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Social and Communicative Development in Infancy

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INTRODUCTION

The evidence presented in this chapter suggests that infant communicative action is highly context specific, showing remarkable variability to even subtle alterations of the social and physical settings in which interaction occurs. The chapter includes reviews of research on affective communication during face-to-face interactions between infants and their social partners, gestural communication in adult-infant interaction, differences in mother versus father interactive patterns with infants, and finally, research on how infants interact in group settings in the family and with peers. These areas reflect the research interest and expertise of the authors and are not intended to cover the scope of work in infant social and communicative development. Rather, our purpose is primarily conceptual: To show by example that *infant social and communicative action is constituted by the dynamic interplay between individuals and the social contexts and physical settings in which that interaction occurs.*

The model of social behavior we propose goes beyond simple notions of the mutual influence of the partner on the infant and vice versa. In our view infant-partner interaction is constantly being created and updated in a process that defies attempts to prescribe a direction of cause and effect. Thus untangling such

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associations requires consideration of the interaction history of the infant and his/her partner. Patterns of social action—such as games with a parent—emerge and dissolve spontaneously and often in the absence of any explicit or implicit intention of either participant. This idea of emergent patterns of action, occurring without plan or intent and constituted only in the act of performance, has only recently been recognized as a fundamental factor in social development (Camaioni, DeCastro, Campos, & DeLemos, 1984; Fogel, 1990a; Fogel, Nwokah, & Karns, in press; Fogel & Thelen, 1987; Lock, 1980).

How are we to understand the development of infant communication? In broad sweep, infants acquire increasingly subtle forms of expression that eventually approximate the communicative style of the adult culture. How this happens is a matter of considerable theoretical and practical importance. It is also a developmental puzzle that evokes strongly divergent explanations. In reviewing current views deriving from ethological and sociocultural perspectives, we argue that infant communicative action cannot be understood as a simple readout of innate expressive movements nor as being shaped entirely by adult contingencies.

CONCEPTUAL FRAMEWORK

Ethological Theories

Ethologists assume that members of a species—both adults and infants—share a common repertoire that includes the movements and expressions necessary for social interaction. In one theoretical scenario, infants are genetically predisposed to display actions that adults can readily interpret. Via processes of maturation, expressive abilities gradually improve, and the infant uses these new skills to better model the adult forms of communication. Some mechanism for mutually synchronizing these social interactions must also be assumed (Trevathan, 1986).

In ethologically based attachment theory, for example, not only behavior but social perceptions and expectations become linked to produce synchronized dyadic actions. The internal working model is a concept designed to capture an individual's representations of relationships with particular persons that influence their patterns of social interactions with those persons (Bowlby, 1980; Bretherton, 1985; Stern, 1985).

Contrary to the premises of ethological theories, research suggests that parents and children do not have the same repertoire, goals, or expectations of the relationship (Kaye, 1980; Lock, 1980). Adult behavior during interactions with infants is not similar to infant behavior, and the social behavior that infants gradually acquire does not resemble the forms of exaggerated actions used by adults.

Another problem with ethological theory is that it presumes that all social behavior has a specific function. Smiling is functional because it leads to positive interaction and play; play is functional because it provides opportunities for cultural learning and skill practice. The theoretical fallacy is in thinking that because we can communicate in specific ways, we are "meant" to do so because of an evolved structure dedicated to social interaction, deemed necessary to our species survival. There are a number of elegant arguments against this position (Bates, 1979; Burghardt, 1984; Gould, 1977) that are beyond the scope of this

presentation. However, many examples of even highly ritualized social interaction can be explained as spontaneous accidents of local circumstances, maintained for a variety of purposes, not all of which would be beneficial to the individuals. These include patterns of insecure attachment or "games" involving physical or sexual abuse (cf. Fogel, 1990a; Fogel, Nwokah, & Karns, in press).

Sociocultural Theories

The theorists that may be collected under this heading are typically silent regarding the biological constraints on behavior and development. Instead, they focus on describing the sociocultural interactions presumed to shape the development of cognition and action (cf. Bruner, 1983; Kaye, 1982; Rogoff, 1990; Vygotsky, 1978). Bruner (1983), for example, illustrates how complex hierarchical structures of parent-infant games like "peek-a-boo" and "pat-a-cake" provide a structure external to the infant, a scaffold, in which the infant's actions are embedded. The infant is not required to have a cognitive scheme or model for all of the structures necessary to learn a game or acquire a cultural skill. The adult, by carefully regulating the infant's participation in the game, can guide the infant's "uptake" (Bruner, 1983) or "appropriation" (Rogoff, 1990) of cultural skills. Thus, external social structure eventually becomes internal individual structure in this developmental perspective (Vygotsky, 1978).

One contribution of sociocultural theory is the recognition that social interaction has regularities and that culture is transmitted via active participation in these routines. These theorists assume that infants and children have an intrinsic interest in the life of the society around them and some basic skill with which they begin to participate. Sociocultural theories view children as active and motivated participants (not mere recipients of contingent reinforcements). And these theories recognize a complex role for adults that is different from that of the children. Adults are required to recognize the child's intrinsic motivation, alter the cultural activity to fit the child's level (such as by making work into a game), and gradually provide opportunities for the child to expand the scope of participation. Thus the concepts of nurture, planning, developmental perspective, and coparticipation extend the role of adults beyond mere model or reinforcer (Rogoff, 1990).

However, functional thinking of the sort discussed in relation to ethological theory also burdens sociocultural theory. From a sociocultural perspective, social routines presuppose goal-directed behavior on the part of the participants, even though sociocultural theory recognizes that the goals of the child and the adult are often dissimilar. It is difficult, therefore, to account for social interactions that are generated without plans or goals at the outset. The imposition of meaning and structure at the outset of an interaction may be a *post hoc* representation as construed by the observer, having little to do with the actual process by which the interaction emerged and was maintained (Lock, 1980).

The Dynamics of Social Interaction

In essence, we propose that social interaction generally cannot be prescribed in advance or defined simply as the additive sum of its components. Rather, *interaction is a dynamically creative process, emergent from the active discourse between two different individuals, or more, in a particular cultural and physical context.* Our

argument is related to Gibsonian perspectives describing action as direct and context specific, without an explicit prescription for the final form of the action (Newell, 1986; Reed, 1982). Our view is similar to constructivist perspectives that do not require the genetic material to have foreknowledge of all the possible outcomes and pathways for developmental change (Fischer & Bidell, 1990; Piaget, 1952). We also recognize a sociocultural component to social development similar to that of Vygotsky (1978). Finally, we propose that human social behavior—including both verbal and nonverbal forms of communication—has not evolved phylogenetically as a manifestation of a dedicated genetic or neurological structure. Instead, communication is an emergent process that partakes of lower level components, none of which contains explicit representations of its final form (Bates, 1979; Burghardt, 1984; Lock, 1980).

