that infants became upset when the situation was optimal for social interaction to take place but their mothers were unwilling to communicate with them (similar to the still-face experiment). On the other hand, when circumstances did not permit mothers to interact in ways they usually did, infants waited patiently until normal interactions resumed. It was interesting that when infants interacted with a doll in the same situations as with the mothers, they did not react differently in the various interactions and treated the doll as an inanimate object in each scenario. Infants demonstrated the ability to differentiate between the changing intentions of the mothers and did not simply respond to the changes in the type of interaction. Thus, when mothers engage with their babies, they both share not only emotions but also intentions. Because early social interactions are characterized by mutual activity and sharing of experiences, infants are able to determine why the connection with others is broken and act accordingly.

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The evidence presented above supports the idea that infants' early social interactions with others are characterized by the sharing of emotions (Legerstee, 2005). Emotions reflect what others are experiencing (Fogel, 2001) and thus allow infants to attribute meaning to people's behaviors. Accordingly,

infants and their caregivers must share each others' emotions in order to communicate in a meaningful way (Bråten, 1992; Markova & Legerstee, 2006; Trevarthen, 1992). Because the sharing of emotions generates sympathy and comfort (Trevarthen, 1992), it is the crucial element of affective relationships. Moreover, caregivers' attunement to their babies' earliest communicative signals is crucial to infants' understanding of their own and others' behaviors. During attuned interactions with their caregivers, infants get a sense of being with the other, which allows them to understand that intentions underlie people's communicative behaviors (Legerstee & Markova, 2007). Interactions with others not only help infants to connect to and understand the social world, but also allow for more complex social interactions to take place, such as sharing experiences about the world around them.

From Sharing Emotions to Coordinating Attention

IN ORDER TO SHARE their experiences with others, infants observe people's faces and their gazes in particular. From birth, infants not only prefer the eyes of people over other facial features (Maurer & Salapatek, 1976), but they understand what others are attending to (Bruner, 1999; Fernald, 1989; Legerstee, 2005; Reddy, 1999, 2003; Stern, 1985; Trevarthen, 1979). Monitoring what others are looking at helps infants to gain information about people's interests and thus, what others are likely to act upon next. As such, the understanding that others attend to things around them is essential for developing an awareness of how people think (Phillips, Baron-Cohen, & Rutter, 1992).

Around 4 months of age infants become interested in things around them, such as toys, and begin to integrate their newfound object interest into interactions with people. Through monitoring the gazes of others, infants begin to realize that people may perceive the same things in the world as they do,

and subsequently learn to share their new experiences with others. Trevarthen (1979) called this the period of *secondary intersubjectivity*, in contrast to *primary intersubjectivity*, as described above, in which infants share emotions with caregivers during interactions. When infants see an interesting toy, they may gaze from the toy to their caregiver and then back to the toy, as if to find out whether the other attends to the same toy. Adults may respond: "That's an exciting toy. Should I wind it up again?"

Coordinating attention with others in this way reflects not only infants' understanding that they can share information with others, but also that people can make things happen in the world. Thus, sharing emotions with others through monitoring their gazes (i.e., primary intersubjectivity) may be the prerequisite for sharing and coordinating experiences about the world with them (i.e., secondary intersubjectivity). The caretakers' attunement to the infants' behaviors may facilitate the development of these skills (Bruner, 1990; Legerstee, 2005).

We have investigated the evolution from sharing emotions to coordinating attention in infants from 3 to 10 months of age and found that monitoring the gazes of mothers at 3 months predicted infants' coordinating attention with mothers at 10 months (Legerstee, Markova, & Fisher, 2007). Most important, we found this developmental pattern only in infants whose mothers were highly attuned to their infants' communicative acts. Caregivers who are attuned to their infants' feelings and attention not only establish relationships with their infants that are more supportive, they also provide more information about their own and the infant's minds (Stern, 1985). For example, when infants show interest in a particular toy, attuned caregivers may comment on their interest: "Do you like that toy? I think it is exciting." During such exchanges, caregivers interpret the infants' experiences, while also commenting on their own. In this way, sensitive and responsive behaviors of caregivers show infants that they can coordinate experiences with others and thus deepen their understanding of the minds of others (Legerstee et al., 2007).

Coordinating attention with others over objects reveals infants' attempts to engage in prelinguistic communication. Sharing experiences about the world with others in this way also plays an important role in the development of more advanced ways of communicating, such as using gestures and, subsequently, language. For example, when infants share a common focus of attention with their caregiver, they are able to determine the referent (e.g., a toy) of this common focus. When adults then comment on this

INTENTIONS MAKE A DIFFERENCE

We observed 3-, 6- and 9-month-old infants in four interactions with their mothers: (a) a natural interaction in which mothers were instructed to interact with their infants as they usually would; (b) a still-face interaction in which mothers were asked to maintain visual contact and a friendly face but otherwise to stop communicating with their infants; (c) an interaction in which mothers wore a mask but were instructed to interact with their infants as usual; and (d) a situation in which mothers appeared to drink from a bottle, and maintained visual contact with their infants, but did not speak.

In both the mask and bottle interactions mothers were unable to communicate

with their infants as they usually did, because something (i.e., mask, bottle) interfered with this activity. Thus, during these situations mothers provided infants with a reason why they did not communicate with them. In contrast, in the still-face condition, there was no apparent reason why mothers refrained from communicating with their infants. To ensure that infants were not only reacting to the changing perceptual features of the different situations, but to the changing motives of their mothers, infants were observed in the same four interactions with a doll.

