

## The correlates of dyadic synchrony in high-risk, low-income toddler boys

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### Abstract

Synchrony has been broadly conceptualized as the quality of the parent–child dyadic relationship. Parenting, factors that compromise caregiving quality, and child characteristics have all been theoretically linked to synchrony, but little research has been conducted to validate such associations. The present study examined correlates of synchrony including parenting, maternal psychological resources and child attributes, among a sample of 120 mother–son dyads who were participating in a treatment study for children identified as being at risk for developing early conduct problems. These families participated in an at-home assessment, which included a series of mother–son interactions. Synchrony was associated with aspects of parenting and child attributes, including maternal nurturance, and child emotional negativity and language skills. The findings are discussed in terms of parent and child contributions to the development of synchrony.

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Caregiving factors, such as authoritative parenting and parental sensitivity, have been associated with the development of behavior problems and competencies (Baumrind, 1975; De Wolff & van Ijzendoorn, 1997), and child factors, such as emotionality and inhibition, have been linked to children's prosocial and problem behaviors (Guerin, Gottfried, & Thomas, 1997; Shaw, Gilliom, Ingoldsby, & Nagin, 2003). Furthermore, research has shown that the match between parenting practices and child attributes is associated with the development of behavior problems above and beyond the individual contributions of parent and child factors (Olson, Bates, Sandy, & Lanthier, 2000; Park, Belsky, Putnam & Crnic, 1997). Thus, the particular combination of a child's temperament with a parenting style may alter the likelihood of future conduct problems (Thomas & Chess, 1977). While a number of studies have investigated reciprocal and transactional processes between parenting and child attributes in relation to child outcomes (Martin, 1981; Shaw, Keenan, & Vondra 1994a; Shaw et al., 1998), fewer researchers have measured the quality of the parent–child relationship in a dyadic manner.

Synchrony has been proposed as a construct that captures the mutuality and reciprocity of parent–child interaction (Harrist & Waugh, 2002). A synchronous interaction is one that involves shared affect, joint attention and responsivity

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on the part of both parent and child (Harrist, Pettit, Dodge, & Bates, 1994; Isabella, Belsky, & von Eye, 1989; Tronick & Cohn, 1989), where the participants coordinate their interactions through mutual affective expression and shared eye contact. Both parent and child attributes ought to contribute to the development of synchrony; however, little research has been conducted to examine the precise parent and/or child characteristics that are associated with synchronous interactions.

## 1. Synchrony and the parent–child relationship

Many aspects of the mother–child relationship, such as maternal sensitivity, responsiveness and proactive parenting (Gardner, Ward, Burton, & Wilson, 2003), have been studied more extensively than has synchrony. However, all of these constructs focus solely on maternal behavior *towards* the child. Despite the similarities between synchrony and other established constructs of the mother–child relationship, synchrony may be different in a number of meaningful ways. Synchrony encompasses both the mother’s and the child’s responsivity, and their emotional availability to each other. Thus, synchrony purports to be a broader construct than maternal sensitivity and responsiveness. However, just as attachment theorists (Ainsworth, Bleher, Waters, & Wall, 1978) posit that sensitivity is required for the development of a secure attachment, dyads displaying higher levels of synchrony would be expected to have high levels of maternal sensitivity and responsiveness.

In fact, a number of researchers have studied the dyadic interplay between the parent and child. Synchrony has been researched in infancy (Cohn & Tronick, 1987; Isabella & Belsky, 1991), middle childhood (Deater-Deckard & Petrill, 2004; Harrist et al., 1994; Kochanska & Aksan, 2004) and adolescence (Criss, Shaw, & Ingoldsby, 2003). Several terms have been used by researchers to label this construct, including dyadic synchrony (Harrist & Waugh, 2002), interactional synchrony (Isabella & Belsky, 1991), mutuality (Deater-Deckard & Petrill, 2004) and mutually responsive orientation (Kochanska & Aksan, 2004). Regardless of the term used, all of these constructs have been defined as a dyadic measure of the quality of the parent–child interaction, and are associated with positive social outcomes (Clark & Ladd, 2000; Criss et al., 2003; Lindsey, Mize & Pettit 1997), and low levels of aggression (Harrist et al., 1994).