In contrast to other perspectives, the dynamic interaction approach suggests that we focus on the contextual constraints that give social action its particular form, rather than appealing to social schemes assumed to represent the action within the infant's partner or to genetic information assumed to be blueprints for the action within the infant (Fogel, 1990b; Thelen, 1989). In the studies reviewed in this chapter, we show that all of the components of an interaction influence the forms and development of social discourse. These include traditional cognitive and affective factors as well as less obvious factors such as the mutual physical posturing of partners and their physical context. Thus our perspective requires one to examine the whole system—individuals in their physical and cultural setting—in order to comprehend how and why they communicate.

RESEARCH ON SOCIAL SYSTEMS IN INFANCY

Face-to-Face Interactions in Early Infancy

As our first research example, we review differences in the social interaction that result from alterations of individuals and settings during face-to-face play between mothers and infants between 3 and 6 months of age. One of the earliest demonstrations of the effects of social context came from research using the "still-face" paradigm, which involves a sudden cessation of maternal participation while the mother continues to gaze at the baby. Although infants rarely cry, they gradually reduce the rate of smiling and gazing at the mother over the time period in which she is asked to remain still-faced, usually 1 to 3 minutes (Cohn & Elmore, 1988; Fogel, Diamond, Langhorst, & Demos, 1982; Gusella, Muir, & Tronick, 1988; Mayes & Carter, 1990; Stoller & Field, 1982; Tronick, Als, Adamson, Wise, & Brazelton, 1978). In related research, mothers were asked to simulate depression and reduce their affect, and their infants correspondingly become more sober after only a few minutes (Cohn & Tronick, 1983).

The experimental setting of these manipulations makes it appear that the mothers' change of behavior causes the infants' behavior to change. Our interpretation is that the infants' actions are also a product of their prior interactive engagement with mother and her history of interaction with them. One of us (Fogel, 1982a; Fogel *et al.*, 1982) and Stoller and Field (1982) showed that the type of behavior infants demonstrated during the period of spontaneous interaction prior to the still face was predictive of their response to the still face. In particular, infants

no were smiling prior to the still face were less disturbed by the still face than infants who were not smiling. More recently, others have shown that maternal positivity affects subsequent behavior during the still face: Boys with positive mothers are more positive during still face, whereas girls display more depressed affect (Mayes & Carter, 1990).

Thus the 3-month-old infant's actions are not dependent simply on a halo effect from an earlier affective state nor on the mother's prior actions. Rather, infant responses to the still face probably reflect the state of the *dynamically constituted interactions between mother and infant over time*. How this process happens and the degree to which infant expectations of the interaction need to be ascribed to the infant will need to be resolved by further research (cf. Fogel, 1982a; Gusella *et al.*, 1988; Mayes & Carter, 1990). Our point is merely that the infant's communicative action in this situation must be understood as an emergent result of the whole system: The behavior of each individual in the context of the prior flow of interactive events.

There are significant cultural differences in the dynamics of face-to-face play that can be understood as extensions of this contextual perspective. Mothers in Japan, for example, respond less actively to infant vocalizations than mothers from the United States (Fogel, Toda, & Kawai, 1988). Japanese mothers use upper body movements physically to loom in and out abruptly and their hands to tap the infant and create visual displays. Mothers in the United States use their hands and bodies more tonically, by staying in one position (closer, on average, to the infant's face than the Japanese mothers) and by holding and touching the infant's body for continuous periods. American mothers make phasic use of their voice with many short utterances and questions and respond more to the infant's vocalizations. The result is a very different quality of play interaction in each culture. Japanese mothers use physical modalities to express themes and variations, whereas Americans use vocal modalities (Fogel *et al.*, 1988). In contrast, Bambara mothers from Senegal express themes and variations through postural motor games (Bril, Zack, & Koum Kou-Hombessa, 1989).

These cross-cultural differences cannot be explained merely on the basis of the culture-specific styles of adult interaction nor even of adult interaction with infants. These styles have developed over centuries of interactions with the infants themselves. In each interaction and within each family, these patterns of interaction are reinvented and reconstituted, based on the dynamic interaction of cultural values and parental and infant proclivities and behaviors. Lock's (1980) concept of the guided reinvention of language is a particularly insightful description of these cultural dynamics and their recreation in the action contexts of the family. Reinvention does not mean a simple reenactment of a cultural script; infants do not know what the script is, and it is doubtful that many adults could articulate such a script except in the most abstract terms. Rather, the concept of reinvention implies a creative and spontaneous process that emerges from action in the context of family and culture.

Even small changes in the local context of parent-infant interaction can affect the form of social behavior that emerges. For example, in one study the total duration of mutual gazing between mother and infant was doubled when the infant's seat was moved from an upright position to a supine position (Fogel, 1988; Fogel, Dedo, & McEwen, in press). Although we are still investigating why a change in postural position alters the face-to-face interaction, we know that the

effect is not due to a change in the mother's behavior or style of interaction nor to the infants' inability to hold their heads upright (the youngest infants in the study were 3 months, and all had head control). Clearly, nonobvious changes in physical setting can have unforeseen effects on infant behavior.

With an interactive partner other than the mother, infant social play behavior is also altered. For example, when with peers, 3-month-olds become more intense, abrupt, active, and less facially expressive than when they are with their mothers (Fogel, 1979). Similar intensity has also been observed during infant interactions with a doll (Legerstee, Corter, & Kienapple, 1990; Legerstee, Pomerleau, Malcuit, & Feider, 1987), although the specific behaviors of infants with dolls are different than those with peers. Finally, infant behavior with a peer differs from that seen when the infant is presented with a mirror or with a closed-circuit TV image of himself or herself (Field, 1979).

In these studies, the infants did not simply change a single behavior, such as less gazing or less smiling between conditions. Rather, painstaking microanalyses have revealed complex and systematic patterns of reorganization of the infant's entire body movements including vocalization, gaze, facial expression, and hand and arm movements. What is the source of such systematic reorganizations? Clearly infants do not need sophisticated, scaffolding partners to engage in the systematic organization of their behavior that is apparent in their interaction with partners other than their mothers. Moreover, many of the mothers in our study of infant peers reported their 3-month-olds had never seen another baby (Fogel, 1979). Yet the behavior of all the infants with peers was similar and significantly different from behavior with their mothers. Similarly, infants inexperienced with dolls, still faces, and maternal depression showed similar and characteristic patterns of interactions. Despite the infants' lack of experience, genetically based schema clearly could not anticipate all these possibilities and their variants. Our genes do not have prescriptions for behavior with dolls, televisions, and mirrors. Instead, the infant's actions in these different social contexts seem to be a product of a dynamic interaction between the infant's proclivities and the particularities of the situation.

