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Development of Mutual Responsiveness Between Parents and Their Young Children

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This comprehensive study of mutual responsiveness examined 102 mothers and 102 fathers interacting with their children at 7 and 15 months. Responsiveness was studied from developmental and individual differences perspectives, and assessed using macroscopic ratings and microscopic event coding. The latter captured parents' reactions to children's negative, positive, and physical bids, and children's reactions to parents' social-interactive bids, mood regulation attempts, and influence attempts. Responsiveness depended on bid type and child age, and reflected developmental changes in children, parents, and relationships. Mothers were more responsive than fathers; children were equally responsive to both parents and coherent in their responsiveness. Ratings revealed dyadic mutuality and longitudinal continuity of responsiveness. Parent–child responsiveness from 7 to 15 months was consistent with assumptions of a parent-driven process.

The importance of early parent–child relationships has been increasingly appreciated. Following the advent of the attachment theory, responsiveness has emerged as a central feature of early socialization. Research has documented the implications of responsiveness for a wide range of outcomes: attachment security, compliance, behavior problems, and cognitive and emotional development (Belsky, 1999; Belsky, Fish, & Isabella, 1991; Bornstein, 1989; Crouter & Head, 2002; De Wolff & van IJzendoorn, 1997; Martin, 1981; Shaw & Winslow, 1997; Thompson, 1998; Wachslag & Hans, 1999).

Responsiveness has been most often seen as the quality of the parent's (mostly mother's) style of reacting to the child's signals and bids directed to the parent. The child's responsiveness to parental bids in naturalistic settings has been studied much less than parental response to child, perhaps with the exception of the research on infancy, where children's responsiveness has been studied in the context of face-to-face communication (e.g., Van Egeren, Barratt, & Roach, 2001). Such a top-down focus fails to incorporate a modern view of the parent and child as active partners who jointly shape the process of socialization (Bell, 1968; Collins & Laursen, 1999; Lerner, Rothbaum, Boulos, & Castellino, 2002; Maccoby, 1992, 1999; Schaffer, 1999). In this modern approach, mutuality, inherently bidirectional, has become a key construct (Deater-Deckard & O'Connor, 2000; Harrist & Waugh, 2002; Maccoby, 1999).

Furthermore, responsiveness has been most often studied with respect to the emotionally negative cues, perhaps because of the importance of child fear, distress, and pain, and of parental comfort and reassurance in the attachment theory. Although parental responsiveness to children's distress is admittedly significant, early social interactions encompass children's and parents' bids of many modalities. Most of children's overtures toward their parents may be affectively neutral or positive, rather than negative. The focus of research on responsiveness on the child's signals of distress is needlessly confining. Parental responsiveness to different types of child bids may have varying consequences for the child. Responsiveness to distress cues may lead to the emerging confidence in protection, whereas responsiveness to other bids—to the emerging sense of control and agency (Goldberg, Grusec, & Jenkins, 1999). We believe it is important to collect ecologically valid data on many types of bids commonly produced by both parents and children in free-flowing interactions, including data on their developmentally changing frequencies and on the responses they elicit from the interaction partners.

Two decades ago, Maccoby (1984) called for an integration of two prominent foci in developmental psychology: on developmental change, typical in

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cognitive research, and on individual differences, typical in socioemotional research. Still, with a few exceptions (Kuczynski, Kochanska, Radke-Yarrow, & Girnius Brown, 1987), most of the research on responsiveness has continued to highlight individual differences. Parent–child responsiveness is rarely seen as a developmental process that reflects maturational changes in the child and accompanying changes in the parent and in their relationship. Consequently, developmental aspects of parent–child responsiveness remain poorly understood. We adopt a dual focus: on developmental change and on individual differences.

Finally, not enough attention has been given to father–child dyads, despite growing recognition that development is best understood in the ecology of family relationships (Belsky, 1984; Belsky et al., 1991; Collins & Laursen, 1999; Parke, 2002; Parke & Buriel, 1998). Although research that involves both parents has grown (Belsky et al., 1991; Lamb, 1997; Volling, McElwain, Notaro, & Herrera, 2002), the picture of responsiveness in the network of early relationships is far from complete. Some, though not all, studies find that mothers are more responsive than fathers (Power & Parke, 1983; Volling et al., 2002) and that the two parents act differently with their children in dyadic interaction, with mothers engaging in more caregiving and comforting, and fathers engaging in more high-intensity play (Lamb, 1997; Parke & Buriel, 1998).

The first set of goals of this study was to provide descriptive data on responsiveness in a comprehensive framework. We viewed responsiveness between the parent and the child as a bidirectional, developmental process, and we coded the parent's responsiveness to the child and the child's responsiveness to the parent in an analogous manner. The study included mother–child and father–child dyads, observed in naturalistic interactions at 7 and 15 months. We adopted two approaches to assessing responsiveness, based on research comparing ratings with event frequency counts (Cairns & Green, 1979; Clark-Stewart & Hevey, 1981; Hetherington & Martin, 1979; Maccoby & Martin, 1983; Rothbaum & Crockenberg, 1995; Waters, 1978). It has been argued that ratings may capture person-oriented, enduring, traitlike features of individuals, whereas coding microscopic events is situation specific and may vary from context to context for the same person. Thus, global ratings and microscopic codes may provide complementary windows into the parent–child relationship.

Consequently, we applied two independent coding systems. The first one was based on the classic study by Ainsworth, Bell, and Stayton (1971); it involved macroscopic, global ratings of sensitivity, acceptance, and cooperation (Kochanska, 1998), based on coders' overall impression. The second approach focused on microscopic coding of discrete bids. We captured several modalities of interpersonal bids by both partners. The choice of the modalities was based on what we had most frequently observed in our research. For parents, we coded social-interactive bids (verbal or nonverbal attempts to engage child), mood regulation attempts (soothing, comforting, distracting from distress), and influence attempts (asking child to start or stop an activity, to cooperate with caregiving), and we assessed children's responsiveness to those bids. This coding was an original contribution of this study.

For children, we coded emotionally negative cues and bids (distress, upset, crying), emotionally neutral or positive bids (most often social overtures, vocalizations, smiles), and physical events or signals (coughing, sneezing, choking, other physiological cues), and we assessed parental responsiveness to those bids (Kochanska, 1998). Because for both sets of codes we had the full matrix of empirical data (responsiveness of the mother to the child, of the child to the mother, of the father to the child, and of the child to the father) at both times, at 7 and 15 months, we could address multiple questions regarding the ecology of early parent–child responsiveness. Do mothers and fathers direct different bids to their infants? Do those bids change as infants mature, reflecting parental adaptation to developmental changes between infancy and early toddler age? Do young children direct different bids to mothers and fathers? Are maturational changes, such as the emerging self and intersubjectivity, reflected in children's bids to parents? Do parents and children respond differently to the other's bids varying in modality at 7 and 15 months?

The second set of goals was to examine individual differences questions in the developing early mutuality. Is parents' and children's responsiveness to each other longitudinally stable? Is child responsiveness coherent across two parents? Is mother's and father's responsiveness to the child coherent?

The third set of goals addressed evolving mutuality within the parent–child dyad. How does mutuality emerge? As noted earlier, most scholars agree that both the parent and child contribute to their relationship. Easy, responsive children likely have supportive, responsive parents; difficult, oppositional, unresponsive children likely have rejecting and unresponsive parents. Who plays the dominant role in driving interactive processes in the dyad?

Some scholars have seen socialization as mostly parent driven because of the asymmetry in power

(Hoffman, 1975) or because of the parent's leading role in forming the attachment relationship (Sroufe, 1985). But others have viewed socialization as child driven (Bell, 1968) and argued that different infants elicit different parental responses. Most scholars adopt a bidirectional view in which both partners are seen as shaping their evolving relationship (Collins, Maccoby, Steinberg, Hetherington, & Bornstein, 2000; Maccoby, 1992, 1999).

We suggest that the relative roles of the parent versus the child may change developmentally. The bidirectional view may accurately depict dynamics of relationships between parents and their toddler or preschool age children, who are active participants in exchanges. In very early stages of developing mutuality, however, given the asymmetry in power, competence, and ability to comfort (Maccoby, 1992; Sroufe, 1985), the parent may play the primary role, setting the stage for the relationship (Wahler, 1990). Parents who are responsive to their infant take the lead on promoting responsiveness in the child (Maccoby, 1983), perhaps because they instill fundamental trust and security in the infant.