## 2. Correlates of synchrony

Synchrony has been theorized to be greater than the sum of mother and child characteristics, but it seems likely that a number of individual parent and child characteristics are associated with its development. As maternal responsivity and affect are vital components of synchrony (Vizziello, Ferrero, & Musicco, 2000; Weinberg, Tronick, Cohn, & Olson, 1999), it follows that parent characteristics that are related to improved caregiving should be associated with synchrony. Similarly, characteristics of the toddler that facilitate active and cooperative participation should be associated with synchrony.

### 2.1. Maternal psychological resources

A mother’s psychological well-being and social support should contribute to her abilities to interact synchronously with her child (Belsky, 1984). For example, maternal depression has been related to lower parental responsivity and positivity (Cohn, Campbell, Matias, & Hopkins, 1990; Field, 1995). Maternal depression has also been linked to impairments in children’s social-emotional development, indirectly through compromised parenting and directly through modeling of maladaptive coping strategies (Carter, Garrity-Rokous, Chazan-Cohen, Little, & Briggs-Gowan, 2001; Leadbeater, Bishop, & Raver, 1996). Based on this research, it is likely that maternal depression would contribute to poorer dyadic synchrony.

Some research suggests that parental personality characteristics may be associated with deficits in parenting (Clark, Kochanska, & Ready, 2000; Ispa, Fine, & Thornburg, 2002). For example, a personality style characterized by aggressive tendencies has been found to be associated with behavior problems in young boys (Shaw, Vondra, Hooper, Keenan, & Dunn, 1994b) and changes in infant attachment classification from secure to insecure (Egeland & Farber, 1984). Further, hostile and aggressive parental personality traits may be more challenging for children to negotiate, promoting decreased contact and reduced synchrony between mother and child. Additionally, maternal negative emotionality appears to interact with child negative emotionality, exacerbating the effects of each one on the dyad (Clark et al.,

2000; Ispa et al., 2002). Thus, parents who demonstrate hostile and aggressive tendencies may show reduced abilities to interact contingently with their children.

Additionally, mothers, who also have low levels of social support have been shown to demonstrate more maladaptive caregiving patterns, including higher rates of rejecting and negative parenting (Ceballo & McLoyd, 2002) and lower rates of maternal sensitivity and warmth (McLoyd, 1998) than mothers with adequate social support. Low levels of maternal social support have also been associated with insecure attachment in infants and toddlers (Atkinson et al., 2000). Given these associations, it follows that higher levels of social support may be associated with more synchronous parent–child interaction.

## 2.2. Parenting

As noted earlier, sensitive and responsive parenting has been conceived of as an essential ingredient of synchrony, as mothers who are better able to respond quickly and warmly to their children are posited to have children who are more eager and willing to interact with parents. Parenting characterized by sensitivity and responsiveness has been associated with secure attachments (Susman-Stillman, Kalkoske, Egeland, & Waldman, 1996), increased infant positivity (Kivijarvi et al., 2001) and lower levels of child emotional negativity (Bell & Ainsworth, 1972). A mother's emotional availability is hypothesized to play a crucial factor in the development of synchrony.

## 2.3. Child factors

Child attributes such as negative emotionality and language ability may also facilitate or impair the development of synchrony. "Negative emotionality" has been used to describe irritability and fussiness in young children. Toddlers who display higher levels of negative emotionality are more likely to have mothers who are less responsive (Owen, Shaw, & Vondra 1998; Van den Bloom & Hoeksma, 1994), report greater maternal stress (Calkins, 2002) and demonstrate higher rates of maternal intrusiveness (Lee & Bates, 1985). One aspect of negative emotionality is low frustration tolerance. Children who have low tolerance to frustration spend greater amounts of time in dysregulated states than do children who are better able to navigate stressful situations (Calkins, 1994). Hence, such children may be more challenging to engage, and parents may derive less pleasure from interacting with them (Shaw & Bell, 1993). This line of research suggests that in young children low levels of frustration tolerance will be related to less synchronous parent–child interactions.