In a study in which infants were observed weekly between 1 and 6 months while interacting with mothers during a face-to-face play situation on the mother's lap without toys, we found that mothers changed the way they held their infant's bodies as a function of the infant's gazing and affective engagement (Fogel, Nwokah, Hsu, Dedo, & Walker, 1990). Following a 6- to 8-week period in which infants prefer to gaze at mother, infants acquire a visual preference for inanimate, graspable objects and gaze less at their mother. After infants' interest in mother declined developmentally, mothers turned their infants' bodies away from them and toward the direction of the infants' visual interest. This was true, however, only for dyads in which the infant and mother had engaged in mutually positive affective exchange prior to gazing away. For infants who were developmentally late smilers (i.e., they smiled in the weeks following the developmental onset of gazing away from the mother), mothers persisted in trying to attract their infant's attention to themselves until the infants began smiling, which led to positive play exchanges. For these late smilers, mothers did not support the infant's intended gaze preference until the infant had acquired reaching. In the absence of positive interaction, gaze away plus reaching was necessary as a communicative signal to cue the mother's shift in attention management strategies.

The mother's behavior in this study was not caused by the infant's in any strict or simple sense. Rather, the mother's particular actions were contingent on the history of interactions with her particular infant. The participants' actions were constituted by the form and timing of each other's behavior. Therefore, research presented in this section suggests that infant behavior during face-to-face interaction depends on both the current social context and on the history of the particular relationship. In the next section, we discuss interactive and developmental processes in the emergence of intentional gestural communication at the end of the first year of life.

CONTEXTUAL DYNAMICS IN THE DEVELOPMENT OF COMMUNICATIVE GESTURING

Most infants first communicate intentionally by using manual gestures rather than speech. Once regarded as an unimportant precursor to language, gestural interchange—which first appears around 10 months—is currently seen as a separate avenue of communication with a distinct developmental history (Camaioni *et al.*, 1984; Franco & Butterworth, 1989). Communicative gesturing can be defined as the intentional use of gestures to elicit or respond to a partner's actions, when those gestures have a conventional form that both infant and partner can recognize. Examples include pointing to request or indicate an object, nodding the head "yes," and enacting a sign for an object (e.g., bouncing a pretend ball).

This section focuses on how infants' communicative gesturing is affected by the social and physical contexts in which the infants interact. A subsection is devoted to each of two major issues: (1) the effects of physical context on the *comprehension* of gestures; and (2) the effects of social contexts such as partner, concurrent activity, and gestural input on the *production* of gestures. In these subsections, we will hypothesize about elements that may be necessary to these communicative achievements; we will also highlight what is known and not known about the processes through which these developments occur.

Physical Context Affects 9-Month-Olds' Comprehension of Gestures

How do infants begin to understand what others are communicating to them? An important developmental achievement is comprehending that an extended index finger directs one's attention to other objects in the visual environment. At 9 months, infants may see the extended index finger primarily as an interesting display; however, at 14 months they actively search out the object being pointed at. Lempers (1979) and Murphy and Messer (1977) have identified two visual-contextual parameters that affect whether 9-month-olds can use a partner's manual point to direct their attention to an object (see also Schaffer's review, 1984).

Lempers (1979) had experimenters point at objects that were either a half-meter or 2½m away from their extended fingers. At 9 months, the majority of infants could follow the experimenters' points to the near object but not the far object. The close physical proximity of a gesture to the object to which it referred was necessary for the 9-month-olds' comprehension. By 12 months, the majority of infants followed points to both the near and the far objects.

Murphy and Messer (1977) had mothers seated to the left of their infants point

at toys that were either (1) across the infant's field of vision to the right; (2) in front of the infant; or (3) to the left of the infant on mothers' side. Only when mothers' points and the toys they referred to were both on the same side of the infants, did 9-month-olds gaze at the toys at above chance levels. Only two of twelve 9-month-olds gazed across from their mothers' hand on their left to an object to their right. The greater the angle that the 9-month-olds had to gaze across from the referring point to the toy, the less likely they were to do so. By 14 months, most infants could follow all three types of points.

In both studies, the less 9-month-olds had to shift their visual fields from the extended index finger to the target, the more likely they were to do so. This finding may shed light on the process through which infants come to comprehend communicative points. Infants may learn that points refer to objects by gradually associating the pointing gesture with objects close to or within the same visual field as the extended index finger. The hypothesis is that a necessary component in initially comprehending the meaning of a partner's referential gesture is seeing the point and the object in proximity without having to switch gaze from one to another. Indirect support for the hypothesis is provided by Murphy and Messer's (1977) observations that early maternal points often actually touch the object being pointed at.

At least in the case of points and probably in comprehending other manual gestures as well, the infant's social partners construct physical contexts that scaffold the infant's developing comprehension of the conventional message. As will be seen in the following sections, social context is also an important factor in infant gestural production.

Social Context Affects the Production of Gestures

In what types of social contexts are infants likely to gesture communicatively? Bakeman and Adamson (1984, 1986) addressed this question with data from videotaped home visits of 28 infants playing with mother, with a familiar peer, and alone when the infants were 9, 12, and 15 months old. Bakeman and Adamson (1986) found that, when infants were with their mothers, they made more conventional gestures such as offers of objects and ritualized requests than when with a peer or alone. When with mother, infants spent more time in states of *coordinated joint engagement*, either actively gazing back and forth between an object and a partner or simply attending to the same object as the partner, and infants spent more time involved in *conventional routines*, such as playing with a toy phone or pretend eating ("action formats" in Bakeman & Adamson, 1984). The percentage of time the infant spent in coordinated joint engagement and conventional routines and the infants' rate of communicative gesturing increased from 9 to 15 months.

What was it about interaction with mother that facilitated communicative gesturing? In general, communicative gesturing tended to occur at times when the infant was jointly engaged with mother and an object and involved in a conventional routine. However, joint engagement and conventional routines also had rather different effects on offering and pointing. At both 12 and 15 months, joint engagement was associated with a high rate of showing and offering objects, whereas conventional routines had no independent effect. However, at 15 months, both conventional routines and joint engagement were associated with increased pointing.

From a social-dynamic perspective, it is not surprising that different gestures are facilitated in the context of diverse social activities. Although offers and requests both involve joint engagement, they seem to involve very different infant goals. In preliminary results from a longitudinal study, Messinger and Fogel (1990) found that infant offers were more likely to cooccur with coordinated joint engagement and were more likely to involve smiling than infant requests, indicating that offers may be occasions for "making contact" with mother by visually engaging her or smiling. In contrast, requests (e.g., points) were more likely to take place during the table condition where mother could control access to the toys rather than during the floor condition. Thus infants seemed to offer objects to become more engaged with mother and seemed to request objects from mother to become more engaged with an object.

The results of the Messinger and Fogel (1990) study, together with those of Bakeman and Adamson (1986), suggest that the conditions under which infants offer and point are likely to differ and to reflect different social dynamics. Regarding offers, Reinecke (1987) noted that shortly after voluntarily releasing objects to mothers, the two infants he studied began to extend objects in offers. Although such detailed description is helpful, these observations need to be codified and employed with larger numbers of subjects. Moreover, more precise descriptions of play routines and conventional routines, which appear to be the site of some early referential offers (Reinecke, 1987), would also be helpful.

