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BRIEF REPORTS

Maternal Responsiveness to Young Children at Three Ages: Longitudinal Analysis of a Multidimensional, Modular, and Specific Parenting Construct

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Responsiveness defines the prompt, contingent, and appropriate reactions parents display to their children in the context of everyday exchanges. Maternal responsiveness occupies a theoretically central position in developmental science and possesses meaningful predictive validity over diverse domains of children's development, yet basic psychometric features of maternal responsiveness are still poorly understood. In this prospective longitudinal study, the authors examined structure, individual variation, and continuity of multiple dimensions of responsiveness in 40 mothers to their infants' activities at 10, 14, and 21 months during natural home-based play interactions. Both age-general and age-specific patterns emerged in maternal responding. The study's developmental results support the multidimensionality, modularity, and specificity of this central parenting construct.

Keywords: parenting, responsiveness, longitudinal, infancy, modularity

Persistent childrearing practices are often credited with influencing the course of child development (e.g., Bornstein, 2002, 2006; Collins, Maccoby, Steinberg, Hetherington, & Bornstein, 2000). One feature of parenting believed to be especially influential is *responsiveness*, parents' prompt, contingent, and appropriate reactions to their children (Ainsworth, Bell, & Stayton, 1974; Bornstein, 1989b; Bornstein et al., 1992; De Wolff & van IJzendoorn, 1997; Landry, Smith, Swank, Assel, & Vellet, 2001; Tamis-LeMonda & Bornstein, 2002). Maternal responsiveness has attracted the attention of developmental scientists for several reasons. First, it reflects the keystone parent component in the recurring three-term sequence in everyday exchanges between child and parent that involve child act, parent reaction, and effect in child. Second, responsiveness is a common characteristic of parenting around the world (e.g., Girolametto et al., 2002; Paavola, Kunnari, Moilanen, & Lehtihalmes, 2005; Valenzuela, 1997; van IJzendoorn, Bakermans-Kranenburg, & Sagi-Schwartz, 2006), and responsiveness generalizes across contexts (e.g., from laboratory to home; Crockenberg & Litman, 1990; Rothbaum & Crockenberg, 1995). Third, parenting that is responsive is credited with fostering valued developmental outcomes, including emotional security, social facility, symbolic competence, verbal ability, and intellectual achievement (Ainsworth et al., 1974; Bornstein, 1989b; Bornstein, Tamis-LeMonda, & Haynes, 1999; Landry, Smith, Miller-Loncar, & Swank, 1997; Paavola et al., 2005; Riksen-Walraven, 1978; van IJzendoorn, Dijkstra, & Buss, 1995).

Despite its consensual centrality, robustness, and predictive validity, some basic characteristics of maternal responsiveness remain poorly understood. They are its internal structure, individual variation, and continuity through time. Internal structure refers to how components of responsiveness relate to one another. Individual variation refers to the distributions of different components of responding among mothers. Continuity refers to whether components of responsiveness remain the same or change in their mean levels over time. The current prospective longitudinal investigation examines these issues in different forms of mothers' responsiveness to prominent child activities across three ages in children's first 2 years.

A minimally necessary and sufficient definition of responsiveness includes promptness, contingency, and appropriateness (Ainsworth et al., 1974; Ainsworth, Blehar, Waters, & Wall, 1978; Baumrind, 1967, 1978; S. M. Bell & Ainsworth, 1972; Bornstein, 1989a, 1989b; Bowlby, 1969; De Wolff & van IJzendoorn, 1997). Responsiveness needs to be prompt to be effective; however, mere contiguity rather than contingency inadequately describes psychologically consequential responsiveness for the child, just as promptness or contingency without appropriateness is not the kind of responsiveness that is developmentally meaningful.

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Internal Structure, Individual Variation, and Continuity of Maternal Responsiveness

Internal Structure

Some theoreticians have treated responsiveness as a monistic trait of parents, normally rated on a global scale (e.g., Ainsworth, Bell, & Stayton, 1971; Ainsworth et al., 1974; Biringen, Robinson, & Emde, 1998; Landry et al., 2001). The alternative view characterizes responsiveness as a multidimensional, modular, and specific set of behaviors—that is, an aggregate constellation (Bornstein, 2006). Parenting is multidimensional in the sense that parents think about parenting and engage children in different ways for different purposes. Parenting is modular in the sense that different domains of parenting are not necessarily associated; they serve different functions and follow different developmental trajectories. Finally, parenting is specific in the sense that particular features of parenting exert particular effects on children's development. Two mothers may be similar in their overall responsiveness (i.e., how often they respond) but differ in (a) the target activities to which they respond—one mother might respond to her child's vocalizations, and another to her child's exploration—and (b) the type of responses they exhibit—one mother might respond by affirming her child's actions, and another by describing them.

