

# Activities and Interactions of Mothers and Their Firstborn Infants in the First Six Months of Life: Covariation, Stability, Continuity, Correspondence, and Prediction

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BORNSTEIN, MARC H., and TAMIS-LEMONDA, CATHERINE S. *Activities and Interactions of Mothers and Their Firstborn Infants in the First Six Months of Life: Covariation, Stability, Continuity, Correspondence, and Prediction*. CHILD DEVELOPMENT, 1990, 61, 1206-1217. Activities of primiparous mothers and infants were observed at 2 and at 5 months of age during naturalistic interactions at home. 5 prominent features of mother and infant exchanges in this short-term longitudinal study are described and discussed in the context of 3 models of unique environment-development relations: covariation, stability, continuity, correspondence, and prediction. Generally, mothers' activities did not positively covary at either age, nor did those of infants. Some maternal activities were stable in this time period; some developmentally increased, and some developmentally decreased. Infants' activities were unstable, but most increased over time. Specific mother and infant activities corresponded, and over time mothers and infants influenced one another in specific ways. In the critical period of the first half year, infants appear to be flexible and plastic in their behavioral repertoires and are influenced by their mothers; mothers are somewhat consistent, but they also adapt to the behaviors of their infants.

For new parents, the first months with an infant are thought to constitute a period of adjustment and transformation; for the infant, parents' activities in the first months are thought to constitute critical experiences in development. The present study aimed to learn more about the nature of mother-infant interaction and its consequences in the period of the dyad's initial accommodation during the first half year of the infant's life by examining unique and specific influences of mother on infant and of infant on mother.

Several generic models of mutual effects have been discussed in infancy research (see Bornstein, 1989a, 1989b; Bradley, Caldwell, & Rock, 1988; Wachs & Gruen, 1982). Three define unique effects of one member of the dyad on the other. In one model, the activity of the mother, for example, uniquely affects the infant at an early time point, and the consequent change in the infant thenceforward

endures, independent of later interactions between the two and independent of stability in the infant. In a second model, mother exerts a unique influence over her infant only at a later point in development and independent of stability in the infant. In a third model, both early and late maternal influences exert independent effects. In this study, we examined these three models of unique influences between mothers and infants in the period of the first 6 months of life. We first defined a set of salient interactive activities in mother-and-infant dyads, and we then quantified covariation, stability, continuity, and correspondence in them. Each of these types of analysis contributes to understanding unique concurrent and predictive effects, and several address empirical questions of their own.

## *Domains of Mother and Infant Interaction*

Everyday interactions between mothers and babies are characterized by a melange

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of activities. This study focused on prominent domains concerned with different orientations of visual and vocal exchange. A social domain describes interactions that, for mother, encompass physical and verbal strategies used in engaging the infant interpersonally and, for the infant, have a corresponding focus of attention on mother. Many published studies of mother-infant interaction have concentrated attention on the social domain. Even within the first half year of life, however, mothers and babies alike are increasingly concerned to distinguish and incorporate into their interactions the world outside the dyad (see, e.g., Belsky, Gilstrap, & Rovine, 1984). A didactic domain of activities describes interactions that turn outward from the dyad; they consist, for mother, in physical and verbal strategies used in arousing and stimulating the infant to engage the environment and, for the infant, they imply a corresponding focus of attention on the environment.

Another domain concerns modes of speech in mother and of vocalization in infant. Mothers often modulate vocal pitch in interaction with infants, and it has frequently been suggested that the prosodic contours of such "motherese" (as opposed to adult conversational tones) might provoke or potentiate infant attention, thereby promoting infant information processing (Papoušek, Papoušek, & Bornstein, 1985). Infants, too, vocalize non-distress and distress in communicatively meaningful ways.

Of course, the activities of mothers and babies are intricate and meshed, so that different modes of engagement do not always or necessarily occur in isolation from one another. Yet, many investigators have operationally distinguished the social and didactic domains as separable and significant, whether they are called animate versus inanimate, affective versus informational, or social versus object-centered (e.g., Field, 1981; Goldfield, 1987; Sherrod, 1981; Stern, 1985). In this paper, we set out to assess several characteristics of these domains.