We asked those questions with regard to the longitudinally emerging mutuality. Using structural equation modeling (SEM) techniques within a cross-panel framework, we tested three hypotheses, each depicting an alternative process of emerging longitudinal mutuality (Bollen, 1989). The first hypothesis—parent-driven mutuality—was consistent with our view. It depicted early parental responsiveness as influencing the child's future responsiveness to that parent. The second hypothesis—child-driven mutuality—depicted the child's early responsiveness as influencing that parent's future responsiveness. The third hypothesis—bidirectional mutuality—depicted both the parent's and the child's responsiveness as influencing future responsiveness of the partner in that dyadic interaction.

The assumptions implied by each of the first two unidirectional hypotheses or models (parent and child driven) were evaluated relative to, or tested against, a null, baseline model. The baseline model assumed the absence of longitudinal mutuality. The third, bidirectional model was tested against both unidirectional models.

All three comparisons involved the use of nested likelihood ratio (LR) chi-square statistics. Unlike the traditional regression techniques, SEM in a cross-panel framework provides rigorous statistical control over two factors simultaneously: (a) longitudinal stability of responsiveness of each individual in a dyadic relationship, and (b) the concurrent correlations among responsiveness measures from all three family members. In addition, SEM techniques allow us to evaluate whether the model assumptions provide an adequate and comprehensive explanation of the studied phenomena.

Method

Participants

The families volunteered in response to letters and advertisements in Iowa. At 7 months, 102 two-parent families with normally developing infants (51 girls) were recruited. At 15 months, 101 (51 girls) returned. The families were relatively diverse: 28% of mothers and 32% of fathers had a high school education, 15% of mothers and 18% of fathers had an associate degree, 39% of mothers and 33% of fathers completed college, and 21% of mothers and 20% of fathers had postcollege education. Most infants were firstborn (42%) or second born (35%). Annual family income ranged: under \$10,000 (2%), \$10,001 to \$20,000 (6%), \$20,001 to \$30,000 (9%), \$30,001 to \$40,000 (8%), \$40,001 to \$50,000 (17%), \$50,001 to \$60,000 (9%), \$60,001 to \$70,000 (15%), over \$70,001 (34%). Among mothers, 91% were White, 3% Hispanic, 1% each African American, Asian, Pacific Islander, and 3% other non-White. Among fathers, 84% were White, 8% Hispanic, 3% African American, 2% Asian, and 2% other. In 20% of families, one or both parents were non-White.

Overview

The families participated in two 1.5- to 2-hr home sessions, each involving the infant and one parent at 7 months, and in two 2-hr laboratory sessions, again one with each parent (in randomized order) at 15 months. All sessions were conducted by a female visit coordinator and videotaped using a camcorder at home and through a one-way mirror in the laboratory. The measures of parent–child responsiveness were based on observations of their interactions in typical care activities, chores, and play routines at 7 and 15 months. Although each context was naturalistic and the parent was asked to behave as he or she normally would, the session followed a structured script that specified the same order of the paradigms for each dyad.

Assessment of Responsiveness Between Parents and Children, 7 and 15 Months

Responsiveness was assessed during 45 min of mother–child and 45 min of father–child naturalistic interactions at 7 months and at 15 months, which encompassed a variety of typical daily contexts during the home and laboratory sessions: preparing and having a snack with the baby, free play, playing with toys, bathing and dressing the child, free time, opening a gift together, and other routine parent–child leisurely, chore-oriented, and caregiving activities. The measures of responsiveness of mothers to children and children to mothers, and fathers to children and children to fathers came from the same interactions but were coded by independent teams. Two coding systems were used: macroscopic (global ratings) and microscopic (where all discrete parental and child bids and the partner's responses were coded). Most coders had a bachelor's degree in psychology and extensive training and experience.

Macroscopic Coding of Responsiveness: Ratings

The macroscopic coding of responsiveness was based on Ainsworth's (Ainsworth et al., 1971) coding of maternal responsiveness, although we rated each observed context (e.g., play, snack) separately to increase the robustness of the final measure. Based on our past research, where the scales—sensitivity–insensitivity, acceptance–rejection, and cooperation–interference—had always intercorrelated above .70 (e.g., Kochanska, 1998), we combined them into one responsiveness rating ranging from 1 (*highly unresponsive*) to 7 (*highly responsive*). Each anchor was carefully described. The conventions for child responsiveness to the parent, developed for this study, were adapted to capture child response.

Parental Responsiveness to the Child

Reliability, alphas, were .91 at 7 months and .96 at 15 months. The scores were then aggregated across all the contexts into an overall macroscopic responsiveness score at each age for the mother and the father.

Child Responsiveness to the Parent

Reliability, alpha, was .93. The scores were then aggregated across all the contexts into the child's overall macroscopic responsiveness score at each age to the mother and to the father.

Microscopic Coding of Responsiveness

Parental Responsiveness to the Child

Coding and reliability. The combination of a time-sampled and event-triggered approach entailed two passes through a videotape, using 60-s intervals. During the first pass, the coders decided, for each 60-s interval, whether the child directed a bid or signal toward the parent that had the potential for parental response (reliability, $\kappa = .82$). If the child directed one or more signals to the parent, they were coded as (a) negative/distress signal or bid (e.g., crying, whimpering), (b) neutral or positive social bid, or (c) physical bid (e.g., sneezing, coughing) Kappa was .77.

During the second pass, the coders evaluated the parent's response to each child's bid using one of four mutually exclusive codes: poor, fair, good, or exceptional (κs = .79 to .80). The judgment integrated multiple dimensions of responsive parenting (e.g., promptness, engagement, sincerity, and other aspects of sensitivity, acceptance, and cooperation; emotional availability; following child lead or focus of attention; adjusting stimulation to child state; De Wolff & van IJzendoorn, 1997; Thompson, 1998). Coding conventions specified how to judge the degree of responsiveness given the type of the child's bid. For example, to be coded as "exceptionally responsive" to child distress, the parent needed to respond very empathically, eagerly, promptly, warmly, in a comforting, appropriate manner. To be so coded to child positive social bids, the parent needed to respond enthusiastically, share the focus of attention with the child, and demonstrate a clear desire for interaction.

Data reduction. We tallied all instances when the parent responded poorly, fairly, well, or exceptionally to the child's bids in each of the three categories, and each tally was divided by the total number of the bids in that category. For example, for the child negative bids category, we produced the proportions of all instances of child negative bids to which the parent responded poorly, fairly, well, or exceptionally. We then created a parental responsiveness score to each type of child bid by weighing the composite of poor responses by −2, that of fair responses by −1, that of good responses by +1, and that of exceptional responses by +2, and summing these scores.

Next, we computed an overall parental responsiveness score across all types of child bids. We first created four broader composite scores to reflect poor, fair, good, and exceptional response patterns (the average of the relevant response across all three categories of child bids).

Child Responsiveness to the Parent

Coding and reliability. The approach to coding was fundamentally the same: During the first pass, the coders (different teams than for parents) observed each 60-s segment and judged whether the parent directed any specific bid or signal to the child that had the potential for child response (κ = .95). Obviously, parental bids to the child were not the same as the child's bids to the parent. We coded three types of bids: (a) social-interactive (social) bids, (b) influence attempts (attempts to regulate child behavior or secure his or her cooperation in areas other than social interaction and mood expression, e.g., in caregiving routines), and (c) mood regulation attempts (comforting, distracting). Kappas were .89 to .94. We also coded parental physical bids, such as sneezing or coughing, but they were very rare and thus not considered.

We found that parents directed so many bids to their children that it was impossible to code each of them, in contrast to children's bids to the parents, which could all be coded (in the parental responsiveness coding system). Therefore, for each 60-s segment, the coders marked each type of bid that occurred during that minute (thus, up to three per minute) and then coded the child's responsiveness to each bid category within that minute.

During the second pass, the child's response was coded as poor, fair, good, and exceptional (κs = .79 to .80). The criteria for coding were generally similar to those in parental system but designed with developmental considerations in mind. They captured the promptness, sincerity, eagerness, and wholeheartedness of response, and how likely the child's reaction was to please the parent. As in the case of parental responsiveness, conventions described how to code child response given the specific type of parental bid.

Data aggregation. The approach was similar to that used for parental responsiveness: The proportions of each type of child response to each type of parental bid were computed and child responsiveness score to each type of parental bid was created by weighing the composite of poor responses by −2, of fair responses by −1, of good responses by +1, and of exceptional responses by +2, and by summing these scores. Finally, we computed an overall child responsiveness score across all types of parental bids.