Our approach led to certain expectations. First, we expected a degree of independence among different types of responsiveness. Second, on the basis of developmental changes in children across the first 2 years, we hypothesized that different child target activities and maternal types of responsiveness would be prominent at different periods.

Individual Variation

Mothers vary among themselves in their responsiveness, and so responsiveness and different types of responding should be distributed. If responsiveness were a coherent global trait, mothers would be expected to vary in their general responsiveness, but not across different types of responsiveness. If, alternatively, responsiveness were multidimensional, modular, and specific, mothers would be expected to vary in both their general responsiveness as well as across different types of responsiveness.

Continuity

Continuity in the average level of responsive parenting across time implies that childrearing behaviors assessed at one point in time can be assumed to reflect prior as well as future childrearing (Roberts, Block, & Block, 1984). However, our alternative view is that some types of responsiveness change over time whereas others remain consistent.

We asked: How do children change in their exploration, play, bids to mothers, and vocalizations across the 1st and 2nd years? To which child activities do mothers respond? At what rates? Do rates of maternal responsiveness differ across target child activities within and across child age? How do mothers respond? Do maternal response types differ across child age?

Method

Participants

Forty mother–child dyads (23 daughters), recruited from private obstetric and pediatric groups in New York City, participated (Table 1). Dyads were visited in their homes when children were 10, 14, and 21 months—all developmental periods of rapid change in children's cognitive, language, socioemotional, and motor competencies (Tamis-LeMonda, Cristofaro, Rodriguez, & Bornstein, 2006).

Home Observation Procedure and Coding

At each age, mother and child were videorecorded playing on the floor with the same standard set of toys for 10 min (Bornstein, Haynes, O'Reilly, & Painter, 1996). Mothers were asked to behave in their usual manner and to disregard the observer's presence. We studied mothers' responses to child exploration, play, bids to mother, and vocalizations. These child behaviors are frequent and prominent at these ages, and are behaviors that middle-class Western mothers monitor closely and respond to. We studied mothers' most frequent and prominent response types: affirmations, imitations, descriptions, questions, play, and exploratory prompts. Event-based coding of all child activities and maternal responses was conducted from the videorecords (Bornstein et al., 1992, 1999; Tamis-LeMonda, Bornstein, & Baumwell, 2001). Coders viewed records in real time, but could stop them at any point to document precisely which infant and mother behaviors occurred (taking up to 10 hr to code 10 min). Coding began when the child exhibited a change in his or her ongoing behavior in one of four categories: (a) exploration (looking and/or manipulating an object); (b) play (functional or pretense play with an object); (c) bidding to or looking at mother; or (d) vocalizing. We distinguished children's exploration of objects from their play on the basis of documentation in the literature that children across this age shift from primarily exploring objects to engaging in symbolic play with objects. The categories of child behaviors were mutually exclusive (if young children displayed overlapping categories of behaviors with vocalizing, vocalization was coded; this forced-choice approach was implemented for analytic purposes).

After noting the child's activity, the coder recorded whether or not the mother responded. A maternal response was defined by the coordination of the three features of responsiveness with respect to

Table 1
Study Sample Characteristics

Characteristic	*M*	*SD*	Range
Child			
Birth weight in kg	3.5	0.5	2.7–4.5
Age (months), 10 months	10.1	0.1	10.0–10.7
Age (months), 14 months	14.0	0.2	13.6–14.2
Age (months), 21 months	21.5	0.3	21.1–22.2
Mother			
Age (years)	33.3	3.4	25–40
Years of schooling after high school	5.6	2.1	3–15
Family SES[a]	59.1	5.8	48–66

Note. All participants came from European American, broadly middle-class, intact households in which both mother and father were native English speakers. Children were firstborn, term, of normal weight at birth, and free of any known neurological and sensory abnormalities. Because demographic variables were unrelated to any mother or child measures in this sample, they were not considered in the analyses. SES = socioeconomic status.