Another relevant child attribute is language acquisition, which is one of the principal milestones of a toddler's second and third year of life. There is evidence that expressive language delays during the toddler period may compromise the quality of parent–child interactions, as children with compromised language skills are viewed as more challenging to engage than children without such delays (Irwin, Carter, & Briggs-Gowan, 2002). In addition, young children with expressive language delays are more likely to have higher levels of behavior problems (Carson, Klee, Perry, Muskina, & Donaghy, 1998; Kaiser, Cai, Hancock, & Foster, 2002), lower levels of social-emotional competence (Irwin et al., 2002) and less optimal parent–child interactions (La Paro, Justice, Skibbe, & Pianta, 2004). As such, language delays are hypothesized to be associated with lower levels of dyadic synchrony.

The proposed relationship between the psychological resources of the mother, parenting, child attributes and synchrony is illustrated in Fig. 1. Factors from each of these domains are hypothesized to be directly linked to mother–child synchrony. Much has been written about the theorized components of dyadic synchrony; however, little research has been conducted to examine associations between these hypothesized parent and child factors and synchrony. Thus, the primary goal of the present study was to extend our current understanding of dyadic synchrony by examining its correlations with theoretically linked maternal psychological resources and child characteristics. Within a univariate framework, it was hypothesized that multiple mother and child attributes would be directly related to synchrony, including maternal psychological resources, responsive parenting and child attributes. Further, when examining factors from all domains within a multivariate framework, it was hypothesized that factors from both maternal and child domains would contribute unique variance to the prediction of synchrony.

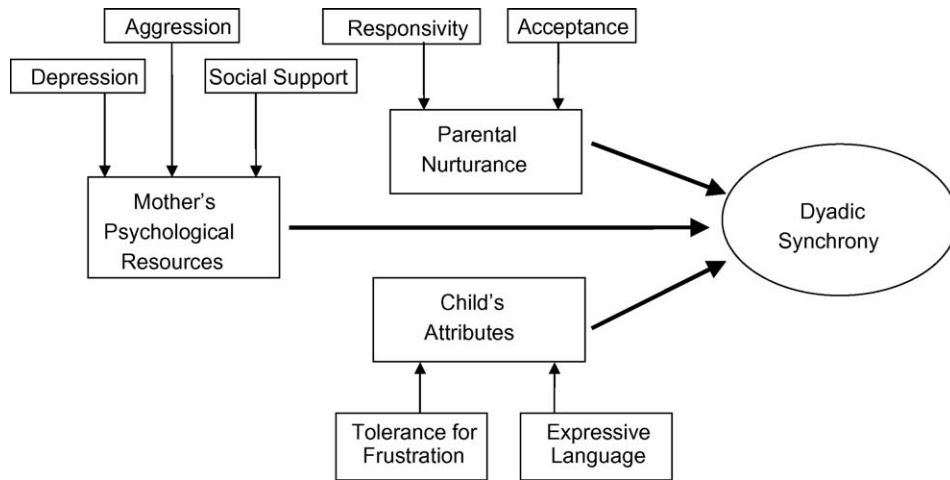


Fig. 1. Model of proposed parent and child correlates of dyadic synchrony.

### 3. Method

#### 3.1. Participants

The sample consisted of 120 mother–son dyads recruited from the Women, Infant and Children (WIC) Nutritional Supplement Program in the Pittsburgh, PA metropolitan area. Participants were recruited as part of a larger intervention study on the prevention of child conduct problems. Families were invited to participate if they had a son between 17 and 27 months old, and if they met eligibility criteria for the study, which included having at least two socioeconomic, family and/or child risk factors associated with trajectories of persistent child conduct problems in early childhood (i.e., two of the three risk factors were required for inclusion in the sample; see Shaw, Dishion, Supplee, Gardner, & Arnds, *in press*, for greater details).