#### *Characteristics of Mother and Infant Interaction*

Despite the dynamic range of individual activities that mothers naturally engage in with their infants, many authorities, including psychoanalysts and ethologists, have conceptualized parental (read: maternal) caretaking as adhering to only one or a small number of bipolar dimensions, commonly described as "good," "sensitive," or "warm" (e.g., Brody,

1956; MacPhee, Ramey, & Yeates, 1984; Rohner, 1985; Rothbaum, 1986). This view builds on the infrequently tested assumption that parenting reflects personality traits, and therefore that parents behave in consistent ways across domains of interaction, time, and context. The term *covariation* can be used to describe consistency in rank-order status of different parenting activities within individuals; covarying activities in parents would therefore include those that parents perform frequently relative to one another. Alternative positions are that frequently performed activities are not psychologically linked, and that individuals vary in the constellation and pattern of their activities such that there is no monistic organization of parenting.

Studies of covariation between social and didactic domains of interaction offer answers to several developmental questions. Do mothers' activities covary in a way that suggests unity in their behavior? Do infants' activities similarly covary? Are patterns of covariation in mother and in infant consistent in the infant's first months? In addition, it is necessary to account for covariation in maternal and infant activities to study their unique and specific effects in development.

In this connection, it is desirable to assess basic developmental characteristics of mother and infant activities. The term *stability* can be used to describe consistency in the relative ranks of individuals with respect to activity occurrence over time. A stable parenting activity, for example, would be one that some parents perform relatively frequently when their infants are young and again perform relatively frequently when their infants are older. The term *continuity* can be used to describe consistency in the absolute level of group performance of an activity over time. A continuous parenting activity would be one performed by a group of parents with approximately the same frequency when their infants are young and old. Stability of individuals and continuity in the group are independent (McCall, 1981).

An assumption often associated with the monistic view of parenting is that the overall level of parental stimulation affects the child's overall level of development (see Maccoby & Martin, 1983). However, increasing evidence suggests that specific parental activities relate concurrently and predictively to specific aspects of child performance (Bornstein, 1989b; Bradley et al., 1988; Vibbert & Bornstein, 1989; Wachs & Chan, 1986). The term *correspondence* can be used to describe con-

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sistency in the rank-order status of specific parent and infant activities. In achieving correspondence, parents who perform one kind of activity relatively more often, more appropriately, etc., can be expected to have infants who perform a specific corresponding activity relatively more frequently or who possess a relatively higher ability of a particular kind.

Studies of parent-child correspondence offer answers to several questions of their own. Are maternal activities linked to specific and conceptually corresponding infant activities? Are patterns of correspondence consistent in the infant's first months? Further, concurrent and predictive correspondences begin to define the mutual influences that mother and infant exert on one another.

### *The Present Study*

The present study was designed to assess covariation, stability and continuity, and concurrent and predictive correspondences in social and didactic domains of activity and in different modes of vocalization in mothers and infants, first, as independent issues in early development and, second, for the critical role they play in differentiating unique and specific models of early interaction. The study began when infants were 2 months of age because of the intentionality and flexibility in behavioral organization that first emerge at about this time (e.g., Emde, Gaensbauer, & Harmon, 1976). Mothers and infants were revisited at 5 months because by this time the baby's scope of apperception has considerably broadened beyond the dyad, infants look to the environment and reach out and grasp, and they more actively participate in turn-taking exchanges (e.g., Kaye & Fogel, 1980).

## Method

### *Sample*

Twenty-eight primiparous mothers and their infants (13 males and 15 females), recruited from patient populations of private obstetric and pediatric groups, participated in two home observations. Dyads were first seen when the infants were 2 months of age ( $M = 66$  days) and again when 5 months of age ( $M = 161$  days). Infants were term at birth ( $M$  weight = 3.39 kg;  $M$  length = 51.2 cm) and were healthy throughout the course of the study. Households were middle- to upper-SES ( $M = 59$  on the Hollingshead Four Factor Index, 1975; Gottfried, 1985). Dyads were sampled from a limited socioeconomic stratum in order to evaluate models of environment-development relations with socioeconomic status controlled.

### *Home Observation Procedure*

Home observations followed the same procedures at 2 and at 5 months and were identical to those we have used previously. Briefly, mothers were asked to behave in their usual manner and to disregard the observer's presence insofar as possible; beside the observer, only mother and baby were present at home; and observations took place at optimal times of the day for individual babies (see Bornstein, 1985; Tamis-LeMonda & Bornstein, 1989). Our purpose was to observe mothers and infants under the most natural and unobtrusive conditions possible for each dyad, and not to standardize the context of data collection beyond what was normal and ecologically valid. All observations lasted 45 min and were conducted in real time using a sampling technique in which a 30-sec observation period was followed by a 30-sec recording period (Seitz, 1988). The bounds of each period were signaled to the observer by a covert automatic timer.