[a] SES was measured by the Hollingshead (1975) Four-Factor Index of Social Status (see Bornstein, Hahn, Suwalsky, & Haynes, 2003).

the child's target act: prompt (occurring within a 5-s window of the onset of child behavior); contingent (depending conceptually on the preceding child behavior; e.g., if the child picks up the spoon, the mother refers to the spoon); and appropriate (mother responds in a positive and meaningful way; e.g., saying "That's a spoon."). The 5-s window represented the upper end of coding a maternal response. However, it was frequently the case that mothers responded to more than one child behavior in succession within 5 s; when this occurred, each different child behavior and each different response were coded. For each maternal response, coders also recorded how the mother responded—her *response type*. Response types were coded into six mutually exclusive categories: (a) affirmations of child action ("Yes," "That's right"), (b) imitations/expansions of child vocalization ("ball" after child uttered "ba"), (c) descriptions of an object, event, or activity ("That's a blue spoon"), (d) questions about an object, event, or activity ("What is that?"), (e) play prompts ("Feed the doll"), and (f) exploratory prompts ("Look here"). Over 90% of maternal responses could be classified into one of these six types, with the balance of responses being fillers (e.g., "Uh-huh," "Let's see") excluded from analyses.

Four random reliability checks were conducted at each age for each of three coders ($n = 24$); different coders scored child activity and maternal responsiveness in different data waves to ensure coder blindness. Reliabilities (κ) averaged .77 for child target acts and .73 for maternal response types.

Results and Discussion

Descriptive Statistics and Internal Structure of Maternal Responsiveness

Tables 2, 3, and 4 present descriptive statistics for all measures at the three ages. Especially notable are the degrees of variation in all measures of maternal responsiveness even in this sociodemographically homogeneous sample. The sample-specific coefficient of variation puts the standard deviation in units of the mean (Tables 3 and 4): It is conceptually informative about relative variation across repeated instances of the same variable or across different variables.

To assess the internal structure of maternal responsiveness, we examined correlations among frequencies of mothers' response types at each age. Mothers' response types rarely related to one another: Only 1, 1, and 2 coefficients out of the possible 15 at each age were significant at 10, 14, and 21 months, respectively. On average, coefficients were small in magnitude and not significant, mean $*\hat{p}*$s = .16, .18, and .17; 95% CIs = (−.15, .45), (−.14, .46), and (−.15, .45) at 10, 14, and 21 months, respectively. All three ratios of aggregated shared variances to aggregated shared plus aggregated unique variances for all pairs of frequencies of maternal response types were low (Kaiser-Meyer-Olkin measures = .46, .57, and .58 at 10, 14, and 21 months, respectively), rendering factor analysis pointless. Independence among response types lends support to a multidimensional and modular account of maternal responsiveness.

Continuity in Child Activity and Maternal Responsiveness Across Three Ages

Figure 1 displays the means and standard errors of the mean (*SEM*) of unconditional frequencies of child activities and conditional frequencies of maternal responses for each of the four target child behaviors across the three ages.

Child activity. Table 2 presents child activities at the three ages and age effects from separate repeated-measures analysis of variance (ANOVA). Child exploration (Figure 1A) declined between 10 and 14 months, but leveled off between 14 and 21 months. Play (Figure 1B) increased between 10 and 14 months, but leveled off between 14 and 21 months. Bids to mother (Figure 1C) increased between 10 and 14 months and between 14 and 21 months. Vocalizations (Figure 1D) increased between 10 and 14 months and between 14 and 21 months. If child behavior is viewed as an invitation to mothers to respond, mothers at the three ages were offered different opportunities to respond to different child behaviors. We therefore analyzed continuity in the proportions of maternal responses (the number of maternal responses to each child behavior divided by the number of occurrences of that child behavior; e.g., if a child engaged in eight episodes of play, and the mother responded to four of those episodes, her response proportion was .50) and frequencies of the six maternal response types.

Maternal responses: Proportions. Overall, mothers responded to 50% to 80% of all child activities. Table 3 presents descriptive statistics of maternal responses to child activities and age effects from separate repeated-measures ANOVAs using a 3 (within-subjects factor, child age: 10 vs. 14 vs. 21 months) × 4 (within-subjects factor, activity: explorations vs. play vs. bids to mother vs. vocalization), including the interaction term, factorial design. A significant Child Age × Activity interaction emerged, $F(5.1, 197.5) = 2.53$, adjusted degrees of freedom (Huynh & Feldt, 1976)