Following Vygotsky (1978), detailed work has been carried out on the origins of conventional requests. Vygotsky hypothesized that points develop out of the infant's unintentional finger extensions when reaching for objects. Partners respond by giving the object *as if* the infant's gesture were communicative, providing the conditions for the infant to point with the intention of eliciting the partner's offer. This is reminiscent of Lock's (1980) description of how a partner's responses to an infant's requests at 12 months were associated with increasingly clear gestural requests that culminated in a point at 14 months. In a more systematic, but less developmental treatment, Lock, Young, Service, and Chandler (1990) found that mothers who were less responsive to their infants' requests had infants who requested less than infants who had more responsive mothers. However, Bruner (1983) found that requests for objects began at 9 months as responses to mother offering the object. The degree to which requests are facilitated by responding to the infant and the degree to which they are scaffolded by mothers presenting the object needs further investigation.

To summarize, infants are more likely to gesture conventionally when they are with adult social partners, particularly when the infants integrate their awareness of the adult and the physical environment. It should be noted, however, that as conventional gestures do occasionally occur outside of these contexts, the contexts do not appear to be *necessary* to infant gesturing. Instead more abstract features, which may often be created within these social contexts, could be necessary to various gestures. Thus we hypothesize that offers involve awareness of both object and partner (as indexed by joint visual engagement) as well as a desire to engage the partner (as indexed by involvement in games and smiling). Conventional requests are hypothesized to involve a desire for an object and a social partner who can reliably be signaled to give the object (as indexed by increased requests when infants are dependent on their partners for objects and when the partners tend to respond to requests by providing objects). To ask how infants begin to gesture

communicatively, then, is to ask about the social history of a particular gesture: the pattern through which it becomes conventionalized in the context of other social activities.

An area of research in which attention has been devoted to the acquisition of specific gestures (such as making a particular sign for an object or referring with a point) is the study of gestural "input." The literature reviewed on this topic (see also Acredolo & Goodwyn, 1990) indicates that the extent of gestural input an infant receives affects the extent of his or her early gestural "vocabulary."

Acredolo and Goodwyn (1990) trained the parents of six infants to encourage gestures in their infants. Parents were provided with five new toys, each of which they were instructed to embed in a daily routine with their infants, while modeling an iconic gesture and providing a verbal label for the toy. From approximately 11 to 18 months, 120 symbolic gestures were reported for the six infants. Though there was no control group, the mean of 20 signs per infant was severalfold higher than the means of between four and five signs for untrained groups assessed in earlier retrospective and diary studies (Acredolo & Goodwyn, 1988). These results suggest the degree to which social context may facilitate gesture use. Some combination of factors, including embedding the object in a daily routine (e.g., bath time), and providing both gestural and verbal input, appears to have increased the range of gestures that infants employed and probably the frequency with which they were used as well.

Similar studies have shown that deaf and hearing children, exposed to American Sign Language (ASL), develop gestural signs earlier than hearing children develop spoken words. For example, Orlansky and Bonvillian (1985) report that the average age for first sign production among 13 hearing infants who received ASL input was 8.6 months, which is substantially earlier than the average age of onset of spoken words (11 to 14 months).

It appears that infants regularly exposed to large amounts of gestural input develop, and use more, communicative gestures and use them earlier than other infants. However, it is not clear whether everyday gestural input (e.g., parental pointing) is *necessary* to the development of infant gesturing (Goldin-Meadow & Mylander, 1990). It is also important to note that Acredolo and Goodwyn (1990) found no strong evidence in the literature that social context can catalyze *symbolic* gesture use, in which the infant manifests understanding that referents refer to things in a variety of contexts, earlier than 1 year.

Nevertheless, increased gestural input that is embedded in everyday contexts increases the number of gestures that infants use with their partners. Whether these gestures are more likely to be produced in the same social contexts that facilitated the communicative gesturing discussed earlier, such as conventional routines and joint visual engagement, remains open to investigation.

Conclusion

At 9 months, both infants' receptive and expressive gestural communication is limited. However, the provision of contextual components can facilitate increased performance. Nine-month-olds will look from a referring index finger to an object only if the two are, from the infant's perspective, in proximity to one another. It may be that to comprehend early communicative gestures, the conventional meaning of the gesture must be made manifest by the social and physical contexts in which it

is presented. Similarly, Bakeman and Adamson (1986) found that only one-seventh of their infants made one or more gestures with mother at 9 months. However, concentrated gestural input (i.e., ASL) seems to catalyze communicative gesturing as early as nine months.

Between 9 and 12 months, infants' production of communicative gestures increases, as does the amount of time spent in communicative activities such as coordinated joint attention and conventional routines. The social scaffolding of infant communication through joint activity, coordinated joint attention, explicit demonstration of gestural models, and appropriate response to infant gestures, all seem to increase the rate or broaden the range of infant communicative gesturing. However, the mechanisms through which these elements affect gesturing remains unclear.

By 15 months, infants spend an average of one-tenth of their time interacting with mother in states of coordinated attention, four-tenths of the time in conventional routines, and produce an average of almost one communicative gesture per minute. Infants have also begun to use gestures (and words) spontaneously as symbolic referents for classes of objects. The social context of joint engagement with mother remains a facilitating context for infant communicative gestures. Yet the rate of communicative infant gestures with peers increases, suggesting that the gestures have become more robust and can be generalized to other social contexts.

From 9 to 15 months, physical and social context facilitate the comprehension, production, and development of communicative gestures. However, we lack an understanding of the dynamic mechanisms through which social context facilitates gesturing. Research to address this question must use more infants than a case study format allows; yet observations must be detailed and frequent so that the *process* of development can be described (e.g., Fogel *et al.*, 1990). Relevant coding variables include (1) detailed coding of different types of infant gestures at various levels of conventionality, in temporal relation to partner gestures coded at the same level of detail; (2) patterns of partner and infant gaze; (3) precisely defined play sequences that include information on infant activity or passivity; and (4) pragmatic coding of the infants' partners' activities. Log-linear techniques that analyze at the level of gesture are recommended. These analyses can determine whether infant gestures are likely to occur prior to, concurrent with, and/or subsequent to patterns of events in all of the modalities listed. Log-linear techniques can also be used to document how facilitating conditions change with age, providing a contextual history of the comprehension and development of infant gestures.

The next sections will highlight the complexity of social context. We first discuss how the different interactive styles of mothers and fathers influence communicative development and conclude with a section on the influence of triads and larger groups on infant communicative development.