Of the 327 mothers approached for study recruitment at WIC sites, 271 (83%) agreed to participate in the initial screen. Of these, 124 families met the eligibility requirements and 120 (97%) agreed to participate in the study. At the time of the initial screen, participating children had a mean age of 24.1 months (range 17.6–30.1 months). Mothers were between 18 and 45 years of age. The mean number of people living in the child's home was 4.49 (range 2–10). The average family income was US\$ 15,374 per year (range US\$ 2400–45,000) with a per capita income of US\$ 3624 (range US\$ 480–13,000), which indicates that the sample is at or below the federal poverty guidelines for 2001 (Proctor & Dalaker, 2002). The mean level of education attainment for mothers was 12 years (i.e., a high school degree or GED). Further descriptive characteristics of the sample are provided in Table 1.

#### 3.2. Procedures

Mothers were approached at WIC sites and were asked if they were willing to complete a series of questionnaires about the “Terrible Two’s”. The questionnaires included questions about the child’s behavior on the *Eyberg Behavior Inventory* (Eyberg & Pincus, 1999), the mother’s perception of her child, parenting hassles, and maternal depressive symptoms. These measures were used as a screening tool for further participation. The screen took 20–25 min to complete and participants who completed it received US\$ 10. Families who met criterion for study inclusion based on socioeconomic status (i.e., maternal education and family income) and either or both family and/or child risk (e.g., maternal depression or substance abuse; child externalizing symptoms), were contacted about participating in a more intensive home assessment and their willingness to be randomly assigned to a home-based, family intervention. If risk criterion were attained only for socioeconomic and family risk, mothers were also required to rate children above the normative mean on either the intensity ( $M=98$ ) or problem ( $M=7$ ) factors of the *Eyberg Behavior Inventory* (Eyberg & Pincus, 1999) to increase the probability that parents would desire assistance in this area.

Table 1  
Socio-demographic description of sample at the age-2 home visit ( $N = 120$ )

	Mean	Standard deviation
Child's age (months)	24.1	2.8
Maternal age (years)	27.2	6.1
Number of people in home	4.49	1.53
Annual income (US\$)	15504.92	8754.25
Annual per capita income (US\$)	3624.14	2058.24
	<i>N</i>	%
Child's ethnicity		
African-American	58	48.3
Caucasian	48	40.0
Biracial	14	11.7
Maternal education		
Less than high school	22	18.3
High school/GED	58	48.3
Greater than high school	40	33.3
Maternal marital status		
Married/living with partner	54	45.0
Single and never married	60	50.0
Divorced/separated/widowed	6	5.0

Parents (i.e., mothers and, if available, alternative caregivers such as fathers or grandmothers) and sons 1.75–2.5 years of age who met eligibility requirements and who agreed to participate in the study were then scheduled for a 2.5 h home assessment, which included a free play (15 min), a clean-up task (5 min), a delay-of-gratification task (5 min), a series of teaching tasks (3 min each) and the presentation of two inhibition-inducing toys (2 min each). Finally, mothers were instructed to spend 10 min preparing lunch for their sons while the children were waiting to eat. The dyad was then given 10 min (or longer if needed) to eat their lunch. After lunch, mothers completed an assessment of expressed emotion (5 min) and all remaining questionnaires (1.25 h). Families received US\$ 100 for participating in the home assessment. At the end of the assessment, after the senior examiner had completed observational ratings for the *HOME Inventory*, the examiner opened a sealed envelope, revealing the family's group assignment and shared this information with the family. Prior to this time, the examiners were kept "blind" to the family's group assignment so that this knowledge would not bias ratings about the home environment.

Families randomly assigned to the treatment condition were then scheduled to meet with a parent consultant. Treatment consisted of a brief intervention based on motivational interviewing and behavioral parent training, and modeled after the Drinker's Check Up (Miller & Rollnick, 2002). Typically, the intervention, labeled the Family Check Up, included two sessions during which the parent consultant summarized the results of the initial assessment using motivational interviewing strategies. After these sessions, the parent was offered a maximum of six additional follow-up sessions that were focused on areas of parental concern. Families were paid US\$ 25 for completing the feedback session. Out of the families assigned to the treatment condition, 92% met with the parent consultant for at least two sessions.