Although the approach to the coding of child responsiveness to parent was similar to that of the parent to child, the numbers of parental bids to child and child bids to parent were coded differently (see the preceding). Also, the responsiveness scores were not comparable because of the asymmetric nature of each partner's role. It is impossible to compare responsiveness of an adult to an infant with responsiveness of an infant to an adult. The 4-point scale of poor, fair, good, and exceptional responsiveness was similar in range but not meaning. Basic differences in the nature of the coded behaviors prevented us from making direct comparisons (e.g., "Is the mother more responsive to her infant than her infant is to her?"). Those means were not directly compared. Descriptive data are in Table 1.

Results

First, we examined the correspondence between the two sets of responsiveness measures: the global ratings and the microscopic scores. Then, we followed the dual focus of this study: a mean differences perspective (developmental changes, differences between parents and among bids) and an individual differences perspective. We began with a set of descriptive analyses of parents' and children's responsiveness, using the macroscopic ratings and the microscopic scores. Both sets of codes allowed us to examine the developmental changes between 7 and 15 months for parents and children, the differences between the two parents, and the difference between children's responsiveness to mothers and fathers. The microscopic scores, in addition, produced extensive descriptive information regarding several dependent measures, which the macroscopic ratings could not provide: the frequency of parents' bids to their children and children's bids to their parents at 7 and 15 months, and parents' responsiveness to children and children's responsiveness to parents for different types of bids. Each set of measures was submitted to a three-way within-subjects analysis of variance (ANOVA) to examine systematic mean differences as a function of parent (mother vs. father), the type of bid, and the time of assessment (7 vs. 15 months). All of the means are in Table 1.

We then adopted an individual differences perspective, again for the macroscopic ratings and the microcopic codes. These analyses described the concurrent and longitudinal correlations between parents' and children's responsiveness, and the extent of consistency and rank-order stability for those measures within and across the mother – child and father – child dyads.

Finally, we examined the question of the emerging mutuality in the parent – child dyads. We used SEM techniques (Bollen, 1989) to test the different models that may account for the patterns of observed mutuality.

Correspondence Between Macroscopic Ratings and Microscopic Scores of Responsiveness

Even though independent teams coded parents' and children's responsiveness using the macroscopic

Table 1
Descriptive Statistics for All Responsiveness Measures: Parents to Child, Child to Parents

	Age 7 months		Age 15 months	
	M	*SD*	*M*	*SD*
Macroscopic ratings of responsiveness				
Mother's responsiveness to child	4.82	.73	4.95	.78
Father's responsiveness to child	4.44	.93	4.51	.93
Child's responsiveness to mother	4.99	.52	5.08	.79
Child's responsiveness to father	4.85	.67	5.05	.67
Microscopic scores of responsiveness				
Mother's responsiveness to child				
Negative/distress				
Number of bids	0.50	.39	0.31	.31
Mother responsiveness	0.44	.54	0.35	.59
Positive social				
Number of bids	0.22	.16	0.65	.37
Mother responsiveness	0.57	.63	0.61	.29
Physical				
Number of bids	0.31	.17	0.20	.20
Mother responsiveness	0.18	.58	− 0.10	.76
Overall number of child's bids	1.03	.46	1.16	.48
Overall mother responsiveness	0.40	.38	0.29	.39
Father's responsiveness to child				
Negative/distress				
Number of bids	0.53	.52	0.26	.27
Father responsiveness	0.25	.71	0.16	.69
Positive social				
Number of bids	0.19	.15	0.63	.35
Father responsiveness	0.41	.76	0.32	.42
Physical				
Number of bids	0.30	.19	0.16	.13
Father responsiveness	0.01	.58	− 0.26	.80
Overall number of child's bids	1.03	.56	1.05	.43
Overall father responsiveness	0.22	.48	0.07	.48
Child's responsiveness to mother				
Social interactive				
Number of bids	0.69	.16	0.48	.13
Child responsiveness	− 0.19	.48	0.15	.48
Influence attempts				
Number of bids	0.44	.07	0.62	.10
Child responsiveness	0.11	.45	− 0.29	.50
Mood regulation				
Number of bids	0.14	.12	0.03	.05
Child responsiveness	− 0.53	.79	− 0.31	1.03
Overall number of mother's bids	1.28	.17	1.13	.17
Overall child responsiveness	− 0.19	.45	− 0.11	.51
Child's responsiveness to father				
Social interactive				
Number of bids	0.63	.16	0.44	.15
Child responsiveness	− 0.30	.47	0.11	.45
Influence attempts				
Number of bids	0.43	.07	0.58	.10
Child responsiveness	0.17	.56	− 0.25	.45

Table 1
Continued

	Age 7 months		Age 15 months	
	M	*SD*	*M*	*SD*
Mood regulation				
Number of bids	0.13	.14	0.03	.05
Child responsiveness	– 0.74	.75	– 0.47	.79
Overall number of father's bids	1.20	.19	1.05	.18
Overall child responsiveness	– 0.26	.45	– 0.16	.41

Note. In microscopic coding, all child-produced bids (parental responsiveness coding) were recorded, but only one parent-produced bid per each coding segment was coded (in each bid category). The numbers of bids represent percentages of segments. Because several bids could be coded in each segment, the sums do not add up to 1.00.

ratings and microscopic codes, those two sets of measures converged significantly (all *p*s $< .001$). At 7 months, mother responsiveness to child, coded using the two systems, correlated, $r(102) = .48$; father responsiveness to child, $r(102) = .46$; and child responsiveness to mother, $r(102) = .45$, and to father, $r(102) = .60$. At 15 months, the correlations were: mother responsiveness to child, $r(101) = .48$; father responsiveness to child, $r(101) = .51$; child responsiveness to mother, $r(101) = .71$, and to father, $r(101) = .49$.

Effects of Time of Assessment, Parent, and Bid Types in Parent–Child Responsiveness

We first tested gender effects and found none in parents' responsiveness to children or children's responsiveness to parents (or interactions) in either macroscopic ratings or microscopic scores. Thus, gender was not included in any of the analyses reported. In the analyses of the microscopic scores, not every child and every parent produced every kind of bid, and thus different analyses vary in terms of sample size. Comparisons of responsiveness scores of parents and children who did and did not have all three types of bids revealed no systematic differences between those groups.

Macroscopic Ratings

Parental responsiveness to children. A two-way within-subject ANOVA for parental responsiveness with the parent (mothers vs. fathers) and the time of assessment (7 vs. 15 months) as the within-subject factors revealed a significant effect of parent, $F(1, 100) = 29.82$, $p < .001$. Mothers were more responsive than fathers at both 7 and 15 months. There were no other effects.

Children's responsiveness to parents. A two-way within-subject ANOVA for children's responsiveness with the parent (mothers vs. fathers) and the time of assessment (7 vs. 15 months) as the within-subject factors produced only one significant effect: the time of assessment, $F(1, 100) = 4.56$, $p < .05$. Children were more responsive at 15 than at 7 months.

Microscopic Scores

Rates of parents' bids to their children. First, we examined the mean differences in the overall number of bids parents directed to their children at 7 and 15 months with a repeated measure ANOVA using parent (mother vs. father) and time (7 vs. 15 months) as the within-subject factors. The number of bids decreased between 7 and 15 months for both mothers and fathers, $F(1, 100) = 65.84$, $p < .001$. Mothers issued more bids than fathers at both times, $F(1, 100) = 30.07$, $p < .001$.

We next examined the differences in the rates of bids of each type that parents directed to their child in a three-way within-subject ANOVA. The measures were the tallies of each type of bid, divided by the number of coded segments. The parent (mothers vs. fathers), the time of assessment (7 vs. 15 months), and the type of bid (social-interactive vs. influence attempts vs. mood regulation attempts) were the within-subject factors.

There were two significant two-way interactions: Time of Assessment × Bid Type, $F(2, 200) = 219.43$, $p < .001$, and Parent × Bid Type, $F(2, 200) = 4.85$, $p < .01$. The Time of Assessment × Parent interaction was not significant, $F(1, 100) < 1$, and neither was the three-way interaction, $F(2, 200) = 2.32$, *ns*. Furthermore, all three main effects were significant: parent, $F(1, 100) = 30.07$, $p < .001$; time of assessment, $F(1, 100) = 65.84$, $p < .001$; and bid type, $F(2, 200) = 1264.54$,

$p < .001$. Given the significant interactions, none of the main effects was interpretable. We next conducted follow-up analyses.

