

Dyadic Synchrony and the Development of Boys' Conduct Problems in Early  
Childhood

by

Emily Moye Skuban

B.A., Yale University, 1999

Submitted to the Graduate Faculty of  
Arts and Sciences in partial fulfillment  
of the requirements for the degree of  
Master in Sciences

University of Pittsburgh

2006

UNIVERSITY OF PITTSBURGH

School of Arts and Sciences

This thesis was presented

By

Emily Moye Skuban

It was defended on

March 3, 2005

and approved by

Daniel S. Shaw, Ph.D., Professor

Susan B. Campbell, Ph.D., Professor

Joan I. Vondra, Ph.D., Professor

Thesis Director: Daniel S. Shaw, Ph.D., Professor

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# **Dyadic Synchrony and the Development of Boys' Conduct Problems in Early Childhood**

Emily Moye Skuban, M.S.

University of Pittsburgh 2006

## **Abstract**

Dyadic synchrony has been broadly conceptualized as the quality of the parent-child dyadic relationship from infancy to the school-age period. It has been theorized as a molar construct that captures features of parent-child interaction that are beyond individual attributes. A sample of 120 mother-son dyads from a high-risk, low-income sample were observed at age two years during a series of interactions and coded for their dyadic synchrony. It was hypothesized that characteristics of the child, maternal psychological resources and aspects of parenting would be associated with synchrony. It was also hypothesized that synchrony would be associated with concurrent externalizing symptoms and externalizing symptoms at a 1-year follow-up. Results of a series of bivariate correlations found that synchrony was associated with mother, child and parenting attributes. However, results of a series of hierarchical regression analyses found that synchrony was not associated with concurrent or later externalizing symptoms. While synchrony did not moderate the association between most child characteristics and maternal attributes, synchrony was found to moderate the relationship between maternal depression and later externalizing symptoms. These findings suggest that synchrony is associated with multiple measures of child and maternal functioning; however, in this sample of low-income, high-risk samples where rates of synchrony are generally low and rates of externalizing problems are somewhat higher, an association between externalizing symptoms and synchrony may not be present.

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## 1.0 INTRODUCTION

For the developmental psychopathologist, one ongoing goal of research is to understand the developmental trajectories that lead to behavior problems and future psychopathology in children. There is evidence that family and parent factors, such as authoritative parenting and parental sensitivity, are associated with better outcomes in children (Baumrind, 1975; De Wolff & van Ijzendoorn, 1997). Research also suggests that child factors, such as temperament, play a role in the development of children's behavior problems (Earls & Jung, 1987; Guerin et al., 1997; Maziade, et al. 1989). Furthermore, the match or mismatch of parenting practices and child temperament also have been shown to interact to contribute to the development of behavior problems above and beyond the individual contributions of parent and child factors (Bates et al., 1998; Olson, et al., 2000; Park et al., 1997). For example, highly inhibited children may benefit from warm, sensitive parents who are not very restrictive and encourage exploration of the environment whereas highly impulsive children may benefit from parents who are more restrictive and strongly monitor their environmental exploration. Thus, the particular combination of a child's temperament with a parenting style may increase or decrease the likelihood of future conduct problems. There has been less research on the contributions of the dyadic parent-child relationship on the development of children's behavior problems.

Interactional synchrony (Harrist & Waugh, 2002) has been proposed as a construct that captures the interconnectedness, mutuality and reciprocity of parent-child interaction. A

synchronous interaction is one that involves shared affect, joint attention, mutual engagement, and responsivity on the part of both the parent and the child and infant (Harrist et al., 1994; Isabella et al., 1989; Tronick & Cohn, 1989). Interactional synchrony requires that the two participants are coordinating and extending their interactions together through mutual affective expression and shared eye contact. Research on synchrony in predominantly middle-class, low-risk populations has found that children who have more synchronous play interactions with their mothers have more friends and greater social-emotional competencies (Feldman et al., 1999; Harrist et al., 1994), are more likely to have secure attachments to their mothers (Isabella et al., 1989) and are less likely to be aggressive or engage in antisocial behavior (Harrist et al., 1994; Criss et al., 2003). However, there has been little research examining the maternal and child correlates of synchrony. One reason for the lack of research is that synchrony is simply an aggregate of better-understood and previously established constructs, such as maternal sensitivity and responsivity, and child emotionality and compliance. An alternate explanation is that while the interaction between individual parent and child factors contributes to the development of synchrony, synchrony represents more than the sum of its parent and child parts. Theoretically, synchrony embodies a holistic image of dyadic functioning, similar to Thomas and Chess's (1977) 'goodness-of-fit' perspective, that cannot be adequately captured by summing the individual contributions of parenting style or child attributes.

Although a number of researchers have examined the relationship of synchrony to the development of problems and competencies in children (Criss et al., 2003; Feldman et al., 1999; Harrist et al., 1994; Lindsey et al., 1997), there has not been as much focus on maternal and child characteristics associated with synchrony. The first aim of the present study is to examine relationship between synchrony and maternal, child and parenting factors (e.g., maternal

depression, social support, child language ability). The second aim is to test the relation between synchrony and concurrent and later conduct problems. A final aim is to examine the manner in which synchrony may moderate the associations of mother and child factors with later child behavior. The sample consisted of 120 male toddlers from low-income families identified to be at risk status for future behavior problems because of socioeconomic, family, and child risk factors, followed from ages 2 to 3 years.