DIFFERENCES IN MOTHER—VERSUS FATHER—INFANT INTERACTION

In an attempt to understand the role of family context on infant development, researchers have looked at the differences in communicative strategies between mothers and fathers in various situations. However, the effects of these differential strategies on infants' communicative and social development is not clearly under-

stood. Unlike the process-oriented research reported for face-to-face play and gestural communication, researchers studying between-parent differences have focused on the global styles of parents and infant outcome variables rather than on the process of social interaction and infant development. In order to see a more complete picture of parent–infant social interactions, we need investigations that track the patterns of behavioral changes within these contexts. We focus the following review on a critique of the literature from a process perspective.

Background

The influence of fathers has been studied in the development of gender roles (McGuire, 1982), cognitive development (Parke, 1981), social competence (Easterbrooks & Goldberg, 1984; Sagi, 1982), and independence (Parke, 1981). Even though fathers seem to serve important functions in their infants' development, the process by which fathers contribute to these outcomes is unclear. Why and what are fathers doing during interactions with their infants that is different than mothers? How are infants responding to their mothers versus their fathers?

Studies comparing mothers and fathers have examined a variety of behavioral differences—from responsiveness to cries (Donate-Bartfield & Passman, 1985) to play behavior. In this review, we focus on parent–infant play for several reasons. First, play is increasingly being recognized as a context in which infants can learn and develop a variety of cognitive and social skills such as turn taking (Stern, 1977, 1985). As Fogel, Nwokah, and Karns (in press) point out, parent–infant play is a creative process that emerges from the dynamics of social discourse between two or more individuals, within a particular cultural and physical context. Second, play is one of the most extensively studied areas in which parental differences have been observed. Kotelchuck (1976) reports that mothers spend approximately 25.8% of their time with infants in play activities, whereas fathers spend 37.5% in play. Thus play provides a natural arena for looking at the differential effects of parents on infants.

This section has two objectives. First, we describe major investigations on parent–infant play. Second, we attempt to convey what is missing from each report that would be needed to understand the multiple facets of infant social development. The approach we take is to determine what answers the studies can provide to the following five questions: (1) What do we learn about fathers' actions versus mothers'? (2) How close does this study come to describing social interaction? (3) What is missing from the study? (4) What do we learn about infants' behaviors? (5) What do we learn about the process of infant social development?

Father–Infant Play Research

In a classic study using play observations, Clarke-Stewart (1978) observed families when their infants were 15, 20, and 30 months of age. First, the investigator observed infants within the natural family context. Second, parents were asked to choose between activities that were either social/physical (e.g., playing little piggy), intellectually stimulating (reading a story), or independent activities (child plays with toy on own). Clarke-Stewart found that, in the forced choice condition, father–infant play was more likely to be physical and arousing and less likely to be didactic, intellectual, or mediated by objects as mother–infant play. However, in the

naturalistic observations, there were no significant differences between mothers and fathers in the frequency or quality of social/physical play. Clarke-Stewart reported that children seemed to prefer fathers' play over mothers', and they were more responsive to play initiated by their fathers, but only during the forced choice condition.

Power and Parke (1982) videotaped mothers and fathers playing with their 8-month-old infants. They reported that parents engaged in three main types of play activity bouts: attention/arousal-regulating bouts, exploratory bouts, and communicative bouts. The results indicated that fathers engaged in more physical bouts (i.e., toy touching and lifting infant) than mothers. Fathers treated male and female infants more differently than did mothers. Fathers were more likely to encourage visual, large motor, and fine motor exploration in their sons while encouraging vocal behavior in their daughters. Mothers tended to watch more and engage in toy play that "successfully engaged in the infant behavior that defined the bout" (Power & Parke, 1982). For example, an illustration of a behavior in a large motor bout would be retrieving a toy. The investigators suggested that fathers turned to physical play because their toy play was not usually successful. Power and Parke contended that their results indicate that fathers' engagement in physical bouts may lead to their playing a major role in infant social development and that mothers' greatest influence is in the realm of early exploratory and cognitive development.

Belsky, Gilstrap, and Rovine (1984) conducted a longitudinal study of patterns of mothering and fathering when infants were 1, 3, and 9 months of age. Though this study did not focus on play but rather on naturalistic home observations, it provides valuable information on parental differences and similarities. They reported that fathers tended to watch more television and read, whereas mothers responded to, stimulated, and took basic care of infants more frequently. However, Belsky *et al.* (1984) noted that fathers are as sensitive to the developing nature of their infants as mothers. For both parents, frequency of responding to and stimulating the infant increased over time. As the infants grew older (3 months), mothers and fathers alike frequently directed the infant's attention to objects. Belsky *et al.* (1984) found that by 9 months of age, the frequency of infants' smiling and positive displays are correlated with measures of father involvement and marital interaction (defined as intensity of engagement between spouses).

Crawley and Sherrod (1984) conducted a cross-sectional study of 7-, 10- and 13-month-old infants in their homes. Infants were observed either with their mothers or with their fathers (not with both). Results indicated that regardless of infant age, both parents spent the majority of the time manipulating objects in play. Fathers used physical rough play more, and their play showed developmental changes that were similar to mothers. As infants grew older, both parents played games that were more sophisticated and that allowed the infant to use coordinated schemes, such as object manipulation. However, fathers increased their use of this type of play between 7 and 10 months, whereas mothers increased gradually over the 7- to 13-month period.

In summary, the studies described provide some information about differences in parents' play styles. Overall, it appears that fathers' play with infants is more social and physical. On the other hand, mothers' play is generally believed to be object mediated and more intellectually focused. Even though the investigations presented in this section were not designed to provide the answers to the five

questions previously posed, we can begin to determine what needs to be done to further understanding about infant social development.

First, even though we have learned something about mothers' actions versus fathers', in some cases this information was constrained by factors such as using forced-choice play procedures or observing only one parent in a family. The most important problem, however, is that in two of the studies (Belsky *et al.*, 1984; Clarke-Stewart, 1978) it is uncertain whether direct effects of the father were ever assessed. In both efforts, when fathers were home, they were observed within a triadic situation. Thus any direct effects are obscured by the presence of the other parent. For example, within a triadic context, fathers may not be using intellectual play as they could be leaving it up to mothers to play in this style. Also, fathers would not be as likely to watch as much television or read if mothers were not present. If fathers were alone with their infants, they may be just as responsive and stimulating as mothers.

A second complication with these studies is their statistical methods. Most studies use analyses of variance or correlational methods that do not describe the process or dynamics of social interactions. Because no contingency or other types of process analyses were conducted, we do not know what type of events precipitated or followed particular behaviors, such as fathers' changes from toy to physical play. Thus it is difficult to determine how infants and parents coregulate each others' behaviors within social interactions.