The interaction of the time of assessment and the bid type. For the follow-up analyses of the Time of Assessment × Bid Type interaction, we averaged rates across mothers and fathers for bids to their children. At 7 months, parents issued more social-interactive bids than influence attempts, $F(1, 100) = 224.46$, $p < .001$, and more influence attempts than mood regulation attempts, $F(1, 100) = 631.96$, $p < .001$. In contrast, at 15 months, parents issued more influence attempts than social-interactive bids, $F(1, 100) = 91.91$, $p < .001$, and more social-interactive bids than mood regulation attempts, $F(1, 100) = 1650.54$, $p < .001$. In other words, at 7 months, the most frequent parental bids were social interactive, followed by influence attempts, and then by mood regulation attempts. At 15 months, however, influence attempts became the most frequent, followed by social-interactive bids. Mood regulation attempts remained the least frequent.

We also examined the changes over time for each bid type. From this perspective, parents decreased their social-interactive bids, $F(1, 100) = 167.98$, $p < .001$, and mood regulation attempts, $F(1, 100) = 104.25$, $p < .001$, as their children aged (from 7 to 15 months). By contrast, however, they increased their frequency of influence bids, $F(1, 100) = 321.10$, $p < .001$.

The interaction of the parent and the bid type. For the follow-up analyses of this interaction, we averaged the rates of bids across 7 and 15 months. The most informative interpretive framework for this interaction emphasized differences between the mothers and fathers for each bid type. These follow-up analyses showed that, compared with the fathers, the mothers directed more social-interactive bids, $F(1, 100) = 15.70$, $p < .001$, and more influence attempts, $F(1, 100) = 10.46$, $p < .005$, to their children. Both parents directed similar rates of the mood regulation attempts to their children, $F(1, 100) < 1$.

Rates of children's bids to their parents. We examined the overall number of bids children directed to their parents at 7 and 15 months using a repeated measures ANOVA. There was no effect of parent, $F(1, 100) = 1.82$, *ns*, and a trend for time, $F(1, 100) = 2.64$, $p = .10$ (with children marginally increasing their overall number of bids at 15 months).

We next conducted a three-way within-subject ANOVA on the percentage or rate of different kinds of bids children directed at their parents. The measures were the tallies of each type of bid, divided by the number of coded segments. The target parent (mother vs. father), the time of assessment (7 vs. 15 months), and the type of bid (negative vs. positive social vs. physical) served as the within-subject factors.

The only significant interaction was a two-way interaction between the time of assessment and the bid type, $F(2, 200) = 122.29$, $p < .001$. The other interactions were not significant: Parent × Bid Type, $F(2, 200) < 1$, and Time of Assessment × Parent, $F(1, 100) = 2.48$, *ns*. There was no three-way interaction, $F(2, 200) < 1$. There was only one significant main effect: for bid type, $F(2, 200) = 30.13$, $p < .001$. The main effects of parent, $F(1, 100) = 1.82$, *ns*, and time of assessment, $F(1, 100) = 2.64$, *ns*, were not significant.

Interaction between the time of assessment and the bid type. For the follow-up analyses of this interaction, we averaged the rates of bids children directed at mothers and fathers. We found that at 7 months, infants directed more negative bids than physical bids, $F(1, 100) = 26.68$, $p < .001$, and more physical bids than positive social bids, $F(1, 100) = 36.42$, $p < .001$, to their parents. In contrast, at 15 months, infants directed more positive social bids than negative bids, $F(1, 100) = 79.48$, $p < .001$, and more negative bids than physical bids, $F(1, 100) = 19.28$, $p < .001$. Thus, at 7 months, children most often produced negative bids, followed by physical bids, followed by positive social bids. At 15 months, however, positive social bids were most frequent, followed by negative bids, followed by physical bids. These follow-up analyses emphasize differences among types of bids infants directed at parents.

An alternative and complementary examination may emphasize the changes observed over time for each bid type. From this perspective, from 7 to 15 months, the children decreased the number of negative, $F(1, 100) = 33.69$, $p < .001$, and physical, $F(1, 100) = 45.33$, $p < .001$, bids, but they increased the number of positive social bids, $F(1, 100) = 175.15$, $p < .001$.

Parents' responsiveness to their children. We conducted a three-way within-subject ANOVA on parental responsiveness to examine the effects of the parent (mother vs. father), the time of assessment (7 vs. 15 months), and the type of the child's bid directed toward the parent (distress vs. positive social vs. physical). Thus, the parent, the time of assessment, and the type of the child's bid served as the within-subject factors. With list-wise deletion, we had 66 families in which children had directed all three types of bids to both parents at both ages.

The only significant interaction was a two-way interaction between time of assessment and children's bid type, $F(2, 130) = 6.85$, $p = .001$. All three main effects were significant: parent, $F(1, 65) = 17.14$, $p < .001$; time of assessment, $F(1, 65) = 10.78$, $p < .001$;

and children's bid type, $F(2, 130) = 46.0$, $p < .001$. Given the significant two-way interaction, the only clearly interpretable main effect was that for the parent. Mothers were more responsive than fathers to each type of bid and at both ages.

Interaction between the time of assessment and the child's bid type. We next conducted the follow-up analyses for this significant interaction. For these analyses, we averaged the responsiveness measures across mothers and fathers. These analyses indicated that at both 7 and 15 months, parents were more responsive to children's negative/distress bids than to their physical bids: at 7 months, $F(1, 65) = 6.33$, $p < .05$, and at 15 months, $F(1, 65) = 28.81$, $p < .001$. At 15 months, parents were also more responsive to children's positive bids than to their negative bids, $F(1, 65) = 17.71$, $p < .001$, though this was not true at 7 months, $F(1, 65) = 1.68$, *ns*. These follow-up analyses emphasize that parents are differentially responsive to their young children's bids differing in modality. Children's positive social bids, such as smiles or vocalizations, directed toward the parents meet with most responsive reactions, whereas their physical signals, such as coughing or sneezing, elicit the least responsive reactions.

An alternative, complementary examination emphasized the changes over time in parental responsiveness to the child's various bids. From this perspective, we noted that the two-way interaction reflected a drop in parental responsiveness to children's physical bids from 7 to 15 months and relatively little or no change in responsiveness to children's positive or negative bids from 7 to 15 months. The drop in responsiveness to children's physical bids from 7 to 15 months was significant, $F(1, 65) = 18.55$, $p < .001$, but there was no change in responsiveness to children's positive social bids, $F(1, 65) < 1$, or their negative bids, $F(1, 65) = 1.40$, *ns*.

Children's responsiveness to their parents. We next conducted a three-way within-subject ANOVA on children's responsiveness to their parents with parent, time of assessment, and type of parental bid (social interactive vs. influence attempts vs. mood regulation attempts) as the within-subject factors. However, with list-wise deletion, we had only 20 families in which both parents had directed all three types of bids to their children at both ages. Because the main effect of parent was not significant, $F(1, 19) < 1$, to increase our sample size, we averaged the child responsiveness scores across both parents at each age. We then submitted the resulting matrix to a two-way within-subject ANOVA, in which time of assessment and bid type served as the within-subject factors. The resulting sample size was 70.

The effects in this two-way within-subject ANOVA paralleled those for the three-way ANOVA. The two-way interaction between time of assessment and bid type was significant, $F(2, 138) = 32.87$, $p < .001$, as was the main effect of bid type, $F(2, 138) = 62.82$, $p < .001$. There was no significant main effect for time of assessment, $F(1, 69) = 2.59$, *ns*.

Interaction between the time of assessment and the parent's bid type. The follow-up analyses of this interaction indicated that at 7 months, children were most responsive to their parents' influence attempts, more so than to their social-interactive bids, $F(1, 69) = 50.26$, $p < .001$, and were more responsive to the parents' social-interactive bids than to their mood regulation bids, $F(1, 69) = 37.18$, $p < .001$. In contrast, at 15 months, children were most responsive to their parents' social bids, more so than to their influence attempts, $F(1, 69) = 97.57$, $p < .001$, or to their mood regulation bids, $F(1, 69) = 32.84$, $p < .001$. There were no significant differences between children's responsiveness to parental influence and mood regulation attempts, $F(1, 69) = 2.20$, *ns*. These analyses emphasize the differences in children's responsiveness along the dimension of modality of parental bids.

A complementary examination emphasized the changes over time in children's responsiveness to various parental bids. Between 7 and 15 months, children became more responsive to parental social-interactive bids, $F(1, 69) = 45.98$, $p < .001$, and to mood regulation attempts, $F(1, 69) = 5.75$, $p < .05$. In contrast, children's responsiveness to parental influence attempts showed a marked decline: Children became less responsive to their parents' influence attempts at 15 months than they had been at 7 months, $F(1, 69) = 39.14$, $p < .001$.

Concurrent and Longitudinal Relations in Parent–Child Responsiveness

Macroscopic Ratings

Table 2 presents intercorrelations among the measures of macroscopic ratings of maternal and paternal responsiveness to the child, and the child's responsiveness to the parents at 7 and 15 months.