Table 2
Child Activities: Descriptive Statistics and Age Effects

Child activities frequency	10 months *M* (*SD*)	14 months *M* (*SD*)	21 months *M* (*SD*)	Overall age effect $F(2, 38)$	10 vs. 14 months $F(1, 39)$	14 vs. 21 months $F(1, 39)$	10 vs. 21 months $F(1, 39)$
Exploration	24.55 (6.89)	18.48 (6.84)	17.85 (9.14)	14.40^{***}, $\eta_p^2 = .43$	23.90^{***}, $\eta_p^2 = .38$	0.16, *ns*	17.69^{***}, $\eta_p^2 = .31$
Play	11.40 (7.41)	30.23 (11.86)	35.37 (13.12)	83.69^{***}, $\eta_p^2 = .82$	90.19^{***}, $\eta_p^2 = .70$	3.99, *ns*	121.26^{***}, $\eta_p^2 = .76$
Bids to mother	11.65 (6.86)	15.18 (8.86)	24.43 (11.92)	23.36^{***}, $\eta_p^2 = .55$	6.94^{*}, $\eta_p^2 = .15$	28.60^{***}, $\eta_p^2 = .42$	47.69^{***}, $\eta_p^2 = .55$
Vocalization	19.30 (11.77)	27.27 (17.54)	58.90 (29.86)	34.22^{***}, $\eta_p^2 = .64$	6.46^{*}, $\eta_p^2 = .14$	49.85^{***}, $\eta_p^2 = .56$	69.22^{***}, $\eta_p^2 = .64$

Note. Following significant main effects, separate repeated-measures analyses of variance were performed to compare differences among child ages and/or activities. To accommodate the number of pair-wise comparisons made, significance criteria were adjusted (.017 and .008, respectively, for pair-wise comparisons on age and activities) with Bonferroni inequalities (Keppel, 1982).
* $p < .05$. *** $p < .001$.

Table 3
Maternal Responses: Descriptive Statistics, Ranges of Coefficients of Variation, and Age Effects

Maternal responses proportion	10 months *M* (*SD*)	14 months *M* (*SD*)	21 months *M* (*SD*)	Ranges of CV 10–21 Months	Overall age effect *F*(2, 38)	10 vs. 14 months *F*(1, 39)	14 vs. 21 months *F*(1, 39)	10 vs. 21 months *F*(1, 39)
Exploration	.65 (.14)	.68 (.20)	.64 (.17)	0.40–0.63	0.79, *ns*			
Play	.57 (.31)	.66 (.18)	.58 (.16)	0.42–0.83	4.32*, η_p^2 = .19	3.88, *ns*	6.79*, η_p^2 = .15	.01, *ns*
Bids to mother	.83 (.17)	.80 (.19)	.78 (.12)	0.47–0.63	1.61, *ns*			
Vocalization	.54 (.21)	.58 (.21)	.61 (.16)	0.55–0.67	1.53, *ns*			

Note. Following significant main effects, separate repeated-measures analyses of variance were performed to compare differences between child ages and/or activities. To accommodate the number of pair-wise comparisons made, significance criteria were adjusted (.017 and .008, respectively, for pair-wise comparisons on age and activities) with Bonferroni inequalities (Keppel, 1982). CV = coefficient of variation based on conditional frequencies.
* $p < .05$.

for violation of sphericity assumption, $p < .05$, $\eta_p^2 = .06$, as well as a significant main effect for activity, $F(3, 37) = 40.34$, $p < .001$, $\eta_p^2 = .77$. In consideration of the Child Age × Activity interaction, the main effect for activity was interpreted by exploring the activity effect at each age. Activity effects emerged across all three ages, Fs (3, 37) = 25.44, 14.06, and 36.09, $\eta_p^2 = .67$, .53, and .74, at 10, 14, and 21 months, respectively, ps $< .001$.

At 10, 14, and 21 months, mothers responded proportionally more frequently to bids to mother than to exploration, Fs(1, 39) = 51.62, 14.76, and 22.14, $\eta_p^2 = .57$, .27, and .36, respectively, ps $< .001$; play, Fs(1, 39) = 34.02, 15.82, and 94.67, $\eta_p^2 = .47$, .29, and .71, respectively, ps $< .001$; and vocalization, Fs(1, 39) = 73.76, 43.55, and 35.44, $\eta_p^2 = .65$, .53, and .48, respectively, ps $< .001$. At 10 and 14 months, mothers responded proportionally more frequently to exploration than to vocalization, Fs(1, 39) = 17.13 and 9.20, ps $< .001$ and $< .01$, $\eta_p^2 = .30$ and .19, respectively.

Examination of the age differences in each maternal response (Table 3) revealed an age effect in the proportion of maternal responses to child play (Figure 2): Proportions of maternal responses to child play were not statistically different between 10 and 14 months (note the high variability at 10 months), but decreased between 14 and 21 months. The proportions of maternal responses to child exploration, bids, and vocalizations were flat across age (Table 3). Bids to mother were responded to most, a finding that accords with other studies (e.g., Bloom, Margulis, Tinker, & Fujita, 1996). At the two younger ages, mothers responded more frequently to child exploration than to vocalizations; however, this difference attenuated by 21 months.