Results showed that infants differentiated between the different situations

when interacting with their mothers. Specifically, as early as age 3 months infants showed more positive affect toward their mothers during the natural interaction than during the still-face, mask, and bottle interactions. In fact, they got very upset during the still-face conditions but not when mothers wore a mask or when they drank from a bottle. In contrast, no such differential responsiveness was shown during the doll condition—the infants treated the doll as an inanimate object, they stared, tried to reach for the doll, and sometimes got upset if they could not get hold of the doll. (Legerstee & Markova, 2007)

(1)



(2)



(3)



(1) Natural, (2) mask-face, and (3) still-face interactions with the mother.

(4)



(5)



(4) Natural and (5) mask-face interactions with the doll.

particular toy, they enable infants to learn names of objects (Tomaseello & Farrar, 1986). Thus, secondary intersubjectivity is an important prerequisite for the development of language, which is first evident by using gestures to communicate.

Sharing Experiences Through Nonverbal Communication

BEFORE INFANTS BEGIN to speak, they use gestures such as pointing, showing, giving, and requesting to communicate nonverbally with others about aspects of the world (Bates, Camaioni, & Volterra, 1975). A specific type of gesture, declarative pointing, is particularly interesting because infants use this gesture to make nonverbal comments about something (e.g., “Wow, look at that! It’s beautiful.”), as opposed to simply requesting that people make things happen (e.g., “I want you to give me that.”; Camaioni, Perucchini, Bellagamba, & Colonesi, 2004; Legerstee & Barillas, 2003; Legerstee & Fisher, in press).

Infants may progress from the ability to coordinate their attention with others over toys to the more complex understanding that they can direct others to objects of interest in the world around them through declarative pointing. In a recent study, Legerstee and Fisher (in press) showed that when infants and caregivers play together with toys, infants observe the actions of their caregivers and coordinate their attention to those objects with them. Infants then progress from attending to caregivers and to the objects in which the adults are interested to using declarative pointing to actively direct the caregivers’ attention to the objects the infant finds interesting. Caregivers who are attuned to the infants’ behaviors then reciprocate these communicative acts, and thus facilitate the infants’ understanding that they can share their own experiences with others. In support of this idea, a recent study showed that infants of highly attuned mothers produced more declarative pointing than do infants of less attuned mothers (Legerstee & Barillas, 2003).

Conclusions

INFANTS DEVELOP an increasingly sophisticated understanding of the minds of others from birth. Newborn infants share emotions with their caregivers and at 3 months of age they distinguish different communicative intentions of adults during interpersonal exchanges. Monitoring people’s gazes during these early interactions is an important prerequisite for coordinating attention with others at 10 months, which, in turn, provides the basis for using declarative pointing to direct others’ attention to interesting aspects in the world. These

behaviors reflect infants’ growing awareness of the minds of others, and are facilitated and deepened through attuned behaviors of caregivers.

Infants may progress from the ability to coordinate their attention with others over toys to the more complex understanding that they can direct others to objects of interest in the world around them through declarative pointing.

It is remarkable that infants’ early communicative behaviors are not simply reactions to events in the environment or randomly occurring acts that others respond to, but instead are tools that infants use to connect with others and to share experiences with them (Newson, 1979). That is, what infants do gives meaning to what adults do, and vice versa. Because during these early interactions infants expand their understanding of others’ minds, we must consider the role of both infants and caregivers in order to get a clear picture of the development of early awareness of the minds of others (Tronick, 1982). In Trevarthen’s (1979) words: “In the first functional stage of human communication the infant recognizes the mother and invites her to share a dance of expressions and excitements. The infant needs a partner but knows the principles of the dance well enough, and is not just a puppet to be animated by a miming mother who ‘pretends’ her baby knows better” (p. 347).

Accordingly, the task that caregivers face is not necessarily to teach infants to understand them, but to become skilled at understanding their infants (Bateson, 1979). That is, caregivers must set the stage so that infants can learn from their own experiences. Specific behaviors of caregivers play an important role in how infants develop an understanding of others’ minds. Caregivers who are affectively attuned to their infants’ communicative bids have infants who are more capable of learning from social interactions. Consequently, infants of highly attuned caregivers are not only open to the interactive signals of their caregivers but also to those of various other communicative partners. This openness to communicative acts of people enables infants to learn and motivates them to share experiences. Thus, interactions with

socially responsive caregivers promote and modify children’s growing abilities to understand the minds of others. §

GABRIELA MARKOVA is a doctoral candidate in the department of psychology, York University, Toronto, Canada. Her dissertation proposal investigating infant communication skills in interaction with peers has been awarded the York University President Fellowship and the Norm Endler Research Grant.

MARIA LEGERSTEE, PhD, is director of the Centre for Infancy Studies and professor in the department of psychology, York University, Toronto, Canada. She is the recipient of the Faculty of Arts Dean’s Award for Outstanding Research contributions. Her work has appeared in books published by Cambridge University Press and by Raffaello Cortina, Italy. She is coeditor of a special series of the *Journal of Infant Behavior and Development*, and of the forthcoming *Handbook of Jealousy: Theories, Principles and Multidisciplinary Approaches* (Wiley Blackwell Publishing).

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At the Centre for Infancy Studies, researchers are interested in the development of communication, emotion, and attention in the first 3 years of life. Studies of how infants communicate are revealing the process of how an awareness of mental states develops in infants, and studies on interpersonal interaction and its effect on the development of communication are revealing an important mechanism that promotes the development of a Theory of Mind in infants.

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