From social expectations to social cognition in early infancy

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The end of the first year marks an important social-cognitive transition for human infants. Around this time, they start to engage in a new variety of joint attentional behaviors not clearly present in the preceding months. These new social behaviors are thought to index infants’ understanding of intentions in others—an understanding that ultimately gives way to an active participation in human culture. Given the importance of such understanding, the question is from where infants’ new social-cognitive repertoire may originate. Well before the emergence of joint attention, infants are sophisticated social beings, readily able to form expectations about others and inclined to relate differentially to them. The author focuses on the potential connection between social expectations developing in the context of early face-to-face interactions and the social-cognitive changes taking place by the end of the first year of life. (Bulletin of the Menninger Clinic, 65[3], 361–370)

The end of the first year marks an important transition in human infancy. It is around this time that human infants start to engage in a host of social behaviors not present just a few months earlier. In particular, by around 9 months, infants start to tune in to the attentional states of others in a variety of novel ways: They start systematically to follow others’ gaze and point gestures (Carpenter, Nagell, & Tomasello, 1998; Scaife & Bruner, 1975), to show and offer objects to people (Bakeman & Adamson, 1984; Carpenter et al., 1998; Striano & Rochat, 2000), and to use others’ emotional displays as information to disambiguate novel situations in the environment (e.g., Campos & Sternberg, 1981; Feinman & Lewis, 1983; Hornick, Risenhoover, & Gunnar, 1987; Sorce, Emde, Campos, & Klinnert, 1985).

The coemergence at around 9 months of an understanding of com-
municative gestures (Bates, Benigni, Camaioni, & Voltera, 1979) and the behavioral manifestation of joint attention (i.e., “triadic social behaviors”) is considered as indexing the developmental origins of an intentional stance, as infants start to perceive and understand others as intentional agents (Bretherton, 1991; Carpenter et al., 1998; Tomasello, 1995). The intentional stance is based on the detection of intentionality in people via the active monitoring, prediction, and understanding of other peoples’ behavior, whether in terms of their actions, dispositional qualities, emotions, or overall expectations based on past experiences (e.g., Rochat & Striano, 1999). Such social-cognitive skills afford new means by which to communicate with people and allow ultimately for an active participation in human culture (Tomasello, 2000).

Given the importance of human social cognition, the question is from where such abilities might originate. In this article, I present research suggesting that infants’ social-cognitive skills emerging by the end of the first year likely have their roots in early dyadic interactions and in expectations that are starting to be built over the first months of life. I begin by highlighting the role of interpersonal contingency in the development of social expectations, and suggest that infants’ joint attention skills are likely built on an early sensitivity to interpersonal contingency, which begins to develop in early infancy.

Early social attunement

The human infant’s social-behavioral repertoire undergoes dramatic change over the first couple of months of life. From an early inclination to attend to social stimuli, faces in particular (e.g., Fantz, 1963; Johnson, 1990; Walton, Bower, & Bower, 1992; Wolff, 1987), and to imitate the gestures and facial expressions of people (Field, Woodson, Greenberg, & Cohen, 1982; Meltzoff & Moore, 1977), infants by around 2 months of age start to monitor and reciprocate with their social partners in the context of intimate one-to-one (dyadic) exchanges (Stern, 1985; van Wulfften Palthe & Hopkins, 1993). Dyadic exchanges provide opportunity for the development of intersubjectivity, a sense of shared experience between people, considered to be the cradle of social cognition (Rochat & Striano, 1999, Trevarthen, 1979). Within the context of dyadic interactions, affective attunement and emotional coregulation, which include subtle turn taking and coconstructive dialogues as well as coregulation between infants and caretakers (Fogel, 1993; Stern, 1985), have been equated to the expression of a primary intersubjectivity, or a primary sense of shared experience with others (Trevarthen, 1979).
Such experience is foundational to the detection of interpersonal contingency, or sensitivity to how people relate to the self in face-to-face interaction. In addition, such experiences have been shown to affect infants’ ability to perceive others’ facial expressions, an important cue in figuring out the intentions and motives that guide others’ behavior and intentions. I now turn to a recent study relating to this topic that suggests a relationship between maternal affective style and young infants’ ability to discriminate among various intensities of facial expressions.

Maternal affective style and discrimination of facial expressions

Sensitivity to variations in facial expressions is a necessary precursor to recognizing the meaning behind others’ emotions and to predicting how people will behave in the future (Walker-Andrews, 1997). Despite substantial evidence that young infants discriminate and eventually recognize the meaning of facial expressions (e.g., Camras & Sachs, 1991; Ludemann & Nelson, 1988; Serrano, Iglesias, & Loeches, 1992; Sorce et al., 1985), we know little about the factors that may underlie infants’ ability to discriminate facial expressions.