Maternal response types. Table 4 presents descriptive statistics of maternal response types at the three ages and age effects from separate repeated-measures (within-subjects factor, child age: 10 vs. 14 vs. 21 months) ANOVAs. Mainly age effects emerged (see Figure 3). Mothers' affirmations increased between 10 and 14 months, but leveled off between 14 and 21 months. Mothers' imitations/expansions increased between 10 and 14 months and between 14 and 21 months. Mothers' descriptions increased between 10 and 14 months, but leveled off between 14 and 21 months. Mothers' questions did not change between 10 and 14 months, but increased between 14 and 21 months. Mothers' play prompts increased between 10 and 14 months and between 14 and 21 months. Mothers' exploratory prompts did not change between 10 and 14 months, but increased from 14 to 21 months.

Conclusions

Developmental theorists assert the significance of responsive parenting for children's socioemotional, cognitive, and communicative development. In conceptualizing responsive parenting, however, theoreticians and empiricists alike have often assumed that responsiveness is both monolithic and continuous across early child development. In this prospective longitudinal investigation, we examined the internal structure, individual variation, and continuity of maternal responsiveness to young children's activities. Maternal responsiveness, even in a relatively homogenous sample, proved to be multidimensional, modular, and specific in structure and proved to vary widely among mothers. Mothers respond to different child activities differently, and different types of maternal responsiveness follow different developmental trajectories. The dynamic nature of maternal responsiveness suggests that young children play an active role in eliciting maternal behaviors that may be increasingly meaningful and relevant to them as their needs change and as they develop more sophisticated competencies (R. Q. Bell, 1979; Lewis & Rosenblum, 1974). The three-term event sequence that has maternal responsiveness at its fulcrum exemplifies coregulation in early child–parent development. From that perspective, this study deepens our understanding of the maternal responsiveness cog in the core formulation of developmental transaction.

Our participants were primiparous mothers who came from homogenous, educated, intact, middle-class, nonclinical European American families. Of course, different patterns of results could emerge in other samples. Nonetheless, conceptualizing responsiveness in a more differentiated way promises a better understanding of patterns of responding in different populations who may emphasize responses to different targets in children or different ways of responding that are overlooked when global measures are employed. We concentrated on selected child activities and types of maternal responses in interactions of a fixed type and duration at a particular developmental time. By studying maternal responsiveness during free play, there was little opportunity to examine other types of maternal behaviors, such as disciplinary styles, that are also core to the socialization of children. We also examined maternal responsiveness in a relatively narrow, if still developmentally significant, window: 10 to 21 months. Whether patterns of maternal responsiveness would differ at earlier or later periods is open to question. Responsiveness was initially conceptualized

by Bowlby (1969) and Ainsworth et al. (1971) as applicable in situations of child separation and distress, and the literature on responsiveness has focused on parental sensitivity to children's emotional upset. However, neutral to positive contexts reflect the vast majority of children's time, so it may be equally if not more important to examine responsiveness in situations that are not distressing to the child. For these reasons of prevalence and effect, the internal structure, individual variation, and continuity of responsiveness during neutral and positive interactions merit attention.

When we analyzed covariation among the different forms of responding at each age, we found that component features of responsiveness covaried very little and did not submit to principal components analysis. Moreover, different types of responsiveness also followed different developmental trajectories in ways that aligned with the changing competencies of children. Our findings suggest that maternal responsiveness is more profitably conceived of as multidimensional, modular, and specific. This more differentiated view suggests that maternal responsiveness is not global in its efficacy. When maternal responsiveness is decomposed, specific components show domain-specific relations with specific child abilities. Mothers' responding to children's language is associated with advances in children's language, not play, for example, just as responsiveness to play is related to advances in children's play, not language (Paavola et al., 2005; Tamis-LeMonda, Bornstein, Baumwell, & Damast, 1996; see also Davidov & Grusec, 2006).

Developmental scientists are interested in behavioral consistency. Whether children and mothers as a group remain the same or increase or decrease in various behaviors informs not only the general developmental course of those behaviors but also provides clues as to their origins, future, and perhaps effectiveness (see Appelbaum & McCall, 1983; McCall, 1981). The children we assessed followed different developmental trajectories in each of four categories of activity, providing different starting points and pathways of development for their mothers. As children develop into increasingly active social partners, mothers are challenged to modify their responses to accord. We found that mothers' mean levels of responsiveness to three of four child activities remained consistent across time. In other words, mothers were continuous in responding to their young children across the 2nd year of life despite children's changing level of behaviors.