Correlations across the two parents. Within one family, there was a moderate correlation between the mother's and father's responsiveness to their child at both 7 and 15 months. The children were also significantly coherent in their responsiveness to their mothers and fathers at both assessments.

Correlations regarding mutual responsiveness. At both times there was evidence of positive mutuality

Table 2
Intercorrelations Among Measures of Responsiveness (Macroscopic Ratings)

	Mother to child		Father to child		Child to mother		Child to father	
	7 months	15 months	7 months	15 months	7 months	15 months	7 months	15 months
Mother to child								
7 months	—	.51***	.35***	.38***	.35***	.30**	.37***	.23*
15 months		—	.40***	.46***	.19	.50***	.17	.22*
Father to child								
7 months			—	.61***	.29**	.16	.41***	.29**
15 months				—	.08	.26**	.28**	.26**
Child to mother								
7 months					—	.17	.35***	.09
15 months						—	.14	.49***
Child to father								
7 months							—	.22*

*$p < .05$. **$p < .01$. ***$p < .001$.

between a given parent's (mother or father) responsiveness to the child and the child's responsiveness to that parent.

Longitudinal correlations. Both mothers and fathers were significantly stable in their responsiveness to their child from 7 to 15 months. Children were modestly stable over time in their responsiveness to their fathers, and marginally to their mothers.

Microscopic Scores

Table 3 presents intercorrelations among the measures of overall maternal and paternal microscopic responsiveness to the child, and the child's responsiveness to the mother and the father at 7 and 15 months.

Correlations across the two parents. Within one family, there was a modest correlation between the mother's and father's responsiveness to their child, but only at 7 months. The children, however, were significantly coherent in their responsiveness to their mothers and fathers at both 7 and 15 months.

Correlations regarding mutual responsiveness. It is surprising that there was no evidence of mutuality between a given parent's responsiveness to the child and the child's responsiveness to that parent (mother or father) at 7 or 15 months, with the exception of a marginally significant mutuality between the children and their fathers at 15 months ($p = .08$).

Longitudinal correlations. For mothers, there was no significant continuity between their responsiveness to their child from 7 to 15 months. Fathers,

Table 3
Intercorrelations Among Measures of Responsiveness (Microscopic Scores)

	Mother to child		Father to child		Child to mother		Child to father	
	7 months	15 months	7 months	15 months	7 months	15 months	7 months	15 months
Mother to child								
7 months	—	.12	.26**	.35***	.11	.19	.14	.16
15 months		—	.11	.02	– .04	.05	.15	– .06
Father to child								
7 months			—	.43***	– .23*	– .08	.05	.09
15 months				—	– .10	– .06	.07	.17
Child to mother								
7 months					—	.26**	.36***	.11
15 months						—	.09	.27**
Child to father								
7 months							—	.15

*$p < .05$. **$p < .01$. ***$p < .001$.

however, were moderately, significantly stable in their responsiveness. Children showed the opposite pattern: They were significantly stable in their responsiveness to their mothers but not to their fathers.

Evolving Mutuality Between Parents and Children

The goal of this set of analyses was to examine how parent–child mutuality evolves over time. Because most findings indicating mutuality between parents and children came from the macroscopic ratings, we used only those data in the model-fitting analyses.

Model-Fitting Analyses

Our primary goal was to evaluate the relative superiority of three models. Each of these models assumed different processes that may generate the longitudinal correlations between parental and child responsiveness from 7 to 15 months. Our secondary goal was to assess whether the substantive models provided an adequate comprehensive explanation of parent–child responsiveness considered in isolation. To address these goals, we used cross-panel model-fitting analyses with observed variables (Finkel, 1995). We submitted list-wise variance-covariances of mothers', fathers', and children's responsiveness ratings at 7 and 15 months to LISREL 8 (Jöreskog & Sörbom, 2000). With list-wise deletion, we had $N = 101$, considered small for SEM analyses, and thus a source of caution (Quintana & Maxwell, 1999).

Overview of tested models. All models made a common set of assumptions that were incorporated into the null, baseline model (Figure 1, Panel A). All models allowed freely estimated concurrent correlations at 7 and 15 months among responsiveness measures, recognizing mothers, fathers, and children as members of a family unit. In addition, all models assumed person- and relationship-specific stability

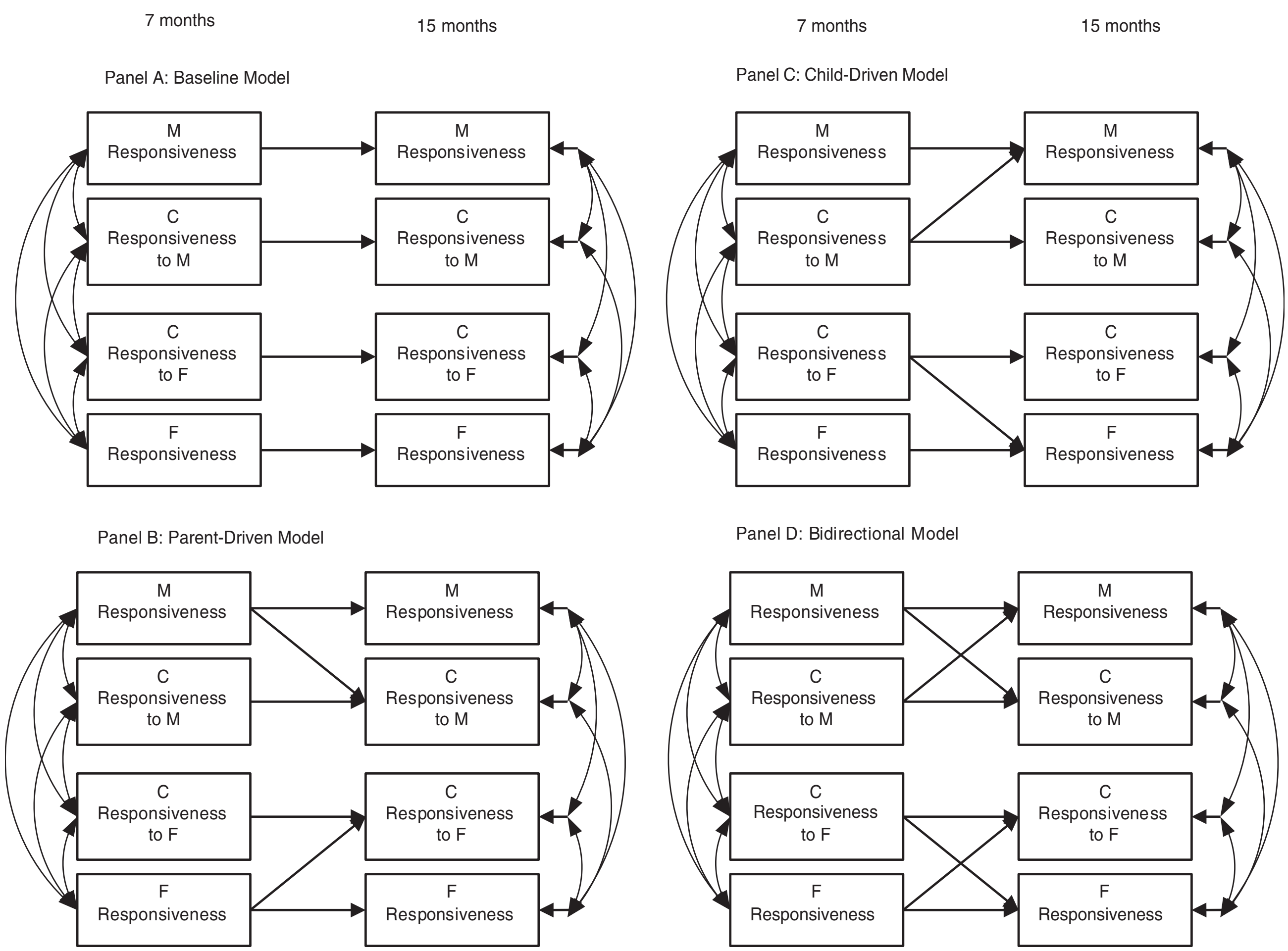

Figure 1. The models of mutuality in parents' and children's responsiveness. Panel A: Baseline model assuming the absence of mutuality unfolding over time. Panel B: Parent-driven model of unfolding mutuality. Panel C: Child-driven model of unfolding mutuality. Panel D: Bidirectional model of unfolding mutuality. M = mother; F = father; C = child.

in rank order from 7 to 15 months. The three models of substantive interest made additional assumptions, which were also relationship specific, but also incorporated parent-to-child and child-to-parent predictions from 7 to 15 months.