A third problem with this research is that information on infants' behaviors with each parent individually is not provided, thus making it difficult to determine the sequence of developmental events. Do particular infant behaviors occur more with one parent than the others and does this pattern change over time? For example, Belsky *et al.* (1984) reported that fathers' involvement resulted in more smiling. Does this correlation exist due to direct effects, such as games fathers play, or is it due to an indirect effect such as a good marital relationship? When fathers use toys, what do infants do when their father's toy play is unsuccessful? Do infants cry or look away? Because members of a dyad coregulate each other's behaviors, what happens within the context to cause father to start physical play? Does the infant become engaged or redirect the father's attention? More data concerning infant behaviors during play interactions are needed because infants may play a role in encouraging fathers' use of proximal play. As we cannot answer these questions with the available research, we are learning very little about infants' social development or the interactional contexts.

The final concern with this work is that cross-sectional studies do not allow inferences about developmental processes, particularly when little is reported about infant behaviors. Due to cross-sectional procedures, dyadic and triadic history effects are neglected, such as how a mother typically constructs a play situation with her child alone versus how she does it when the father is present.

Parental Effects on Infant Behavior

One common feature of the investigations described is that they do not report how infants' behaviors differ between maternal and paternal play contexts. In a few studies we catch some glimpses of infant behavior during play with either parent that will be described next.

Yogman (1982) studied both parents' and strangers' weekly interactions with

3-month-old infants. An analysis of mutual regulation revealed that there are similarities in joint regulation during dyadic interactions of infants with their mothers and fathers. The author reported that fathers' interactions were more arousing and playful than mothers', whose interactions were more contained and smooth. Infants vocalized more with mothers than fathers. It appears that fathers' physical games resulted in aroused, attentive 3-month-old infants who remained still (immobile) more than with their mothers (Yogman, 1982).

By using longitudinal techniques, Yogman was able to present us with the most descriptive work done on infants and parents' interactions within a laboratory context. However, the author analyzed the monadic phases, or temporal structures of the interactions, by using a system developed by Tronick (1977). Fogel (1988) argues that the use of monadic phase scaling distorts the temporal organization of interactions as it clumps different types of behaviors together. Thus this system ignores discrete behaviors that defeats any functional significance of the interactions for parents and infants. Once again, developmental process is being obscured, this time by a statistical technique.

Field, Vega-Lahr, Goldstein, and Scafidi (1987) examined face-to-face interactions between 8-month-old infants and their employed mothers and fathers. They found that mothers smiled, vocalized, and touched their infants more than fathers. In turn, the infants tended to smile more and were more active with their mothers. However the investigators do not provide any information regarding how the infant was behaving in the presence of their fathers. They do point out that because the infants were in high chairs, this may have restrained fathers' usual mode of physical play. Field *et al.* (1987) did not conduct any sequential analyses; rather, repeated measure analyses of variance were employed. The problems with these approaches to infant communicative and social development have been discussed many times in this chapter.

In the last study to be discussed, Teti, Bond, and Gibbs (1988) compared play behaviors of mothers, fathers, and firstborn siblings with infants aged 12 months and later at 18 months. They reported that mothers and fathers were more alike than different in the amounts of play experiences they provided. In interactions with infants, mothers played with objects more than fathers, who in turn played with objects more than siblings. Teti *et al.* (1988) reported that mothers did more nonsocial object play than fathers, who used objects more socially. However, fathers' play involved language as much as mothers'. Thus they suggest that their results support Power and Parke's (1982) assumptions that mothers' object play contributes to cognitive competence, whereas fathers' social play with objects may have an impact on social and communicative development.

This study provides some insight into how parents may be structuring their infants' environment. For example, the fact that parents choose different activities with toy play (social with fathers vs. nonsocial with mothers) offers some information about how their respective interactions differ. However, we need more description of the interactions and more information about the infants' affect and behaviors within parental contexts to draw any conclusions.

Conclusion

The aforementioned investigations suggest that fathers provide a qualitatively different play context than mothers. Researchers are consistent in their reports that

fathers play and act differently than mothers, particularly with toys. There is also the implicit assumption that fathers are insensitive to infant cues. Ninio and Rinott (1988) found that fathers tended to underestimate their infants' needs for, and capacities to engage in, more complex, cognitively demanding activities. In contrast, Crawley and Sherrod's (1984) results indicate that fathers may overestimate infants' abilities because they start more complex interactive play in an earlier timespan than mothers.

Many researchers report that mothers play in a consistent, contingent manner with their infants (Clarke-Stewart, 1978; Power, 1985; Yogman, 1982). The implication is that fathers and others do not play in this manner. Fathers may be providing a context that is less contingent on infant behaviors during play. However, high levels of contingency in play may be a culturally restricted phenomenon associated with American mothers. Carlile and Holstrum (1989) found that both mothers and fathers of the Chamorros of Guam treated infants more like American fathers in terms of involvement and play style.

Fathers could be following their own agenda in play, such as choosing toys *they* like to play with themselves, rather than what the infant prefers. It could be that fathers introduce more objects and "interfere" in order to encourage the infant to play with *him*. Further support for this hypothesis comes from Crawley and Sherrod's (1984) finding that fathers urge infants to play more interactive games at an earlier age than mothers. Also, fathers could be motivated to play in a physical manner because infants appear to like this as they smile and laugh more during this type of play (Clarke-Stewart, 1978; Power & Parke, 1982). Thus fathers' actions may be tapping different developmental processes than mothers. For example, within at least a partially noncontingent play context, infants may have to learn different types of social skills (e.g., gesturing or reaching) that will enable them to obtain what they need or want in such social situations. In summary, fathers may provide a different type of social experience that affords opportunities for infants to develop unique communicative strategies.

It becomes apparent that the studies described provide us with some insight into how the social context might influence infant communicative development. However, they do not give us the detail we need to adequately describe the process of infant social development. We need more descriptive, longitudinal investigations with frequent observation intervals that include analyses that capture the dynamic interactions between individuals in a social context. In the next section, we examine how the addition of others to the infants' social interactions complicates and changes the communicative system.

INFANTS IN GROUPS

Polyadic interactions, which include more than two participants, involve a host of interactive possibilities to infants. For example, in a triadic situation, two participants may form a dyadic interaction while the nonparticipant may engage in behavior nonrelated to the dyad, direct interaction attempts toward one or both participants of the dyad, or may monitor the interaction occurring in the dyad. It is this host of interactional possibilities that makes the study of polyads potentially amenable to a dynamic interactional perspective.

Nevertheless, most polyadic research has remained focused on either individ-

ual participant behaviors or on dyadic interactions. This is probably due to the daunting number of interaction possibilities and indirect effects that accompany the addition of each interactant. Two major types of investigation have been popular within the polyadic context. Between-dyad comparisons ask, assuming a common participant (A), what are the behavioral differences between dyad AB and dyad AC? The second type of investigation concerns indirect effects. The behaviors of participants A and B in a dyad are contrasted with the behaviors of the same dyad AB placed in a polyadic context. Differences in behavior between the two contexts within the same dyad are interpreted as evidence of the indirect influence of an additional participant, C, found only in the polyadic context.