How mothers responded told a different story. With respect to the changing nature of different dimensions of maternal responsiveness, both general and specific patterns emerged. Some forms of maternal responsiveness increased across the three ages, some remained steady, and some decreased (Figure 4). Thus, a second pattern of results emerged in maternal responsiveness that was more specific in nature—viz., different maternal response types rose to prominence at different developmental periods. Specifically, mothers' responding with descriptions and exploratory prompts decreased and their responding with imitations and expansions, questions, and play prompts increased across the same period. Increases in vocal imitations and expansions and questions were especially evident at 21 months relative to younger ages. Mothers do not just talk more, but rather shift from a reliance on verbal descriptions (mother-as-provider-of-information) to a reliance on eliciting input from the child through verbal questioning (child-as-communicative-partner). Thus, changes in functional as-

Table 4
Maternal Response Types: Descriptive Statistics, Ranges of Coefficients of Variation, and Age Effects

Maternal response type frequency	10 months *M* (*SD*)	14 months *M* (*SD*)	21 months *M* (*SD*)	Ranges of CV 10–21 months	Overall age effect $F(2, 38)$	10 vs. 14 months $F(1, 39)$	14 vs. 21 months $F(1, 39)$	10 vs. 21 months $F(1, 39)$
Affirmations	8.67 (6.09)	13.98 (6.45)	15.35 (9.10)	0.46–0.70	16.35^{***}, $\eta_p^2 = .46$	26.20^{***}, $\eta_p^2 = .40$	0.93, *ns*	20.51^{***}, $\eta_p^2 = .34$
Imitations/expansions	2.05 (2.55)	4.15 (4.60)	11.60 (7.98)	0.69–1.24	22.67^{***}, $\eta_p^2 = .55$	6.34^{*}, $\eta_p^2 = .14$	31.62^{***}, $\eta_p^2 = .45$	47.30^{***}, $\eta_p^2 = .55$
Descriptions	14.48 (6.18)	18.02 (6.85)	17.95 (7.48)	0.38–0.43	4.34^{*}, $\eta_p^2 = .19$	7.46^{**}, $\eta_p^2 = .16$	0.00, *ns*	5.02, *ns*
Questions	1.68 (1.62)	2.33 (2.30)	6.73 (4.43)	0.66–0.99	22.94^{***}, $\eta_p^2 = .55$	2.19, *ns*	33.72^{***}, $\eta_p^2 = .46$	47.03^{***}, $\eta_p^2 = .55$
Play prompts	12.08 (6.72)	21.65 (9.51)	28.75 (11.26)	0.39–0.56	47.77^{***}, $\eta_p^2 = .72$	46.53^{***}, $\eta_p^2 = .54$	15.19^{***}, $\eta_p^2 = .28$	85.11^{***}, $\eta_p^2 = .69$
Exploratory prompts	1.33 (1.93)	0.72 (1.32)	2.05 (2.21)	1.08–1.83	6.24^{**}, $\eta_p^2 = .25$	2.71, *ns*	11.97^{***}, $\eta_p^2 = .23$	2.40, *ns*

Note. Following significant main effects, separate repeated-measures analyses of variance were performed to compare differences among child ages and/or activities. To accommodate the number of pair-wise comparisons made, significance criteria were adjusted (.017 and .008, respectively, for pair-wise comparisons on age and activities) with Bonferroni inequalities (Keppel, 1982). CV = coefficient of variation.
$^{*}p < .05$. $^{**}p < .01$. $^{***}p < .001$.