In one of the few studies to consider what factors might relate to this discriminative ability, Kuchuk, Vibbert, and Bornstein (1986) examined the experiential correlates of 3-month-old infants’ perception of varying intensities of static smiling faces. In their study, infants viewed a graduated series of smiling facial expressions that varied in intensity. Infants’ looking times at these smiling facial expressions were found to be related to their mothers’ interactive style. In particular, infants whose mothers more often encouraged attention to their face while they were smiling were most sensitive to subtle variations in static displays of smiling expressions. Interestingly, the relationship between an infant’s discriminative ability and the mother’s encouraging the infant’s attention to her face was most pronounced for those mothers who displayed relatively low amounts of smiling.

Such evidence suggests that infants’ ability to discriminate facial expressions may be related to the quality of their interactive experiences, and not to the relative amount of maternal smiling they encounter per se. Kuchuk and colleagues (1986) speculated that infants might be more likely to develop sensitivity to emotional expressions when their attention is directed toward salient events that they do not frequently encounter. In relation to the affective styles of depressed mothers, who, compared to control mothers, are reported to display more flat affect and less positive facial expressions toward their infants (e.g.,
Cohn, Matias, Tronick, Connell, & Lyons-Ruth, 1986; Field, 1992; Field et al., 1985), this interpretation is particularly intriguing.

Thus, to test the potential role of maternal affective style in infants’ sensitivity to smiling and frowning facial expressions, we studied a group of 46 infants between 3 and 7 months of age (Striano, Brennan, & Vanman, in press). Infants were tested in two phases, a preferential looking phase and an interaction with their mother. In the preferential looking phase, infants viewed one facial expression, from a graduated series of either smiling or frowning facial expressions that varied in intensity, paired with a neutral expression. In an interaction phase, mothers and infants engaged in a 3-minute interplay in which we assessed the gazing and smiling response of mother and infant. Mothers were also asked to fill out a modified version of the Inventory to Diagnose Depression (IDD; Zimmerman, Coryell, Corenthal, & Wilson, 1986).

The results of the study showed that infants reliably discriminate various intensities of smiling and frowning facial expressions from a neutral expression. In addition, mothers’ level of depressive symptoms experienced since the birth of their children was related to infants’ discrimination of facial expressions. In particular, compared to infants whose mothers experienced low levels of depressive symptoms, infants whose mothers experienced high levels of depressive symptoms manifested greater looking preference for the smiling and the most extreme frowning stimuli compared to a neutral expression. These findings show that infants’ discrimination of facial expressions is moderated by their early interactive experiences. The results also suggest a potential link between early interactive experience and the ability to infer the intentional states of others from facial expressions. This leads to the question of when young infants might first become sensitive to the quality of interactive experiences with others. I turn now to research that addresses such questions.

Early interpersonal contingency

A number of studies suggest that young infants are highly attuned to the quality of interactive experiences with others. Murray and Trevarthen (1985), for example, reported that as early as 2 months of age, infants react more positively to their mother interacting with them “live” via a closed-circuit video system, compared to watching a replay video presentation of their mother (see also Bigelow, MacLean, & MacDonald, 1996; Nadel & Tremblay-Leveau, 1999). In a study providing similar evidence, Bigelow (1998) tested young infants’ sensitivity to the contingent responsiveness of their mothers
versus a stranger during a face-to-face interaction. The study’s findings indicate that infants as young as 4 months are sensitive to familiar levels of interpersonal contingency. They exhibit more contingent responding (i.e., vocalizing and smiling) to a stranger whose level of contingent responsiveness is most similar to that of their own. Taken together, these results suggest that in the context of face-to-face interaction, young infants might start to monitor people and become sensitive to the regularities and the structure of protoconversations.

To test this hypothesis, Rochat, Querido, and Striano (1999) tested the smiling and gazing responses of infants 2, 4, and 6 months of age as they interacted with a stranger who engaged them in either an organized or a disorganized peekaboo game. Whereas the information provided in each of the games was the same (i.e., amount of vocalization, affect, and movement), the structure of this information was different. Results of the research indicate that infants develop sensitivity to such information. Whereas 2-month-olds gazed and smiled equally at the experimenter in both conditions, 4- and 6-month-olds demonstrated a significant increase in gazing and a decrease in smiling in the disorganized compared to the organized peekaboo conditions. Such findings provide evidence that infants start to become sensitive to the timing and structure of interpersonal contacts over the first months of life.

Still-face reaction and developing social expectations

The still-face paradigm is another method that has been commonly used to investigate infants’ early social expectations. In this paradigm, the infant’s mother, or sometimes a stranger, is asked to interact with her infant in a normal way for several minutes and then is instructed to suddenly freeze while staring at the infant with a frozen, “neutral” expression. Infants as young as 2 months of age are reported to respond to such perturbations by averting their gaze, smiling less, and engaging in increased self-comforting behaviors (e.g., Cohn & Tronick, 1987; Murray & Trevarthen, 1985; Toda & Fogel, 1993; Tronick, Als, Adamson, Wise, & Brazelton, 1978). Such findings suggest that infants have rudimentary expectations about the nature of face-to-face interactions with others. In particular, they expect people to remain responsive and to reciprocate with them in the context of dyadic interplay (Muir & Hains, 1993; Rochat & Striano, 1999).