### 3.3. Measures

#### 3.3.1. Demographics questionnaire

A demographics questionnaire was administered to mothers during the home assessments. This measure included questions about family structure, socioeconomic status, parental criminal history, child care and familial stress.

### 3.3.2. *Child behavior*

3.3.2.1. *Language development survey (LDS)*. The LDS is a vocabulary checklist of 305 words and mother-report of longest phrases used to assess language development in young children. Mothers completed the LDS at the age-2 assessment. Test–retest reliability for the LDS is reported to be .99 over a 1-week period in a normative sample (Achenbach & Rescorla, 2000). Both the total number of words and the average phrase length reported on the LDS were used to assess the children's expressive language development. The child's percentile rank compared to other children his age was calculated for both of these two indices of expressive language development. The LDS has been found to positively identify children who have been diagnosed as having expressive language delays (Rescorla & Alley, 2001).

3.3.2.2. *Child tolerance for frustration coding system*. Child tolerance for frustration, in the form of positive and negative emotionality, was coded from a delay-of-gratification task administered at the age-2 assessment. The coding system was adapted from the child affect coding system devised by Cole et al. (1994), that had been more recently modified by Gilliom et al. (2002). We further adapted this coding system for use at the age-2 assessment. During a 5 min interval, the child was left to cope with having no toys to play with while his mother worked on questionnaires.

Child affect was coded in 10 s intervals based on the presence of facial and vocal cues. Negativity was coded based on the presence of furrowed brows, frowning, narrowing of eyes, crying, a harsh, raised voice or whining. Positivity was coded based on the presence of wide, open eyes, smiles, laughing and a positive tone of voice. Data were aggregated to generate composites for positive and negative emotion, and a ratio of time spent engaged in positivity versus time spent engaged in negativity was calculated for the final score of frustration tolerance.

The author trained four research assistants on the coding system. Coders were trained to become reliable with the lead coder over a period of 6 months. To assess reliability, 20% of the interactions ( $n = 24$ ) were independently rated by all coders and an acceptable inter-rater reliability was reached (Cohen's Kappa = .63 to .89). All coders were blind to the research hypotheses of the study.

### 3.3.3. *Maternal psychological resources*

3.3.3.1. *Beck depression inventory (BDI)*. The BDI, a well-established and extensively used self-report measure of depressive symptomatology, was administered during the age-2 assessment. The 21 items on the BDI were summed together to form one factor for depression. The inter-item reliability coefficient (alpha) for the BDI was found to be .90 in the present study (Beck, Ward, Mendelson, Mock, & Erlbaugh, 1961).

3.3.3.2. *Personality research form (PRF)*. The PRF is a self-report measure that assesses several dimensions of personality (Jackson, 1989). An author-approved, abridged version of the PRF was administered at the age-2 assessment. To assess the mother's overall hostility towards others, the 16-item Aggression factor was used. For this sample, the inter-item reliability coefficient was .62 for this factor. The Aggression factor was included as it has been found to be associated with changes in infant attachment security (Egeland & Farber, 1984), and later behavior problems (Shaw et al., 1994a, 1994b).

3.3.3.3. *General life satisfaction (GLS)*. The GLS was administered to mothers at the age-2 assessment to assess maternal involvement and satisfaction with social support across a number of settings (e.g., neighbors, family and friends). From this measure the 15-item Satisfaction scale was used to evaluate the mother's contentment with the quality of her support across contexts. Internal consistency was found to be adequate for the factor in this sample ( $\alpha = .79$ ) (Crnic, Greenberg, Ragozin, Robinson, & Basham, 1983).