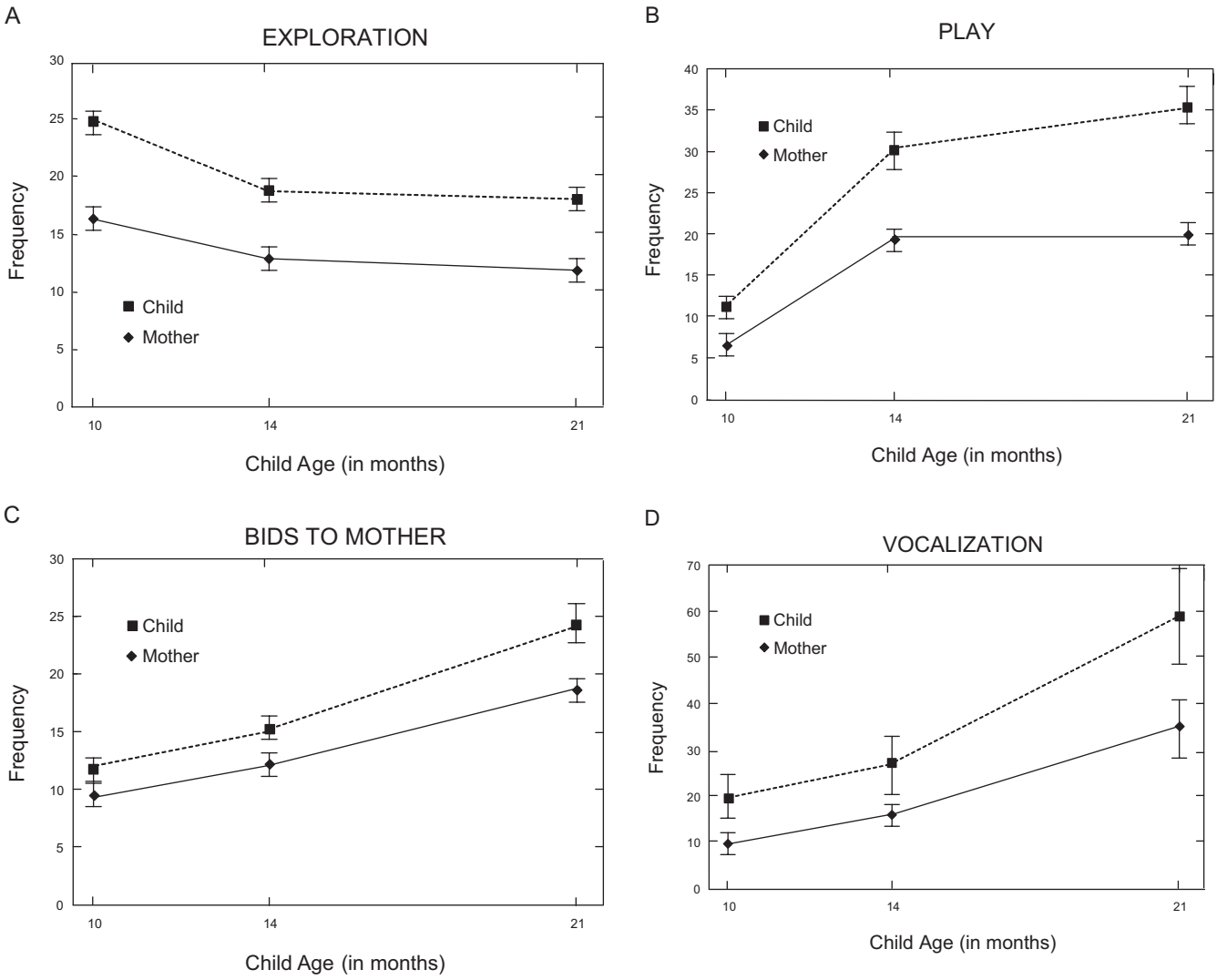

Figure 1. Means and standard errors of the mean (error bars) of unconditional frequencies for child exploration and conditional frequencies of maternal responses from 10 to 14 to 21 months. A: Child exploration. B: Child play. C: Child bids to mother. D: Child vocalization.

pects of communication are evident even in the context of continuity in mean levels of responsiveness.

It is probable that certain forms of responsiveness are more or less appropriate or effective vis-à-vis children's emerging abilities at different developmental stages. At the turn of the 2nd year, children's rapidly advancing cognitive and motor abilities render them increasingly competent to explore their environments. Mothers' attunement to their children's exploratory initiatives by responding with descriptions and exploratory prompts seem especially relevant at this point. Descriptions provide verbal information to young children that is semantically related to their attentional focus, and exploratory prompts foster children's emerging psychomotor abilities. Moreover, by this time, children are beginning to engage in more advanced forms of play, moving beyond exploring objects in concrete ways to juxtaposing toys appropriately and engaging in episodes of rudimentary pretense. As children's play competencies increase, mothers' responses to

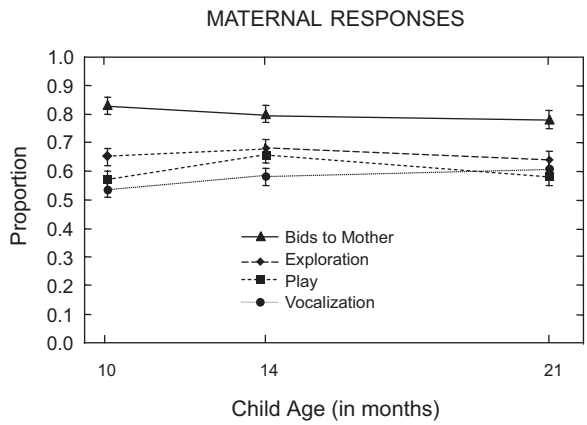

Figure 2. Means and standard errors of the mean (error bars) of proportions of maternal responses to child bids to mother, exploration, play, and vocalization from 10 to 14 to 21 months.