The 2-5-month data reported here were excerpted from a larger ongoing longitudinal study. Four maternal activities and five infant activities were subjected to analysis. Two codes recorded the mother's engagement of her infant and organization of infant attention socially (i.e., to the mother herself) and didactically (i.e., to some property, object, or event in the environment). Mothers could do these by physical or verbal means and by introducing a new topic or elaborating on a topic already introduced. Thus, a mother might touch, gesture toward, or position her infant with the explicit purpose of engaging the baby to herself, or she might demonstrate, point, name, or describe in order to facilitate the infant's visual and/or tactual exploration of some aspect of the environment. The two other maternal codes assessed speech to the infant, either as infant register (characterized by extreme or fluctuating pitch commonly associated with "motherese") or as taking conventional adult conversational tones.

Three of the five infant activities coded orientation of visual exploration to mother or to a property, object, or event in the environment and active hand contact with an object. The final two codes assessed infant vocalization as either nondistress or distress. At the initiation of each 30-sec observation period, the infant's state was also noted (modified from Brazelton, 1973).

During the course of the study, 25% of the visits were independently coded by two observers. Reliability (Pearson  $r$ ) on the nine

categories of mother and infant activity and infant state averaged .92 (range = .77-.99).

#### Data Reduction

Frequency counts were obtained for mother and infant activities in terms of the number of intervals in which each activity occurred. These behavior codes were not mutually dependent; that is, any code could occur in any coding interval. Prior to any statistical appraisal, univariate data were inspected in box plots, and bivariate relations were examined in scatter plots (Tukey, 1977). One outlier emerged (one 5-month-old's distress vocalization), and this datum was selectively eliminated from relevant analyses. Inspection of bivariate distributions also showed that pairs of mother, infant, and mother-infant activities were not systematically associated in any nonlinear fashion.

Activities of mothers and of infants were well distributed. For example, some mothers spoke to their 2-month-olds in the infant register in as few as 6% of the intervals of the observation period, and some in as many as 98%; some mothers never spoke to their 5-month-olds in the infant register, whereas some did in as many as 82% of the intervals. For their part, some infants at 2 months vocalized nondistress in as few as 2% or as many as 38% of the intervals of the observation period, and some 5-month-olds vocalized nondistress in 4% of the intervals, whereas others vocalized nondistress in 62%. Neither infant status (weight and length at birth) nor maternal status (age, educational level, or Hollingshead SES) was systematically related to any of the measured variables, even though each showed variation; moreover, obtained relations held equivalently for boys and girls. Statistical analyses collapsed across these factors.

#### Results

The results of this short-term longitudinal study are organized around several sets of analyses: covariation among mothers' activities and covariation among infants' activities at 2 and at 5 months, and the comparison of patterns of covariation between the two ages; stability and continuity of mothers' and of infants' activities between 2 and 5 months; and correspondence between mothers' and infants' activities at each age, and the comparison of patterns of these concurrent correlations between the two ages. These analyses eventuate in the evaluation of unique 2- to 5-month, 5- to 5-month, and 2- and 5-month predictive models between mothers and infants.

#### Covariation

*In mothers.*—As shown in Table 1A, out of six possible covariation estimates among different maternal activities at each age, only one at 2 months and one at 5 months (didactic encouragement with speech in the infant register) covaried positively. At both 2 and 5 months, mothers' social and didactic styles of interacting with infants were unrelated, and mothers' using the infant register and adult conversational tones in speech to infants were reciprocally related.

*In infants.*—As shown in Table 1B, out of 10 possible covariation estimates among different infant activities at each age, only two at 2 months (didactic exploration with touch and nondistress vocalization) and one at 5 months (didactic exploration with touch) covaried positively. Infants' exploration in social and didactic orientations was unrelated at these two ages, as were infants' vocalizing nondistress and distress. Distress vocalization related negatively to exploration.