Lewis and Feiring (1981) suggest several types of indirect effects that the members of a polyad may have on the interactions of other members. Infants may model or imitate behaviors observed in dyadic interactions among other members, may monitor the interactions of dyads to learn appropriate behaviors, and may experience dyadic interactions altered by the relationships and interactions of the dyadic partner with nondyadic members of the polyad. For example, infants may refrain from behaviors from which they have observed their siblings being punished.

Few studies, however, have focused on how infant communication is affected by the polyadic context. In reviewing research on infant social interaction in group contexts, we can ask similar questions to those posed earlier in reviewing the effects of mothers and fathers on infant social interaction. How well does the study describe social interaction and infant behavior? Does the study provide us with information on how infant action interfaces with those of other participants and on how this process affects infant development?

Siblings in the Family

Murphy (1988) used longitudinal family observations to study the developing relationship between a newborn infant and an older sibling. Families displaying strong sibling mutuality, defined as siblings who were especially sensitive in reading infant cues and responding contingently and empathically to the infant, were the same families where parents showed mutuality with the older siblings. The parents' communication with the sibling reflected a view of the older child as a person of value with unique needs and feelings. In families where the parent-sibling dyad did not display mutuality, the sibling-infant dyad also lacked this quality. Murphy's research, which built on the parallel findings of Kreppner, Paulsen, and Scheutze (1981), reveals that the relationship between parent and sibling influences the sibling's subsequent interaction with the infant. However, these studies provide little information on infant actions, nor do they address how infant actions interface with those of siblings and parents.

Teti and Ablard (1988) used a structured laboratory playroom situation to examine how the attachment of the infant's sibling to mother would influence the interaction of the triad in a play situation. Infants were 1 to 2 years old, and siblings ranged from 2 to 7 years old. Securely attached siblings spent more time consoling distressed infants than did insecurely attached siblings. Infants displayed more positive behavior with securely attached siblings than with insecurely attached siblings.

Both Murphy's (1988) and Teti and Ablard's (1988) investigations illuminate how the quality of an infant's relationship with her siblings is affected by the

sibling's prior interactive history with the parent. Unfortunately, these studies do not adequately describe the interactional accompaniments of mutuality and secure attachment. What, for example, was the secure sibling's role in the interactions in which the infant was positive with them?

Kendrick and Dunn (1980) have gone further in investigating actual, real-time differences in polyadic interaction. They compared parent-sibling interaction when the mother was (1) not caretaking the infant or involved with household tasks, and with (2) situations when the mother was actively involved with either the infant's needs or household activities. When mothers were interacting with infants or involved with household tasks, there was both increased confrontation and increased positive involvement between siblings and mothers. This was a triadic interaction in which mother participated simultaneously in both the parent-infant dyad and the parent-sibling dyad, displaying differences in each. When the mother was not involved with the infant or household tasks, the parent-sibling dyad was likely to be less active. Mother's degree of involvement with the infant affected the mother-sibling dyadic interaction within the mother-sibling-infant triad.

The studies of Murphy (1988) and Teti and Ablard (1988) exemplify how the quality of interaction of one polyad (parent-sibling) can have unforeseen positive results on another polyad (sibling-infant). Moving in a different direction, Kendrick and Dunn (1980) have shown that mother's interaction with the infant also has an effect on her interactions with an older sibling. Involvement with the infant (or household tasks) had the unforeseen consequence of intensifying mother's relationship with the sibling. However, as with the other investigations, Kendrick and Dunn (1980) offer little information on what the infants were doing or on how their actions impacted and were impacted by the behaviors of siblings and parents. One wonders, for example, what impact the infants Kendrick and Dunn observed had on maternal activity and how that in turn affected the mother's increased confrontation and positive involvement with the sibling.

Twin Infants in the Family

Mothers with infant twins are a naturally occurring triad with an extensive interactive history. A small number of studies have focused on the process of interaction within families with twins (e.g., Karns & Fogel 1990; Tomasello, Mannle, & Kruger, 1986). However, most of the research on triadic interactions that includes twins focuses on outcome measures. For example, the behaviors of twins are often compared to those of singletons.

Dickman and Clark (1985) found that certain interactive behaviors emerged early for twins. In a study of social competence, one pair of twin boys and their mother were videotaped monthly in a lab playroom from age 8 months to 2½ years. The twins showed interactive behaviors at an earlier age than the norms for singletons. In a similar vein, Goshen-Gottstein (1986) observed 14 sets of twins, triplets, and quadruplets in their homes, beginning in infancy. These multiple-birth infants generally began visual interactions during the fifth or sixth month. Interactions involving touching and taking were common by 8 months. Goshen-Gottstein (1986) observed examples of even more precocious interaction, such as a set of twins interactively touching at 5 months and copying each other's vocalizations at 7 months. Larger subject pools and comparison with control groups of

singletons are clearly needed. However, the findings of Dickman and Clark and Goshen-Gottstein suggest that the history of interaction infants of multiple births experience with their birthmates may facilitate the development of sophisticated patterns of social interaction.

Interestingly, from a linguistic perspective, the division of maternal attention toward each twin can be viewed as a deficit. Each infant receives less interaction with mother because mother's interactive behaviors may be divided between the two infants. The linguistic environment of twins was the focus of a longitudinal study carried out by Tomasello *et al.* (1986). They compared triadic interactions of mother-twins with the dyadic interaction of mother-singleton pairs. Mothers in both contexts displayed the same levels of speech and interaction. The twins scored lower on tests of language development than singletons. However, both the language learning environment of the twins and their language development differed from those of the singletons. When analyzed from the infant's point of view, each individual twin received less speech directed specifically to him or her. The individual twin had fewer and shorter episodes of joint attentional focus with mother and had fewer and shorter conversations with her. The twins' mothers were also judged to be more directive in their interactional style. These differences between triadic mother-twin interactions and dyadic mother-singleton interactions were positively correlated with the language development of the children (Tomasello *et al.*, 1986).

These twin studies show clear outcome differences for infants whose social development occurs within a group context. The studies exemplify the sensitivity of communicative skills to the particular features of the social contexts in which they emerge. Children of multiple births are likely to show interactive behaviors with peers earlier than singletons, presumably because of the quantity and regularity of their interactions with each other. However, the language development of the infants of multiple birth may be retarded because having a same-age sibling limits opportunities for direct linguistic input from the adult. Thus differences in everyday interactive context between infants of multiple births and singletons may be associated with different patterns of social and communicative development. With respect to singletons, infants of multiple births appear to be ecocious in their interactive competence with each other and somewhat retarded their linguistic development.

One wonders, however, about the processes of social interaction that yielded these outcomes: What is the developmental history of between-twin patterns of interaction? How does the onlooking twin respond when mother directs attention speech to his or her twin? It was in order to address these process-oriented questions that some of us (Karns & Fogel, 1990) coded the interaction patterns of triads and then calculated how these patterns changed over time.