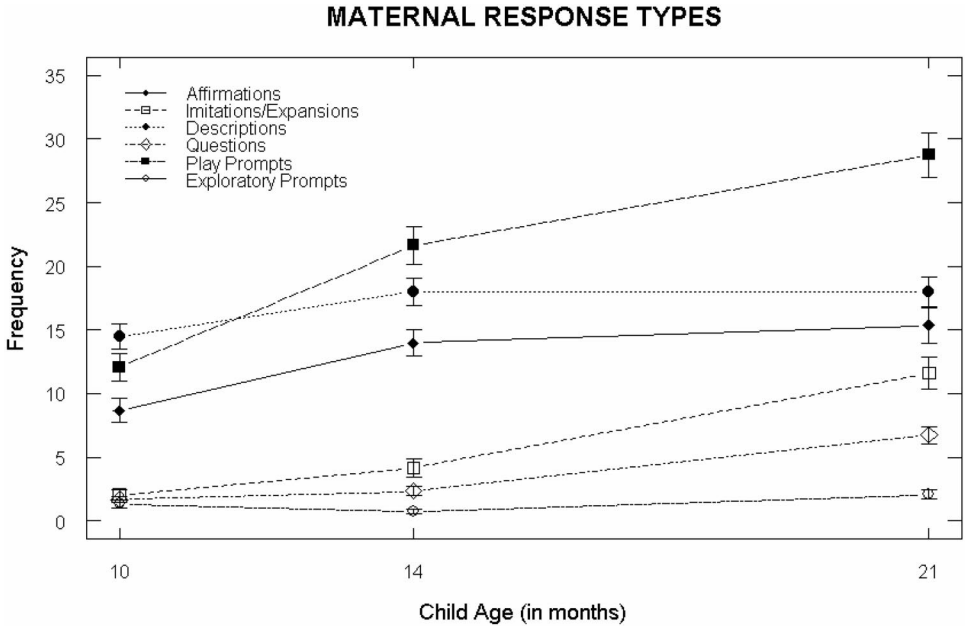

Figure 3. Means and standard errors of the mean (error bars) of conditional frequencies of maternal responses with affirmations, imitations/expansions, descriptions, questions, play prompts, and exploratory prompts from 10 to 14 to 21 months.

basic exploration wane, whereas their responses to play wax, which is especially relevant to supporting developmental advances in children's representation. Across the 2nd year, young children also become more sophisticated communicative partners, and feedback on and elaboration of their verbal initiatives are especially meaningful. Mothers increasingly respond to their children by imitating and/or expanding on children's vocalizations and by using questions. Both forms of responding help to shape children's vocalizations, reinforce their initiatives at communicating, and/or amplify meaning to their utterances. The increase in mothers' questioning suggests that they are aware of their children's enhanced abilities to both understand and respond to verbal inquiries. Furthermore, by responding to their children's attempts to communicate through language and play, mothers both reinforce their children's intentionality and ensure that their conversations will remain semantically related to, and within conceptual reach of, their children's interests.

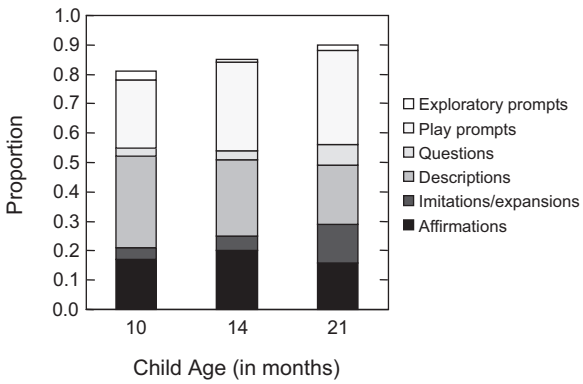

Figure 4. Within- and across-age differences in mothers' response types (in proportions). (These are group means and so do not add to 1.)

Overall, the multidimensional, modular, and specific structure we identified for maternal responsiveness challenges researchers to better parse the role of responsiveness in parenting (with which it is often identified) and in attachment theory (where it is thought to play an especially signal part). One issue for future research concerns the further exploration of specificity in the predictive validity of responsiveness. A second is the meaningfulness of mothers' responses as separate from their frequency. Reciprocally, children's own responsiveness and its implications for parenting have not been sufficiently investigated. Finally, these results demonstrate the worth of reconsidering patterns of development across multiple waves. Examination at one or two specific points in time, although valuable, provides an incomplete developmental picture. By including three ages, we could distinguish linear from quadratic relations between maternal responsiveness and child activity, information that eludes assessments of maternal responsiveness at only one or even two ages.

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