#### Stability

*Of mothers.*—Table 2A shows stability of maternal activities between their infants' second and fifth months. Mothers' social encouragement was not stable; by contrast, their didactic stimulation was statistically stable. Mothers were also stable in their use of the infant register, but they tended not to be stable in their use of adult conversational tones. On average, maternal stability coefficients tended to be moderate.

*Of infants.*—Table 2B shows that infants were unstable in this set of activities between 2 and 5 months. State was not a factor in the evaluation of infant stability, since infants were judged to be in optimal states of quiet or active alert across a minimum of 90% or more of the observation intervals at the two ages.

#### Continuity

*In mothers.*—Table 2A also shows continuity and change in maternal activities across the same 3-month period. Mothers behaved differently in social versus didactic domains. At 2 months, mothers engaged their infants rather equally in the two modes of interaction; at 5 months, mothers engaged in more didactic than social interactions. Between 2 and 5 months, therefore, mothers changed the emphasis of their interactions, significantly reducing interpersonal stimulation with their babies and significantly increasing stimulation of their babies toward the environment. Figure 1 shows this divergence in profiles; its significance is documented in an analysis of differences in in-

TABLE 1  
CORRELATION: MOTHERS' ACTIVITIES AND INFANTS' ACTIVITIES AT 2 AND 5 MONTHS

	STIMULATION						SPEECH		
	Social		Didactic		Infant Register		Conversational Tones		
	2 Months	5 Months	2 Months	5 Months	2 Months	5 Months	2 Months	5 Months	5 Months
<b>A. Mothers' activities:</b>									
Stimulation:									
Social	...	...	...	...	...	...	...	...	...
Didactic	-.09	-.03	...	...	...	...	...	...	...
Speech:									
Infant register	-.06	.21	.47**	.35*	...	...	...	...	...
Conversational tones	.18	.05	.18	.18	-.28	-.66***	...	...	...
<b>B. Infants' activities:</b>									
Exploration:									
Social	...	...	...	...	...	...	...	...	...
Didactic	.01	.12	...	...	...	...	...	...	...
Tactual	.14	.30	.54**	.76***	...	...	...	...	...
Vocalization:									
Nonsdistress	-.03	.20	.50**	.05	.17	.23	...	...	...
Distress	-.61*	-.23	-.44**	-.34*	-.18	-.36*	-.17	-.14	-.14

\*  $p < .05$ .

\*\*  $p < .01$ .

\*\*\*  $p < .001$ .

TABLE 2  
STABILITY AND CONTINUITY: FREQUENCY OF MOTHERS' AND INFANTS' ACTIVITIES AT 2 AND 5 MONTHS

	STABILITY		CONTINUITY			
	2 to 5 Months <i>r</i>	2 Months		5 Months		2 to 5 Months <i>t</i>
		<i>M</i>	(Range)	<i>M</i>	(Range)	
<b>A. Mothers' activities:</b>						
Stimulation:						
Social.....	-.14	5.7	(0-13)	3.9	(0-8)	2.11*
Didactic.....	.34*	7.6	(0-27)	14.6	(1-31)	4.92***
Speech:						
Infant register.....	.40**	20.8	(3-44)	14.2	(0-37)	3.01**
Conversational tones...	.31	14.1	(1-31)	19.6	(3-45)	2.49*
<b>B. Infants' activities:</b>						
Exploration:						
Social.....	-.13	14.5	(1-29)	12.7	(5-24)	1.04
Didactic.....	.18	14.1	(2-25)	24.1	(7-37)	5.73***
Tactual.....	.09	1.4	(0-8)	18.2	(8-36)	11.11***
Vocalization:						
Nondistress.....	.29	7.0	(1-17)	10.2	(2-28)	2.88**
Distress.....	.15	6.1	(0-17)	6.2	(0-18)	.29