The parent-driven model (Figure 1, Panel B) assumed that responsiveness between each parent and their child at 15 months is predicted by parental responsiveness at 7 months but not by child responsiveness to that parent at 7 months. The child-driven model (Figure 1, Panel C) assumed that responsiveness between each parent and their child at 15 months is predicted by child responsiveness to that parent at 7 months but not by that parent's responsiveness at 7 months. The bidirectional model (Figure 1, Panel D) assumed that responsiveness between parents and their children at 15 months is predicted by both partners' responsiveness at 7 months.

Analytical approach. We evaluated the relative superiority of the three substantive models by using an a priori sequence of nested LR chi-square tests. Those are described next. If the parent-driven model significantly improves fit over the baseline model, this would be evidence in support of the importance of parental responsiveness at 7 months. If the child-driven model significantly improves fit over the baseline model, this would be evidence in support of the importance of child responsiveness at 7 months. To infer that both parents and children take part in the process of emerging mutuality over time, the fit of the bidirectional model must be significantly better than both the parent-driven and child-driven models. The aforementioned sequence of nested LR chi-square tests allows us to evaluate the relative superiority of the three models. Any inferences based on these tests alone would be similar to those obtained from multiple regressions (e.g., if both maternal and child responsiveness at 7 months were significant predictors of maternal as well as child responsiveness at 15 months, we would infer that process of emerging mutuality is bidirectional).

However, SEM techniques offer additional advantages over traditional regressions. Goodness-of-fit indexes, in particular, and the significance of the overall model chi-square allow us to evaluate whether assumptions of the substantive models provide an adequate and comprehensive explanation of the observed phenomena. Such indexes allow researchers to gauge the adequacy of the substantive models in isolation.

There are several ways to classify various model fit indexes. Here, we adopted Kaplan's (2000) framework and chose one index from each of three classes of alternatives to model chi-square. Those indexes were as follows: root mean square error of approximation (RMSEA), and its 90% confidence interval (CI), expected cross-validation index (ECVI) and its 90% CI, and the comparative fit index (CFI). When the model is well specified in the population of interest, we expect RMSEA to range from .05 to .08 and CFI to take on values .90 and higher. The values for the ECVI are evaluated relative to the value this index takes for the saturated model, which necessarily has a perfect fit. When the value of the ECVI in the target model is lower relative to its value for the saturated model, we have greater confidence that the results would hold in an independent sample of the same size.

Model tests. Table 4 presents the model fit statistics for all four models. We first conducted the sequence of nested LR chi-square tests to judge relative superiority of the models. The parent-driven model showed significantly better fit to the data than did the baseline model, $\Delta\chi^2(2) = 11.59$, $p < .05$, and the paths from each parent's responsiveness at 7 months to child responsiveness to that parent at 15 months were

Table 4
Fit Statistics for Models of Evolving Mutuality in Parent–Child Dyads From 7 to 15 Months

Model	χ^2	*df*	*p*	RMSEA	ECVI	CFI
Baseline	32.56	12	.0011	.13	.81	.90
90% CI				[.07 – .18]	[.68 – 1.02]	
Parent driven	20.97	10	.021	.10	.75	.95
90% CI				[.03 – .17]	[.66 – .92]	
Child driven	30.48	10	.0007	.14	.84	.90
90% CI				[.08 – .20]	[.71 – 1.04]	
Bidirectional	19.67	8	.012	.12	.78	.94
90% CI				[.05 – .19]	[.68 – .95]	

Note. RMSEA = root mean square error of approximation; ECVI = expected cross-validation index; CFI = comparative fit index; CI = confidence interval. Point estimates for ECVI in the saturated model is .75. List-wise $N = 101$.

significant (ts > 2.4). The child-driven model did not show significantly better fit to the data than did the baseline model, $\Delta\chi^2(2) = 2.08$, *ns*, and the paths from child responsiveness to each parent at 7 months to responsiveness of that parent toward the child at 15 months were not significant (ts < 2.0). The bidirectional model failed to show significant improvements over the parent-driven model, $\Delta\chi^2(2) = 1.3$, *ns*, but it is not surprising that it showed significant improvements over the child-driven model, $\Delta\chi^2(2) = 10.81$, $p < .05$.

In terms of meeting the criteria for relative improvements using nested LR chi-square tests, only the parent-driven model showed the necessary relative improvements. The bidirectional model showed improvements over the child-driven model precisely because the bidirectional model included the assumptions of the parent-driven model. However, the bidirectional model failed to improve over the parent-driven model. Thus, it remains a less parsimonious alternative to the parent-driven model. Figure 2 shows all parameter estimates and their standard errors for the parent-driven model.

These results are consistent with traditional regression analyses (not presented but available from the first author). When each parent's responsiveness and child's responsiveness to that parent at 7 months were entered jointly, only parental responsiveness significantly predicted both child responsiveness and parental responsiveness at 15 months.

Regarding the secondary goal, Table 4 provides unique information, not available from regressions, about the adequacy of the models in terms of their ability comprehensively to account for the pattern of observed correlations between parental and child responsiveness in late infancy. From this perspective, all four models showed inadequate fit to the data despite low power to detect overall inadequacies in SEM analyses (MacCallum, Brownes, & Sugawara, 1996). For example, overall model chi-square was significant for all four models. The CIs for the RMSEA indicated mediocre to poor fit for all four models. The

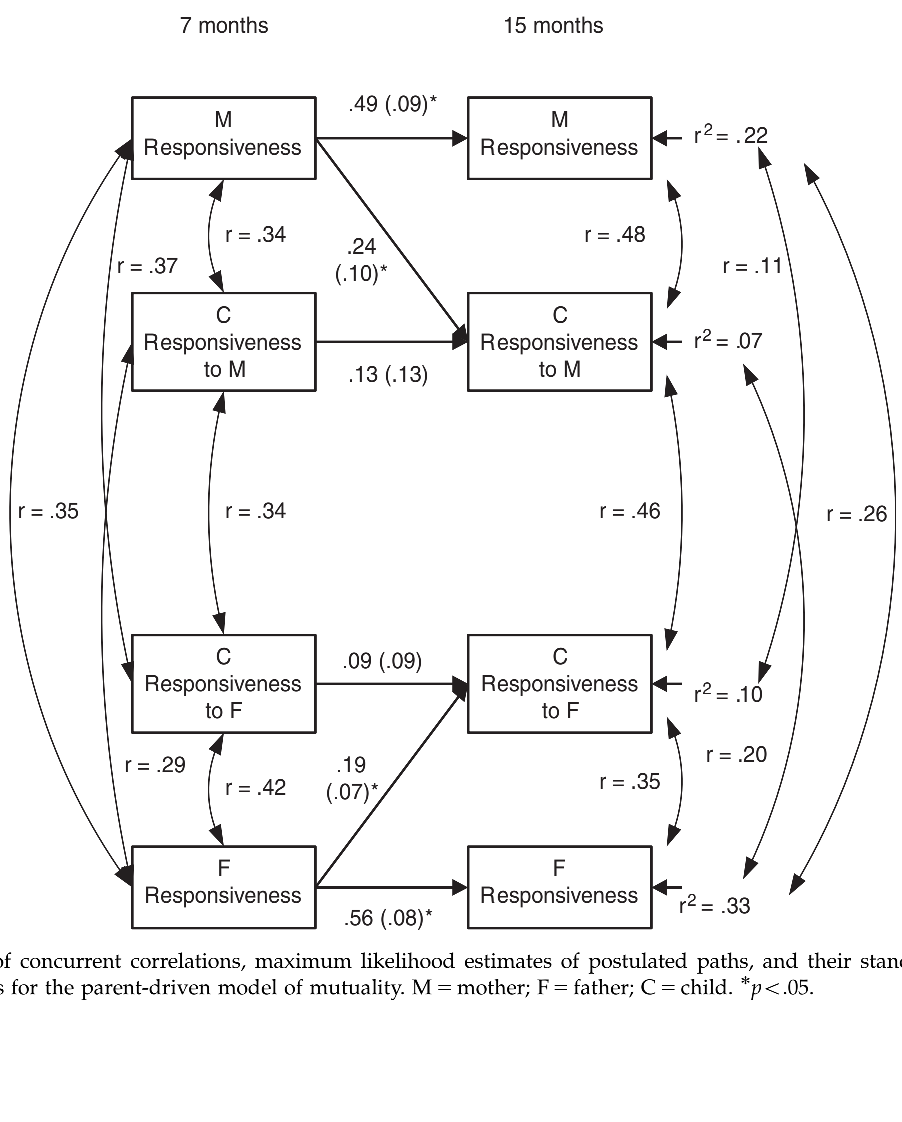

Figure 2. Estimates of concurrent correlations, maximum likelihood estimates of postulated paths, and their standard errors, squared multiple correlations for the parent-driven model of mutuality. M = mother; F = father; C = child. $^{*}p < .05$.

lower limits of the RMSEA CIs for the baseline and child-driven models were consistent with poor fit. The corresponding CIs for the parent-driven and bidirectional models indicated mediocre to poor overall fit. Although the parent-driven model obtained the lowest point estimate for the ECVI and identical to the value of this index in the saturated model, CIs for all four models contained that point estimate. Although the parent-driven model had the highest CFI value, all four models obtained a value of at least .90.