### 3.3.4. *Parenting*

3.3.4.1. *Home observation for measurement of the environment (HOME)*. The HOME is a well-validated and widely used measure that assesses the quality of the home environment (Caldwell & Bradley, 1984). Selected observationally based items of the HOME were completed by a trained examiner at the end of the age-2 assessment. All items are rated as being present (i.e., score of '1') or absent (i.e., score of '0'). For purposes of the present study, observationally based items from the Maternal Responsivity (e.g., "Parent's voice conveys positive feelings towards a child") and Acceptance (e.g., "Parent does not shout at child") scales were used. One item from the Acceptance scale was eliminated as it was

not observable, reducing it from an 8- to a 7-item scale. The 11-item Responsivity scale and the 7-item Acceptance scale were then combined by summing the items into a single 18-item Maternal Nurturance scale (Ingoldsby et al., in press), for which the range of scores was 5–18. For this sample, the internal consistency of the Maternal Nurturance scale was .72. This measure was selected as it provides an independent assessment of a mother's warmth and sensitivity during the observed interactions.

### 3.3.5. Synchrony

**3.3.5.1. Synchrony global coding system.** The observational coding system used in this paper was adapted from systems used in previous research with school-age children that measured synchrony using one 7- or 9-point global rating (Criss et al., 2003; Harrist et al., 1994). Because these systems were developed to assess synchrony in older children, some modifications of the previous coding criteria were required. Descriptions of behaviors such as non-verbal communication, child positivity and child negativity were used to help anchor coders in concrete toddler behaviors. Further, ratings were adjusted to reflect the expectation that mothers would likely initiate a greater percentage of interactions with toddlers than school-age children. Three tasks using this global system were coded based on the videotaped interactions at the age-2 assessment: a clean-up task (5 min), two of the three teaching tasks (6 min) and portions of meal preparation and lunch tasks (10 min).

Following the structure of the system designed by Criss et al. (2003), a 9-point scale was used to assign a single code to describe the dyad's synchrony based on their behavior across the three observational activities at the age-2 assessment. Coders used this single code to rate the dyad's reciprocity, shared affect and mutual focus.

The first author trained four research assistants in the use of the global coding systems. Coders were trained to become reliable with the lead coder on the 9-point global scale over a period of 6 months. To assess reliability, 15% of the interactions ( $n = 18$ ) were independently rated by all four coders. Interclass correlations were used to assess inter-rater reliability between each of the coders and the author. Analyses of the mean inter-rater reliability for synchrony between the author and each coder were in the acceptable range (range of  $\rho = .70$  to  $.85$ ,  $p < .01$ ). The inter-rater reliability for the group of five coders was also acceptable ( $\rho = .79$ ,  $p < .01$ ) (Mitchell, 1979). All coders were blind to the research hypotheses of this study.

## 4. Results

Results for each of the three study hypotheses are reported following the presentation of descriptive statistics for all independent and dependent variables. As displayed in Table 2 and as expected based on the screening process used to recruit the sample, participants' scores were appreciably higher than published data for normative populations. Ratings of maternal depressive symptomatology were also significantly higher than the mean of 6.56 (S.D. = 7.02) reported in normative samples of adult women ages 18–64 (Salokangas, Vaajtera, Pacriev, Sohlman, & Lehtinen, 2002), versus 11.97 (S.D. = 9.31) in the current sample. The mean BDI for this sample indicated that on average,

Table 2  
Descriptive statistics for independent and dependent variables

	<i>N</i>	Mean	S.D.
Independent variables			
Child factors			
Language development scale: length of utterances	117	2.25	0.98
Language development scale: number of words known	120	141.24	88.89
Observed tolerance for frustration: ratio of negativity to positivity	114	4.25	6.81
Maternal psychological resources			
Beck depression inventory	120	11.97	9.31
Personality research form: aggressiveness factor	120	7.38	2.92
General life satisfaction scale: satisfaction scale	120	46.19	5.38
Parenting			
HOME inventory: total score	120	12.58	3.11
Global rating of observed synchrony	114	3.49	1.26

Table 3  
Correlation among dyadic synchrony, child factors, maternal psychological resources and parenting

	2	3	4	5	6	7	8
1. Global rating of dyadic synchrony	0.19*	0.27**	−0.24*	−0.09	−0.28**	0.16#	0.47***
2. LDS: length of utterances	–	0.55***	0.06	−0.07	−0.10	0.13	0.09
3. LDS: number of words known		–	0.04	−0.11	−0.11	0.21*	−0.05
4. Observed tolerance for frustration			–	0.07	−0.01	−0.19*	−0.14
5. BDI				–	0.29**	0.04	−0.01
6. PRF: aggressiveness scale					–	0.10	−0.37
7. GLS: satisfaction scale						–	0.01
8. HOME: total score							–

#  $p < .10$ .

\*  $p < .05$ .