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

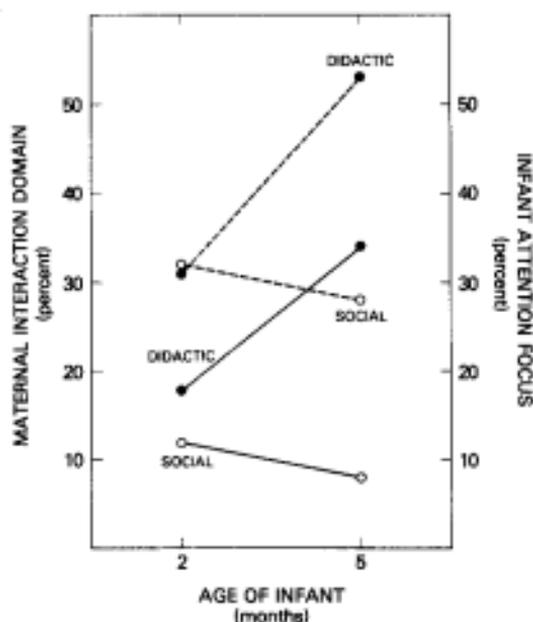


FIG. 1.—Percentage of sampling intervals in the observation period in which mothers (solid functions) engage in social (○) and didactic (●) domains of interaction and infants (dashed functions) engage in social (○) and didactic (●) foci of attention in infants' second and fifth months.

TABLE 3

CONCURRENT CORRESPONDENCE: MOTHERS' STIMULATION AND INFANTS' EXPLORATION AT 2 AND 5 MONTHS

MOTHER STIMULATION	INFANT EXPLORATION					
	Social		Didactic		Tactual	
	2 Months	5 Months	2 Months	5 Months	2 Months	5 Months
Social .....	.41*	.55***	.03	.05	-.06	-.13
Didactic .....	.21	-.20	.47**	.67***	.58***	.33*

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

teractional domains at the two ages,  $t(27) = 4.88$ ,  $p < .001$ .

At 2 months, mothers spoke in the infant register more than in adult conversational tones; at 5 months, they spoke in adult conversational tones more than in the infant register. Between 2 and 5 months, therefore, mothers changed in the form of their speech, significantly reducing use of the infant register and significantly increasing use of adult conversational tones. This crossover in profiles is documented in an analysis of differences in maternal speech styles between the two ages,  $t(27) = 2.99$ ,  $p = .006$ .

*In infants.*—Even though infants tended to be unstable in their individual ranks over the first 6 months, Table 2B shows that infants increased significantly in their orientation to the environment between 2 and 5 months. At 2 months, infants explored equivalently in social and didactic orientations; at 5 months, however, they favored environmental exploration. Figure 1 shows this divergence in profiles; its significance is documented in an analysis of differences in attentional focus at the two ages,  $t(27) = 4.66$ ,  $p < .001$ . Infants also increased dramatically in their tactual exploration between 2 and 5 months. This finding is not surprising, however, given the different abilities of 2- and 5-month-olds to reach for, grasp, and manipulate objects.

At 2 months, infants vocalized nondistress and distress equivalently during the observation period; at 5 months, infants' nondistress vocalization had significantly increased. An analysis of this divergence failed to show a significant difference across age.

#### Correspondence

Table 3 shows concurrent relations between organization-of-stimulation variables in mothers and orientation-of-exploration variables in infants. Mother-infant interaction was

characterized by several specific correspondences; that is, by 5 months more maternal social encouragement of infants was associated with more infant social (rather than didactic) orienting, and more maternal didactic encouragement of infants was associated with more infant didactic (rather than social) orienting,  $t$ 's = 2.21 and 4.69,  $p$ 's < .05, for tests of the difference between dependent  $r$ 's (Cohen & Cohen, 1983, pp. 56–57). This correspondence is best illustrated by the substantial association between mothers' proportional emphasis on didactic versus didactic plus social foci of stimulation and infants' proportional emphasis on didactic versus didactic plus social foci of exploration: at 2 months,  $r = .48$ ,  $p = .005$ , and at 5 months,  $r = .53$ ,  $p = .002$ . Additionally, maternal encouragement of infant attention in the didactic (as opposed to the social) mode related positively to infant tactual exploration at 2 and 5 months,  $t$ 's = 2.58,  $p < .05$ , and 1.71,  $p < .10$ .

The striking consonance of mother-infant mutual foci of attention was not echoed in mother-infant conversation or in cross-relations between mothers' and infants' visual and verbal interactions. That is, mothers' encouraging or speaking and infants' vocalizing were not systematically related, although the relatively restricted range of maternal social encouragement may have contributed to attenuating some of these associations.

Maternal speech and infant exploration were associated, but inconsistently so. Mothers' using adult conversational tones was unrelated to their infants' exploring at the two ages,  $-.10 < r$ 's < .09. However, mothers' using the infant register tended to correlate appropriately in developmental terms with their infants' changing focus of exploration:  $r$  with attention to mother at 2 months = .24, N.S., and  $r$  with attention to the environment

at 5 months = .46,  $p = .007$ . Moreover, mothers' speech in the infant register related positively to infants' tactual exploration at both 2 and 5 months,  $r$ 's = .48 and .41,  $p$ 's < .01.