Unlike the sequence of nested LR chi-square tests, which allowed for a clear judgment on the relative superiority of the models, from the broader perspective of goodness-of-fit indexes, all substantive models showed significant inadequacies. In fact, based on CIs, the parent-driven and bidirectional models cannot be distinguished. This, however, is not surprising. We simultaneously input information regarding responsiveness of three individuals forming a family but tested only questions pertinent to the dyadic relationships of parents with children. In other words, we ignored additional relationship processes that likely impinge on the dyadic relationship of the children with each parent (e.g., dyadic relationship between the parents or the triadic relationship among the mother, father, and child). Modification indexes (MI) from both the parent-driven and bidirectional models were, in fact, consistent with this interpretation of lack of fit. For example, MI indicated that each parent's responsiveness to the child at 7 months would predict the other parent's future responsiveness. Because our goals were limited to understanding dyadic parent–child relationships, we did not model cross-parent influences on a post hoc basis.

Summary. The model-fitting analyses indicated that during the first 15 months of life, global ratings of the parent's and child's responsiveness toward one another in dyadic settings reveal a pattern of mutuality most consistent with the constraints and assumptions of the parent-driven process of influence over time. However, none of the three substantive models was adequate in providing a comprehensive explanation of the processes of influence between parental and child responsiveness from 7 to 15 months.

Discussion

With the upswing in relationship-based approaches to socialization (Collins & Laursen, 1999; Maccoby, 1999), interactions between parents and children are increasingly seen as bidirectional. Research on responsiveness, however, has mostly adopted a unidirectional view focused on how parents (usually mothers) respond to their young children. We have approached responsiveness as a process in which two partners cocreate their shared history over time. In this view, the parent and the child are seen as active agents, directing bids and responding to the bids of his or her social partner. As a cautionary note, we did not capture bidirectionality in the sense of sequential responses of the parent and child to each other's behaviors. Coding was limited to the overall rating of each individual (ratings) or the rate of responsiveness to the partner's specific bids (microscopic codes).

Mothers' and fathers' responsiveness to their children and their children's responsiveness to both parents, at 7 and 15 months, were coded during naturalistic interactions in many contexts. We adopted two systems to assess responsiveness: global, macroscopic ratings and microscopic event coding. Some findings were replicated across both systems, but some were complementary. This is consistent with research on methodology of parent–child interaction that has stressed differential insights afforded by each approach (Cairns & Green, 1979; Clark-Stewart & Hevey, 1981; Hetherington & Martin, 1979; Maccoby & Martin, 1983; Rothbaum & Crockenberg, 1995; Waters, 1978).

Our approach integrated the developmental and individual differences perspectives (Maccoby, 1984). From the developmental viewpoint, we discovered that even very early, between 7 and 15 months, changes occur in both parents' and children's bids and overtures directed at each other, and in their responsiveness to each other's bids of varying modality. From the individual differences perspective, we established, particularly using the global ratings, that parents' and children's responsiveness reflects the emerging mutuality, and that mutuality is best viewed as a parent-driven process.

Development of Parent–Child Responsiveness: Descriptive Findings

The first objective of this study was to provide comprehensive descriptive data on mutual responsiveness at 7 and 15 months: parents' to children and children's to parents. To that end, the microscopic measures provided data that could not be derived from the macroscopic ratings. We began with the analyses of the types of bids that parents and children direct at one another, and followed with the analyses of their responsiveness.

Parents' and Children's Bids to Each Other

The change in parental bids to children that took place between 7 and 15 months reflected the rapid developmental changes in the child, and the associated changing dynamics of the dyad. Parents directed fewer overall bids to their children at 15 than at 7 months. In particular, they decreased their social-interactive bids and their mood regulation attempts. In contrast, they significantly increased their influence attempts.

This pattern of findings clearly reflects parental adaptation to the child's increased autonomy and to the advent of the self in the 2nd year (Kagan, 1981; Stipek, Gralinski, & Kopp, 1991). Parents are more willing to allow the child to lead a higher proportion of interactions, particularly social exchanges. Parents also recognize the child's increasing abilities to regulate distress (Denham, 1998; Kopp, 1989), and consequently, they reduce their mood regulation attempts. Furthermore, the significant increase in parents' influence attempts directed at their children indicates that they recognize and adapt to a set of challenges posed by the onset of proficient upright locomotion at the beginning of the 2nd year, greater exploration, and the potential for safety and norm violations (Biringen, Emde, Campos, & Appelbaum, 1995; Gralinski & Kopp, 1993).

The findings for children's bids to parents present a complementary developmental picture. Between 7 and 15 months, there was a three-fold increase in children's positive bids to parents, largely social overtures, with a simultaneous decrease in negative and physical bids. These trends correspond to maturational changes in the child: rapid development of intersubjectivity, joint attention, and communicative skills between 9 and 15 months (Gauvain, 2001), all of which enhance the child's active role as a social partner. The child's increased physical robustness and capacity to regulate distress (Denham, 1998; Kopp, 1989) are reflected in the decline in negative and physical bids. Those bids largely reflect attempts to seek comfort, and they are a central part of the emerging attachment system. Thus, it is not surprising that negative and physical bids, prominent during infancy, declined at the beginning of the 2nd year in the course of routine daily dyadic interactions between children and parents.

In summary, the changing nature of the infants' interactions with their parents from 7 to 15 months reflected developmental processes in the child and in the parent–child relationship (Maccoby, 1984). Children increasingly adopted an active role, and parents adjusted to it by decreasing their bids to their children, thus allowing them to take the lead as interaction partners. Though overall the parents directed fewer bids to their children at 15 months than at 7 months, they nevertheless did increase their direct influence attempts. Children initiated fewer negative and physical bids, but there was a strong rise in their positive social overtures to both parents.

The differences between mother–child and father–child dyads suggested more interpersonal activity in the former. Compared with fathers, mothers directed more bids to their children at both times, mostly social and influence bids. Children, however, directed similar numbers and types of bids to both parents. Thus, we failed to support a view that children, when addressing mothers and fathers, differentially seek comfort versus social interaction (Lamb, 1997; Parke & Buriel, 1998). It is possible, however, that such differences do emerge in later toddler and preschool age.

Parents' and Children's Responsiveness to Each Other

Developmental processes were also reflected in parents' and children's responsiveness to each other. Despite speculation that mothers may be more responsive to children's comfort-seeking and distress signals, whereas fathers may be more responsive to children's playful and social bids, we found no evidence of such differences. In general, mothers were more responsive than fathers to all child bids—negative, positive, and physical—at both ages, consistent with other studies in normative and special populations (Olrick, Pianta, & Marvin, 2002; Power & Parke, 1983; Volling et al., 2002). These findings emerged across both the global macroscopic ratings and the microscopic codes.

Both mothers and fathers were more responsive to children's positive bids than to their negative or physical bids. Although both parents decreased their responsiveness to children's physical bids, there was little change in their responsiveness to children's negative or positive bids from 7 to 15 months. Given the child's increased robustness and physical self-regulation between 7 and 15 months, the potential urgency and importance of physiological cues such as coughing or sneezing, which may signal a health problem in infancy, understandably decrease by the toddler age. This is consistent with LeVine's (1974) view that protecting child physical integrity is the earliest goal of socialization; once met, it becomes replaced by other concerns.

At both ages, children were equally responsive to both parents, and this finding was replicated across both the ratings and the microscopic codes. The developmental changes in children's responsiveness reflected their increased social engagement and the emerging self. The global ratings showed that, overall, children were more responsive at 15 than at

7 months. The microscopic codes, however, revealed a more complex developmental picture.

Whereas at 7 months the infants were most responsive to their parents' influence attempts and willingly, though passively, cooperated in care routines, by 15 months, their responsiveness to influence attempts dropped precipitously. In contrast, children's responsiveness to parents' social overtures, which may reflect their rising communicative and joint attention skills (Gauvain, 2001), increased. Recall that parents were also consistently more responsive to children's positive than negative bids; such complementary pattern of findings across children's bids and parents' responsiveness highlights how reinforcement contingencies may shape early social exchanges.