\*\*  $p < .01$ .

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

mothers showed moderate levels of depressive symptoms. Similarly, mothers in this sample reported slightly elevated levels of aggressiveness on the PRF (mean = 7.38, S.D. = 2.92) compared to scores ranging between 5.8 and 7.2 in normative samples of men and women (Jackson, 1989). Further, mean global ratings of synchrony (3.49) were only slightly above the score of minimally synchronous, with six dyads receiving a rating of “5” or “6” (“moderately synchronous”) and no dyad receiving a rating higher than “7” (“mostly synchronous”). On the LDS, the sample scored at the 45th percentile for vocabulary and below the 20th percentile for average length of phrase.

No differences in dyadic synchrony were found between European–American, biracial and African–American families,  $F(2,111) = 1.63$ ,  $p = ns$ , nor were differences found for maternal education,  $F(1,111) = 1.76$ ,  $p = ns$ . Thus these factors were not controlled for in later analyses.

To examine the hypothesis that mother–son synchrony would be related to maternal psychological resources, child characteristics and responsive caregiving, a series of bivariate Pearson correlations were computed between observed dyadic synchrony and maternal depressive symptoms (BDI), aggression (PRF) and satisfaction with social support (GLS). A comparable series of bivariate Pearson correlations were computed between observed dyadic synchrony and child attributes and parenting, including language ability (LDS), and observed rating of child frustration tolerance, and observed maternal nurturance (HOME). As displayed in Table 3, observed dyadic synchrony was significantly associated with a number of maternal and child attributes in expected ways, with child’s greater tolerance for frustration, child’s greater language development, lower maternal aggressiveness and higher maternal nurturance significantly associated with higher levels of synchrony. Unexpectedly, synchrony was not significantly associated with either maternal depressive symptoms or maternal social support.

As children’s language develops rapidly during the second and third year of life, and as children in the sample ranged in age from 21 to 30 months old at the time of the age-2 assessment, a partial correlation between the LDS and synchrony was computed controlling for child age. The relation between the number of words known on the LDS and synchrony continued to be significant ( $r = 0.19$ ,  $p < .05$ ), but the relationship between the length of utterances on the LDS and synchrony was no longer significant ( $r = 0.13$ ,  $p = ns$ ). While synchrony was significantly associated with a number of these variables across informant and method, few correlates of synchrony were significantly associated with one another, with the exceptions of maternal depressive symptoms and maternal aggressiveness; maternal depressive symptoms and maternal social support and observed child frustration and maternal social support.

To examine contributors of synchrony in a multivariate framework, a discriminant function analysis (DFA) was computed. Ratings of synchrony were dichotomized into two categories (i.e., scores  $\geq 5$  versus  $< 5$  with cell sizes of 24 for those  $\geq 5$  and 90 for those of scores  $< 5$ ; six cases were not classified). All maternal, child and parenting variables were inserted as independent variables in the equation using a stepwise entry method. After accounting for the effects of the seven variables in the DFA, two variables accounted for significant variance: maternal nurturance and child expressive language ability (Wilks Lambda<sub>(2,106)</sub> = .811,  $\chi^2_{(2)} = 22.86$ ,  $p < .001$ ). These two variables were able to accurately discriminate 70.0% of the dyads who had low levels of synchrony and 75.0% of the dyads with high synchrony.