#### Predictive Validity

Table 4 summarizes results of several independent sets of regression analyses that give evidence of unique mother-to-infant and infant-to-mother effects. These results are discussed with respect to three models of mother-infant relations introduced earlier, unique 2- to 5-month predictive effects alone (Model 1), unique 5- to 5-month concurrent effects alone (Model 2), and unique 2- and 5-month predictive and concurrent effects combined (Model 3). The first line in each three-line set gives the criterion activity. The second line provides evidence for the unique predictive association between members of the dyad from 2 to 5 months. These equations provide solutions after both 2- to 5-month stability in the individual and any 5-month concurrent association between individual and partner are accounted for. The third line provides evidence for any unique concurrent association between members of the dyad at 5 months. These equations provide solutions after both 2- to 5-month stability in the individual and any 2- to 5-month predictive influence are accounted for. Thus, Model 1 is supported by equation sets in which line 2 alone (unique early effect) is significant (e.g., Set 3a in Table 4A); Model 2 is supported by equation sets in which line 3 alone (unique concurrent effect) is significant (e.g., Set 1a); and, Model 3 is supported by equation sets in which both lines 2 and 3 are significant (e.g., Set 3b). In summary, the last two lines in each set reflect solutions for separate and independent families of predictive equations each with three predictor variables.

*Mother-to-infant effects.*—Table 4A reports mother-to-infant results for the three principal forms of infant exploration (social, didactic, and tactual) and for infant nondistress vocalization at 5 months. For comparative purposes, several (but not all) maternal predictors are presented; maternal vocalization in adult conversational tones was never concurrently or predictively related to these infant activities at the zero-order level, for example, and so it was not included. With respect to Model 1, only maternal didactic encouragement at 2 months alone predicted unique variance in infant tactual exploration at 5 months (Set 3a). With respect to Model 2, maternal social encouragement at 5 months alone shared unique variance with infant so-

cial exploration at 5 months (Set 1a), maternal didactic encouragement at 5 months alone shared unique variance with infant didactic exploration (Set 2a), and maternal vocalization in the infant register at 5 months alone shared unique variance with infant didactic exploration (Set 2b). The remaining significant effects conformed with Model 3; maternal vocalization in the infant register and didactic encouragement at 2 and at 5 months both predicted unique variance in infant tactual exploration and infant nondistress vocalization at 5 months (Sets 3b, 4a), and maternal didactic encouragement at 2 and at 5 months predicted unique variance in infant nondistress vocalization at 5 months (Set 4b).

*Infant-to-mother effects.*—Table 4B gives infant-to-mother results for the two principal forms of maternal encouragement, social and didactic, as well as for maternal speech in the infant register at 5 months. With respect to Model 1, no infant activity uniquely and alone influenced maternal activities from 2 to 5 months. With respect to Model 2, infant social exploration alone shared unique variance with mothers' social encouragement at 5 months (Set 1a), and infant didactic exploration and nondistress vocalization each alone shared unique variance with maternal didactic encouragement at 5 months (Sets 2a, d). Finally, with respect to Model 3, infants' nondistress vocalization, tactual exploration, and didactic exploration at 2 and at 5 months each shared unique variance with mothers' vocalization in the infant register at 5 months (Sets 3a, c, d).

#### Discussion

Few behaviors of mothers or of infants covaried positively, suggesting that mothers and infants alike tend to specialize in particular kinds of activities. Notably, social and didactic modes of interacting in mothers are unrelated at these two ages; mothers who are social are not necessarily or automatically didactic, and mothers who are didactic are not necessarily or automatically social. This independence among maternal activities casts doubt on a monistic view of parenting as, for example, broadly "sensitive" in nature. Moreover, it lends critical support to the view that different orientations of caretaking may have different and specific agendas.