Children's responsiveness to parents' mood regulation attempts also increased. This may reflect a combination of improved emotion regulation skills (Denham, 1998; Kopp, 1989) and the coalesced attachment system, within which the child has come to use the parent as the effective source of comfort. In sum, the findings for the rates of bids parents and children direct at each other and for responsiveness to each other are all compatible with the transition into toddlerhood. Children's development of self and resistance to parental demands, increased social repertoire and intersubjectivity, and improved mood regulation, and the corresponding adaptations on the parents' side were all reflected in the developmental patterns of responsiveness.

Individual Differences in Responsiveness

The second goal of this study involved individual differences in children's and parents' responsiveness to one another. We addressed stability in each partner's responsiveness over time and reciprocal mutuality in concurrent responsiveness. Because we used both macroscopic rating and microscopic codes, we could address those questions at two levels of analysis.

Evidence for stability in responsiveness over time varied from partner to partner and depended on the nature of the coding. For example, fathers showed stability in responsiveness in both the ratings and microscopic codes. However, mothers showed significant stability only as captured by the ratings. Infants, on the other hand, showed weak evidence of stability in responsiveness, as indicated by both the ratings and microscopic codes. They did, however, show moderate coherence in responsiveness to their mothers and fathers at both 7 and 15 months across both coding systems. Future research should ask whether such coherence could be due, in part, to child temperament; for example, positive or negative emotionality may account for the child's overall interpersonal style with both parents (Putnam, Sanson, & Rothbart, 2002).

Reciprocal concurrent mutuality in responsiveness varied depending on the type of measurement. For example, there was no evidence of mutuality at either 7 or 15 months in the microscopic codes. In contrast, the global ratings that downplayed the minute situational variability of various bids in favor of more holistic impressions revealed that both mother–infant and father–infant dyads showed a moderate degree of reciprocal mutuality at 7 and 15 months. When mutuality in responsiveness was examined longitudinally, the findings showed a similar pattern. Microscopic codes failed to show that earlier responsiveness, at 7 months, predicted the partner's future responsiveness at 15 months. In contrast, the global ratings showed that mothers and fathers who were responsive at 7 months had responsive infants at 15 months. To a lesser extent, the same pattern was true for infants' responsiveness: Those who were responsive toward their fathers at 7 months had more responsive fathers at 15 months, although the infant–mother pattern was marginal.

As suggested earlier, the weaker findings using the microscopic codes support a view that focusing on minute events, such as child or parent single bids, may reduce the ability to tap more global, enduring, core interaction patterns. The findings obtained with the global ratings were indeed much stronger, consistent with a view that ratings capture characteristics of individuals and dyads that go beyond situational specificity (Maccoby & Martin, 1983; Rothbaum & Crockenberg, 1995). When coders form an impression of a child or parent during an extended interaction, they implicitly integrate more social information than when they identify minute specific bids and make circumscribed ratings of response to each bid. They might perceive subtle expressions of emotion, or they might combine a pattern of multiple cues into a gestalt of a social and emotional aspect of responsiveness. Such overall impressions may not be easily reduced to minute components captured using microscopic codes. Research on this methodological issue would be useful.

It is possible that over time, as the parent–child relationship coalesces, a clear pattern of mutuality evolves that could be detected using either ratings or microscopic event coding. Forming expectations of responsiveness or lack thereof, or developing the internal working model of the partner and the relationship, occurs over time. Most likely by late toddler or early preschool age, we can expect a clearly established mutually responsive or mutually adversarial relationship (Shaw & Winslow, 1997).

Emerging Mutuality in Parent–Child Dyads

The third goal of this study was to examine alternative processes that may give rise to longitudinal mutuality emerging between the parent and child in the first 15 months. Our aims were two-fold: to judge the relative superiority of the models in terms of the specific constraints and assumptions each incorporated, and to examine the adequacy of the models in isolation as comprehensive accounts of parent–child responsiveness in late infancy.

In terms of the first aim, only the parent-driven model met the a priori criteria for relative improvement. The pattern of parent–child responsiveness from 7 to 15 months was most consistent with the specific constraints and assumptions of the parent-driven model: that parental responsiveness at 7 months would predict child responsiveness to that parent at 15 months, and that child responsiveness would play no analogous role to that of the parent. Although the bidirectional view of influence is broadly accepted, at this very young age, we found no support for such a model precisely because children's responsiveness to their parents at 7 months did not predict future parental responsiveness. These inferences pertinent to relative superiority of the three models were fully consistent with traditional regressions, which we conducted given necessary caution because a sample of 101 is only marginally sufficient for otherwise more informative SEM analyses.

Our findings are consistent with the belief that in infancy, parental input rather than the child input may have a dominant role in determining the emerging mutual responsiveness. It would not be prudent, however, to generalize broadly from these findings. First, the dynamics may change in the 2nd year. With the advent of several milestones, such as upright locomotion, communicational competence, and the developing theory of mind and intersubjectivity, children become more active and influential participants in dyadic interactions with their parents, and the asymmetry we observed from 7 to 15 months between the parent and child likely diminishes. Responsive toddlers and preschoolers may even foster parental responsiveness in new ways. As we follow these families into preschool years, we hope to address the dynamic nature of such changes that unfold over time.

Second, perhaps with a shorter time gap between observations, more evidence for the child-driven model would emerge. An infant's strong negative mood and a long bout of rejecting the parent's bids throughout the morning may lead to parental fatigue, impatience, and unresponsiveness in the afternoon. Over several weeks and months, however, the overall weight of influence swings in the parent's direction. Finally, responsiveness is only one aspect of mutuality in relationships. It is possible that other aspects, such as affect, discourse, and control, would conform with bidirectional views.

In terms of the secondary aim—evaluating the adequacy of the models in isolation—all three models showed significant inadequacies. Even with a sample size of 101, all models had significant overall chi-squares. Furthermore, goodness-of-fit indexes indicated generally mediocre to poor fit and did not differentiate between the bidirectional and parent-driven models. Given that the collection of models we tested embody the assumptions of both traditional, top-down views (i.e., the parent-driven model) and modern views of socialization (the bidirectional model), lack of fit has substantive implications for research.

As we noted earlier, we observed mother–child and father–child relationships in isolation and only tested those links that we could disconfirm given the design specifications of this study. In other words, we ignored cross-parent and cross-relationship influences that impinge on each parent–child relationship. For example, we did not consider how marital strife or harmony may affect the dyadic parent–child mutual responsiveness (Belsky, 1984; Parke & Buriel, 1998). We did not consider how adjustment of each parent to the parental role both in terms of role satisfaction and in terms of ability to cope with stressors may influence the other parent's responsiveness to the child. Clearly, however, model-fitting analyses indicate that such processes may play an important role in parent–child responsiveness. One clear implication of lack of fit in these models is that any comprehensive account of emerging parent–child mutuality in responsiveness must cast a wider net to capture sources of influence on that mutuality.

This study has limitations that inspire caution. Our sample of 101 families, with extensive, longitudinal observational data for mother–child and father–child dyads, is among the largest. It is, however, small for SEM analyses (Quintana & Maxwell, 1999). Social developmentalists face a difficult choice between a wish to heed appeals to employ SEM techniques, using rich observational data (Collins et al., 2000; McArdle, 1991), and a wish to observe rigorous sample size requirements those techniques impose (Quintana & Maxwell, 1999). Nevertheless, our inferences on relative superiority of models were consistent with regressions, and significant lack of fit in the models despite low power was substantively meaningful and had important implications for future research.

Additionally, parent–child interactions at 7 months were observed at home, the most appropriate setting for natural interactions between parents and their infants, but at 15 months they were observed in the laboratory. We maintain a naturalistic ambience in our laboratory, and many, though not all, contexts overlap (e.g., meal, play). The impact of the setting on behavior, however, should be acknowledged and systematically studied in future research.

This study incorporated several core current themes in social development (Eisenberg, 1998). We portrayed socialization as a mutual enterprise, with parents and children actively assuming reciprocal roles (Maccoby, 1999). We adopted modern analytic techniques to examine developmental processes in the parent–child dyad, and we showed that in infancy, the parent takes the lead in forming a mutually responsive relationship (Maccoby, 1992). We included mothers and fathers for a comprehensive view of the ecology of relationships (Parke, 2002). Finally, we showed how different approaches to coding interpersonal behavior may yield complementary and nonredundant insights.

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