## 5. Discussion

The purpose of this study was to understand child and parent factors associated with dyadic synchrony. Preliminary analyses indicated that few maternal or child attributes were associated with one another; however, when examined within a univariate framework it was found that several mother and child variables were significantly associated with concurrent observed ratings of synchrony, consistent with the notion that both child and parent characteristics contribute to its development. Consistent with hypotheses, higher levels of mother–child synchrony were associated with higher levels of maternal nurturance and lower levels of maternal aggressivity, and lower levels of child negative emotionality and higher levels of child language development. When considered within a multivariate framework, only two factors accounted for unique and significant variance: maternal nurturance and child expressive language ability.

Maternal nurturance was the maternal attribute most strongly predictive of dyadic synchrony. Toddlerhood is a period of limit-testing and autonomy-seeking, and mothers who are able to respond appropriately and sensitively to these challenging behaviors may be more likely to develop synchronous relationships with their children. Additionally, toddlers have fewer regulatory and verbal resources to bring to the dyadic interaction compared with older children and adults. As mothers are presumably more skilled in social interactions, their role as a sensitive and nurturing play partner is especially critical at this age (Harrist et al., 1994). Thus, conditions that promote mothers' abilities to provide their children with supportive caregiving and nurturance are likely to foster the development of dyadic synchrony.

Aside from maternal nurturance, the strongest predictor of dyadic synchrony was expressive language ability. Child characteristics have been shown to make important contributions to the quality of the parent–child relationship and subsequent child adjustment (Bell, 1968); however, children's expressive language ability has frequently been overlooked. This finding suggests that children with language delays may be particularly at risk for troubled parent–child interactions. While parents of infants and toddlers may guide and support their young children, toddlers actively contribute to the development of dyadic interactions. Parents may find children with poor expressive language abilities to be less enjoyable play partners than more verbal toddlers. It requires less effort for a parent to engage a communicative child in comparison to a child who has little productive language. Furthermore, interactions where the parent and child struggle to communicate verbally may appear one-sided and strained as both members of the dyad are required to put more effort into the interaction.

Is synchrony merely another construct of parenting? The findings of the DFA illustrate that both maternal *and* child characteristics contributed to synchrony. Further, the fact that the HOME inventory, a traditional measure of maternal sensitivity and responsiveness, did not show a similar pattern of covariation with other correlates of synchrony, suggests that synchrony is distinct from measures of maternal nurturance.

One surprising non-significant finding was the absence of association between maternal depression and dyadic synchrony. There is a significant body of literature documenting associations between maternal depressive symptoms and a variety of child outcomes, as well as research demonstrating associations between maladaptive caregiving and depressive symptomatology (Carter et al., 2001; Field, 1995). However, in the current sample, maternal depressive symptoms were not associated with dyadic synchrony or maternal nurturance. The precise reasons for these null findings are unclear, but they echo previous results found in this sample (Shaw et al., *in press*), where non-significant associations were found that have been significant in other studies of young children (Campbell, Pierce, Moore, & Marakovitz, 1996). This pattern of findings might be related to the sample selection, which included a gating procedure that limited the sample to a small percentage of families with atypically elevated scores on all of the factors mentioned above. Previous research examining relationships among synchrony, nurturance, rejecting parenting and child conduct problems in early childhood have generally used lower-risk samples that include a greater range of scores. Thus, as neither high scores on maternal depression or rejecting parenting was unusual in this sample (i.e., ceiling effect), and scores for synchrony were constrained (i.e., range limited to 6 points on a 9-point scale), it is not surprising to see atypical patterns of covariation among these variables.

It should be noted that there are a number of limitations to this study. First, the data presented is cross-sectional, rather than longitudinal, making it impossible to ascertain the nature of the relationships presented or to assume any causality. Further, the sample was a low-income, high-risk sample of boys, which limits its generalizability to normative samples of toddlers. Further, the patterns of associations may be different in mother–daughter dyads. Despite these limitations, this study provides needed information about the construct of synchrony, and provides evidence that maternal *and* child attributes are associated with synchrony, which further support the contention that synchrony is more than a measure of parenting or maternal sensitivity.

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