Based on a variety of careful manipulations to rule out alternative explanations for infants’ responses to the still-face situation, many
researchers have documented that infants’ responses to the still-face situation are not due simply to a general loss of stimulation or fatigue over time (e.g., Muir & Hains, 1993). In fact, when normal interaction is resumed following the still-face situation (i.e., the recovery period), infants’ rates of gazing and smiling return to, or sometimes even exceed, levels of the initial normal interaction phase (Hains & Muir, 1996; Toda & Fogel, 1993), clearly ruling out fatigue as a determinant of the still-face effect.

Still, one may ask whether infants’ expectations are exclusive to people or, alternatively, whether infants might expect animate objects to behave and respond in the same way as social entities. To test the specificity of infants’ social expectations, Ellsworth, Hains and Muir (1993) presented 3- to 6-month-old infants with either a female experimenter or with an inanimate face-like object that moved and made sounds during an initial interaction. Following this “interaction” period, the object or person suddenly stopped moving, becoming still (and passive) before the infant. Interestingly, the authors found that affective responses were primarily reserved for the person. Infants’ smiling was not affected when the object suddenly stopped interacting, but was dramatically reduced when the person became unresponsive.

These findings suggest that infants differentiate between people and animated face-like objects (see also Legerstee, 1992; Legerstee, Pomerleau, & Feider, 1987), and that already by 3 months of age they expect people and objects to behave in different ways. In addition, these results lend further support to the idea that infants’ still-face reactions are not merely due to an overall loss of contingency or stimulation. If this were the case, we would expect infants’ reactions to be similar regardless of whether it was a person or an object that stopped interacting with them. Differential responding to particular static facial expressions posed by an experimenter during the still-face period (D’Entremont, Hains, & Muir, 1997; Rochat, Striano, & Blatt, 2000), and selective responding as a function of the reason that contact was broken (e.g., whether because of an interruption or for no apparent reason; see Murray & Trevarthen, 1985), further exemplify that infants are attuned to more than the presence or absence of a responsive social partner. The development of social expectations and a sensitivity to interpersonal contingency, however, are not analogous to the manifestation of social initiatives that imply the active monitoring and predicting of others’ behaviors, as well as the ability and inclination to initiate, or to modify and somehow alter, the current state of communicative contact with another person.
From social expectations to initiatives

Considering the development of social initiatives in infancy, Cohn and Tronick (1987) examined the sequential structure of face-to-face interactions between mother and infant dyads at 3, 6, and 9 months of age. In general, the authors found that with their 3- and 6-month-old infants, mothers systematically initiated positive emotional displays. They found that it was only by 9 months that infants displayed evidence of social initiatives in the interaction. In particular, by this age infants were more likely to smile before their mothers did in the context of a normal interaction. This finding suggests that toward the end of the first year, dyadic exchanges between infants and adults undergo a dramatic transformation, which requires the detection of structure and regularities in these exchanges. Around this time, infants advance beyond social monitoring and begin to manifest the first signs of social initiatives, that is, behaviors that initiate, maintain, and modify contacts with others. Construed as a first sign of social agency, social initiatives reflect new forms of self-efficacy and may correspond to novel ways of understanding and interacting with others.

In relation to this idea, Striano and Rochat (1999) considered whether the emerging intentional stance might have its roots in the development of social expectations. The authors compared the social responses of 7- and 10-month-old infants in the context of dyadic and triadic situations to determine whether there is any relationship among these developments. In the dyadic situation, infants’ reactions to a sudden 1-minute still face adopted by a social partner in a face-to-face interaction were recorded. In the triadic context, infants’ monitoring of a social partner in various situations of shared attention (joint engagement, blocking, teasing, and attention following) was recorded. The authors found a strong relationship between infants’ responses in the dyadic and triadic situations. At both ages, infants who demonstrated attempts to reengage the experimenter via vocalizing, smiling, clapping, banging, and touching the experimenter during the still-face episode in the dyadic situation were also those who manifested the most signs of monitoring the social partner and in the triadic situations.

From social initiatives to social cognition

These findings are important for several reasons. First, they corroborate previous findings of Cohn and Tronick (1987), indicating that infants by the end of the first year are inclined to initiate positive dyadic interactions with a social partner. The advent of social initia-
tives alters the structure of face-to-face exchanges, with infants starting to take some responsibility for creating and maintaining social contacts. As infants become independent social agents, the nature of interactions is radically transformed, entailing for the first time mutually reciprocal exchanges between social partners. These findings also begin to address the question alluded to at the beginning of this article regarding the developmental precursors of the intentional stance, infants’ emerging sensitivity to the underlying motives and goals that guide others’ behavior.

The fact that social initiatives and joint attention behaviors tend to coemerge in development raises the possibility that each of these domains has its roots in dyadic social competencies. As a majority of evidence alluded to here suggests, these dyadic social competencies, such as the formation of social expectations and a sensitivity to interpersonal contingency, start to emerge well before the end of the first year. Future research is needed to specify further the potential link between infants’ early social competencies developing in the context of dyadic interplay and the emergence of later joint attention behaviors (e.g., attention following, social referencing, checking), which are thought to index infants’ rudimentary understanding of other people as goal-directed and intentional agents.

References
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