Mothers' activities showed some stability over the first half year of their infants' lives (see, too, Belsky et al., 1984; Clarke-Stewart & Hevey, 1981; Crockenberg & Smith, 1982; Dunn & Richards, 1977; Gottfried, 1984;

TABLE 4

PREDICTIVE VALIDITY: 2- TO 5-MONTH, 5- TO 5-MONTH, AND 2- AND 5-MONTH UNIQUE EFFECTS

Criterion/Predictors (Step)	R <sup>2</sup> Change	F Change	Model F
<b>A. MOTHER-TO-INFANT:</b>			
1a. Infant social exploration 5 months:			
Mother social encouragement 2 months (Model 1) . . . . .	.00	.04	3.56*
Mother social encouragement 5 months (Model 2) . . . . .	.20	10.10***	3.56*
1b. Infant social exploration 5 months:			
Mother vocalize infant register 2 months (Model 1) . . . . .	.00	.04	.18
Mother vocalize infant register 5 months (Model 2) . . . . .	.00	.03	.18
2a. Infant didactic exploration 5 months:			
Mother didactic encouragement 2 months (Model 1) . . . . .	.03	1.55	7.85***
Mother didactic encouragement 5 months (Model 2) . . . . .	.32	15.01***	7.85***
2b. Infant didactic exploration 5 months:			
Mother vocalize infant register 2 months (Model 1) . . . . .	.03	.89	2.58*
Mother vocalize infant register 5 months (Model 2) . . . . .	.10	3.30*	2.58*
3a. Infant tactual exploration 5 months:			
Mother didactic encouragement 2 months (Model 1) . . . . .	.10	3.14*	2.16
Mother didactic encouragement 5 months (Model 2) . . . . .	.06	1.90	2.16
3b. Infant tactual exploration 5 months:			
Mother vocalize infant register 2 months (Model 1) . . . . .	.11	3.89*	3.46*
Mother vocalize infant register 5 months (Model 2) . . . . .	.12	4.11*	3.46*
4a. Infant vocalize nondistress 5 months:			
Mother vocalize infant register 2 months (Model 1) . . . . .	.23	8.25**	4.17**
Mother vocalize infant register 5 months (Model 2) . . . . .	.14	5.17*	4.17**
4b. Infant vocalize nondistress 5 months:			
Mother didactic encouragement 2 months (Model 1) . . . . .	.11	3.60*	2.52*
Mother didactic encouragement 5 months (Model 2) . . . . .	.11	3.40*	2.52*
<b>B. INFANT-TO-MOTHER:</b>			
1a. Mother social encouragement 5 months:			
Infant social exploration 2 months (Model 1) . . . . .	.01	.39	3.93**
Infant social exploration 5 months (Model 2) . . . . .	.26	10.10***	3.93**
1b. Mother social encouragement 5 months:			
Infant didactic exploration 2 months (Model 1) . . . . .	.07	1.78	.78
Infant didactic exploration 5 months (Model 2) . . . . .	.00	.00	.78
1c. Mother social encouragement 5 months:			
Infant tactual exploration 2 months (Model 1) . . . . .	.02	.46	.50
Infant tactual exploration 5 months (Model 2) . . . . .	.02	.50	.45
1d. Mother social encouragement 5 months:			
Infant vocalize nondistress 2 months (Model 1) . . . . .	.00	.05	.25
Infant vocalize nondistress 5 months (Model 2) . . . . .	.01	.17	.25
2a. Mother didactic encouragement 5 months:			
Infant didactic exploration 2 months (Model 1) . . . . .	.00	.05	6.72**
Infant didactic exploration 5 months (Model 2) . . . . .	.34	15.01***	6.72**
2b. Mother didactic encouragement 5 months:			
Infant social exploration 2 months (Model 1) . . . . .	.02	.61	1.68
Infant social exploration 5 months (Model 2) . . . . .	.03	.36	1.68
2c. Mother didactic encouragement 5 months:			
Infant tactual exploration 2 months (Model 1) . . . . .	.04	1.19	2.05
Infant tactual exploration 5 months (Model 2) . . . . .	.06	1.90	2.05
2d. Mother didactic encouragement 5 months:			
Infant vocalize nondistress 2 months (Model 1) . . . . .	.05	1.66	3.43*
Infant vocalize nondistress 5 months (Model 2) . . . . .	.10	3.40*	3.43*
3a. Mother vocalize infant register 5 months:			
Infant vocalize nondistress 2 months (Model 1) . . . . .	.17	6.63**	5.00**
Infant vocalize nondistress 5 months (Model 2) . . . . .	.13	5.17*	5.00**
3b. Mother vocalize infant register 5 months:			
Infant social exploration 2 months (Model 1) . . . . .	.02	.59	1.78
Infant social exploration 5 months (Model 2) . . . . .	.00	.03	1.78
3c. Mother vocalize infant register 5 months:			
Infant tactual exploration 2 months (Model 1) . . . . .	.17	6.49*	5.25**
Infant tactual exploration 5 months (Model 2) . . . . .	.10	4.11*	5.25**
3d. Mother vocalize infant register 5 months:			
Infant didactic exploration 2 months (Model 1) . . . . .	.16	6.95**	6.31**
Infant didactic exploration 5 months (Model 2) . . . . .	.08	3.30*	6.31**