Using two mother-twin triads observed weekly during the first year of life, Karns and Fogel (1990) found that more than half of the interaction time of triads was spent in fully triadic interactions or with one infant attending to one or both of other members of the triad. Triadic interaction was significantly likely to follow interaction patterns in which mother and one infant interacted as a dyad while the second infant attended to the interaction but did not participate. On the other hand, triadic interaction was not likely to follow periods in which mother and one infant interacted while the second infant was engaged in solitary activity. Triadic interactions, in turn, were likely to be followed by the pattern of an interacting dyad

with an onlooker or by a double dyad pattern in which mother interacted with both infants but with different activities.

By viewing twin infants and mothers as an interactive system, Karns and Fogel (1990) found that triads do not simply duplicate dyadic behaviors. Over one-half the interactions observed in these structured play sessions involve at least some participation from all three partners. Use of sequential analyses revealed some of the dynamics of the interactions of groups of infants with a caregiver. If the noninteracting twin is attending to the interaction of mother and sibling, she or he is more likely to be incorporated into a triadic activity than if she or he is engaged in solitary play. Thus the actions of the noninteracting twin have a dramatic effect on the other two partners. Approaches that focus only on the interaction of the twins, or only on the interaction of the mother and one twin, are missing the decisive but nonobvious impact of the third partner.

Infants in Group Play

Relatively few investigators have considered group sizes larger than triads because of the technical difficulties involved in observing infant interaction in large groups. The few studies that contribute to our knowledge of the dynamics of group behaviors have examined pairs of peers and established peer groups.

Ross, Tesla, Kenyon, and Lollis (1989) observed the peer conflicts of 20- and 30-month-old infants that occurred when the mothers of both infants were present. When conflicts occurred, mothers were found to support the rights of the peers rather than of their own infants. However, mothers' interventions were directed toward their own infants rather than towards peers, even if the peers were the challengers. Hay and Ross (1982) examined the process of conflict of 21-month-old infants in the same context and found a relationship between conflict roles and order. The loser of a conflict was more likely than the winner to initiate the next conflict. Additionally, some individuals were more likely to engage in conflicts than others. When play partners were rotated, the levels of conflict in the previous play group were predictive of conflict in the new play group.

Lee (1973) found that infants as young as 9 months patterned their interaction with respect to individual differences. Nine-month-olds in an established play group were least likely to approach an infant who had more negative responses, such as grabbing at a peer or a peer's toy. However 9-month-olds displayed a stronger preference for social interaction with peers who had more positive social responses such as smiles.

The findings of Hay and Ross (1982) indicate that in real time, previous losers are likely to initiate the next conflict and that there are individual differences in proclivity to be involved in a conflict. Lee (1973) found that in an ongoing social interactional context, 9-month-olds took account of these proclivities. They were less likely to approach peers who exhibited more negative social responses and were more likely to approach peers who exhibited more positive social responses. By 9 months of age, infants in group settings have developed varied patterns of interaction with different peers. An integration of Hay and Ross's (1982) analysis of the order of events with Lee's focus on peer response might provide a methodological setting for asking how infant peers' patterns of social response change with age.

Infants in polyadic contexts interact in patterns that cannot be derived from a linear transformation of the interactive patterns that occur in a dyadic context. Attending to the cooccurring interaction of a dyad, early complex interaction with a peer and avoiding a peer who is likely to grab toys are all examples of interactive patterns that are specific to (polyadic) interactions with peers. With respect to dyadic interaction with a caregiver, these patterns represent not only a quantitative increase in the number of interaction possibilities open to an infant but also a qualitative change in which new interactive patterns become possible.

These patterns of polyadic interactions have important and particular effects on infant social and communicative development. Although the quality of parents' relations with siblings are reflected in the quality of the siblings' relations with infants, maternal attention to the infant unexpectedly intensifies her interactions with the sibling. Although infants of multiple births develop early complex interactive patterns among themselves, linguistic development often suffers the deficits of reduced directed speech from mother. Triadic interaction of infant twins and their mother is likely to be preceded and followed by a pattern of one dyad interacting while the lone infant attends to this interaction. By 9 months, infant interaction with peers is shaped by a shared interactive history in which infants avoid certain peers and approach others based on their interactive style.

A dynamic interactive perspective asks about the social contexts, the interactive processes, and the physical settings that constitute these effects. Although no prefabricated research agenda can ever be provided, certain issues are clear. Research on infant interaction in polyadic contexts would do well to systematically describe infant behavior in temporal relation to the behavior of partners in naturalistic contexts. Such description could be used relatively frequently to document changes in these interactive patterns over time.

SUMMARY

In this chapter we have presented research from four areas of infant development in an attempt to illustrate the quantity and complexity of interactive effects on infant social and communicative development. In particular, the research demonstrates that different aspects of interactive context have different effects on infant behavior and development and that infant behavior and development is contingent upon the infant's shared interactive history with his or her partner.

Research on mother-infant face-to-face interaction has shown that infant social behaviors are multiply determined by the dyad's shared interactive history. Both infant behavior at the onset of a maternal still face *and* mother's historical level of positive affect predict how infants cope with the maternal still face. Maternal positioning of infants is associated with the history of their interactions. Only when dyads experience bouts of positive affect in conjunction with mutual attention will mothers respond to their infants' changing outward focus of attention by turning the infants away.

Research on communicative gesturing and on the infant interactions with mother, father, and groups of partners demonstrate how different facets of the

interactive context are associated with different types of infant social and communicative development. Visual engagement with an object and the social partner is associated with offering objects, whereas participation in conventional routines is often associated with requests and other types of points. Parental demonstration of gestures for objects in everyday settings seems to facilitate acquisition of these gestures, whereas presenting a gesture and its referent in proximity (from the infant's perspective) may catalyze an infant's comprehension of gestures.

In a similar vein, different aspects of interaction with disparate partners may have particular effects on infant social development. Fathers may tend to use less contingent interactive styles with their infants and engage in more physical play than mothers. Infants seem to enjoy this type of interaction and may learn to cope with extremes of positive affect such as excitement. Research on multiple partners has shown that infants' interactions affect and are affected by other interactions in a group context in unexpected ways. For example, twins' extensive social contact with each other may be related to their early interactive competencies, whereas the relative paucity of exclusive maternal speech and attention may retard language development.

This evidence illustrates that infant social and communicative development in the first 18 months of life is profoundly affected by interactive context. Both the history of the infant's interactional patterns and particular features of those patterns, such as type of interaction, partner, and number of partners, profoundly affect infant social and communicative development.

What is lacking is detailed description of the process through which these developmental patterns emerge in interactive context. Ultimately, the process of interaction is coconstituted by all partners in a situation. Partners are exquisitely sensitive both to each other and are affected by nonobvious elements of the physical situation. Moreover, because partners' actions cooccur and because interaction can always be coded in finer detail, turn taking is not an apt metaphor. Instead, partners weave an interaction together; their moment-to-moment actions constitute the warp and weft out of which relationships are created and maintained.

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