NOTE.—Variables entered hierarchically.

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

Wachs, 1987). Mothers' activities varied in continuity, however. Notably, maternal social engagement decreased, while didactic engagement increased (see, too, Belsky et al., 1984). Infants, by contrast, were unstable, although they regularly increased in exploration and in nondistress vocalization (Belsky et al., 1984; Moss, 1967).

Stability and continuity are not synonymous with sensitivity or appropriateness. It might be equally apt developmentally for one activity to exhibit consistency over time but for another to change. Both maternal activities that were stable (didactic encouragement and vocalization in the infant register) and ones that were not (social engagement) exerted later developmental effects over infants. Thus, maternal activities that fluctuate in time (those that are neither stable nor continuous) are not automatically random or developmentally ineffectual; rather, they may actually display systematic change in level and in pattern in relation to developmental changes in the infant, and on this basis harbor significant consequences for infant development.

Mothers and infants specialize, and their specializations match; that is, mother-infant interactions even in the first months can be described as mutually corresponding. Moreover, the domains of stimulation in mothers and of exploration in infants relate to one another in increasingly specific ways. In the age period studied, maternal didactic stimulation increased in parallel with increases in infant environmental exploration. Despite stylistic distinctions (evident in individual differences), therefore, mothers and infants appear to synchronize their activities in ways appropriate to infants' development. Correspondences in the longitudinal findings lend additional weight to the specificity hypothesis.

The concurrent associations also imply that as partners mothers and infants may be open to one another's influence from an early period in the infant's life. The instability of their individual behaviors over the same time period may indicate additionally that mothers and their new babies are to a certain degree flexible, plastic, and adaptable. The predictive results bear out both of these inferences. Longitudinal data even in the first 6 months provide some evidence for unique early, unique later, and combined early and late experience effects between mothers and infants.

The results of the predictive models can be considered from two perspectives, first, which behaviors of infants and mothers were predicted and, second, what patterns existing

predictive relations followed. Only infant tactical exploration and nondistress vocalization, and only maternal vocalization in the infant register, were uniquely predicted from 2 to 5 months. Mother and infant activities shared unique variance more at 5 than at 2 months, and corresponding relations between partners predominated, such as mother and infant social and didactic activities and mothers' speaking in the infant register and infants' nondistress vocalizing. With respect to predominance of different models, Model 2 results overshadowed Model 1, and significant associations appear to be concurrent more often than predictive; Model 3 relations are common, and if an association is predictive it will be concurrent as well.

Discontinuities characterize infant development in the first year of life (e.g., Emde et al., 1976; Fischer, 1980); presumably, if our observation times had straddled periods of reorganization in infancy, other patterns of results might have emerged. Also, the results reported might apply uniquely to the open style of interaction we studied but not to other more constrained situations. The families in this study were relatively restricted in terms of socioeconomic status and educational history; different patterns of results could emerge in mothers (and conceivably in infants) coming from other regions of the SES scale. Thus, the generalizability of these findings might be circumscribed. Nonetheless, the first 6 months represent a particularly crucial period of adjustment for mother and baby, and the times they were observed provided for an optimal assessment of dyadic interaction. The behaviors observed were also representative of common interactions of mothers with their infants. Moreover, neither maternal nor infant activities related to SES, and mothers and infants alike showed considerable variation in their activities.

Theoreticians and researchers have long supposed that the child's earliest interactive experiences may affect the course of later development (Plato, ca. 350 B.C.), and the importance and pervasiveness of infant effects on caretakers are generally well recognized (e.g., Bell & Harper, 1977). Our analyses converge to support such a multivariate and multi-model view of specificity in mother-infant mutual interactions in the first half year of the infant's life.

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