## **2.0 LITERATURE REVIEW**

Much research has examined the contribution of parent-child relationship quality on early developmental outcomes, including child cognitive development, competencies and conduct problems. Some of the research in this area focused on synchrony, which is defined as the qualitative and dyadic aspects of the parent-child relationship. The following review of the literature will examine the construct of parent-child synchrony and considers both theoretical and empirical perspectives of its potential influence on child adjustment.

### **2.1 SYNCHRONY AND THE PARENT-CHILD RELATIONSHIP**

The concept of parent-child synchrony is one way through which researchers broadly conceptualize the quality of the parent-child dyadic relationship. Similar in nature to the construct of attachment, which focuses primarily on the connection between the mother and child (Ainsworth et al., 1978), synchrony has been viewed as the shared interconnectedness between the parent and child. Theoretically, synchrony captures aspects of the parent-child interaction above and beyond the individual contributions of the mother and child. Specifically, synchrony incorporates the dyadic interplay between the mother and child, such as joint attention, mutual responsiveness and shared affect (Colwell, 2001; Criss et al., 2003; Harrist et al., 1994; Harrist & Waugh, 2002).

Although a substantial body of research has explored the role of mother-child interaction on child development, synchrony is a construct that has been relatively less investigated in the literature. Accordingly, many aspects of the mother-child relationship, such as maternal sensitivity, responsiveness and proactive parenting have been more extensively studied than has synchrony. However, all of these constructs are inter-related in that they attempt to describe the quality of parent and/or child behaviors during a dyadic interaction. Thus, these constructs will be discussed in terms of their relevance to synchrony.

Maternal responsiveness and sensitivity are two constructs that have been found to be associated with child outcome and also have some similarities to synchrony. Maternal responsiveness has been defined as a willingness to respond sensitively and appropriately to a child's distress or bids for attention as well as a mother's emotional availability to her child (Kochanska & Coy, 2002). Similarly, maternal sensitivity, the ability to read and correctly interpret children's cues and appropriately respond, has been linked with positive child outcomes (De Wolff & van Ijzendoorn, 1997). Both maternal responsiveness and sensitivity have been found to contribute to the development of healthy parent-child relationships and secure attachments (Ainsworth et al., 1978; De Wolff & van Ijzendoorn, 1997; Susman-Stillman et al., 1996); however, these constructs focus on maternal behavior.

Gardner and colleagues (Gardner, 1994; Gardner, Sonuga-Barke & Sayal, 1999; Gardner, Ward, Burton & Wilson, 2003) have examined the role proactive parenting on the development of behavior problems. Proactive parenting has been hypothesized to be associated with responsiveness and sensitivity, and primarily involves the mother's ability to anticipate her child's needs and appropriately initiate interactions with her child. Such maternal anticipation may avert difficult situations for a child as the parent may sense what a child needs within

different contexts. Thus, heightened levels of maternal sensitivity and responsiveness are associated with a heightened capacity for proactive parenting. The concept of proactive parenting is undoubtedly a characteristic of mother in a highly synchronous dyad that focuses primarily on the maternal contributions to mother-child interactions.

A body of research on “Mutually Responsive Orientation” by Kochanska and colleagues (Kochanska, 1997, Kochanska & Askan, 2004; Kochanska & Murray, 2000), presents a construct that purports to be a measure of responsiveness and shared positive affect. Mutually responsive orientation appears to be very similar in nature to the theory of dyadic synchrony in that it is a measure of both maternal and child contributions. Unlike the majority of other constructs of maternal-child interaction that focus primarily on maternal contributions, this construct was designed to measure both the mother’s and child’s contributions to an interaction. Research on mutually responsive orientation has found that mutual responsiveness is positively associated with more secure child attachment and negatively associated with lower rates of coercive parenting. Similarly, Deater-Deckard and colleagues (Deater-Deckard & O’Connor, 2000; Deater-Deckard & Petrill, 2004) describe dyadic mutuality as a measure of shared responsiveness and emotional reciprocity. Thus, both mutually responsive orientation and mutuality appear to share a number of characteristics with synchrony, and for purposes of this review will be terms considered to be synonymous with synchrony.

Despite the similarities between synchrony and these better-established constructs of the mother-child relationship, it is possible that synchrony is different in a number of meaningful ways. Unlike other aspects of the mother-child relationship, synchrony has been less researched, validated and established. Thus, it is difficult to know both how to measure synchrony and whether synchrony is a meaningful concept that should be measured. Mutually responsive

orientation is perhaps another term for the same construct, but maternal sensitivity, responsiveness and prosocial parenting are a more specific group of maternal behaviors. Synchrony encompasses both mother and child responsiveness, as well as their emotional availability to each other. Thus, synchrony purports to be a broader and less specific construct than maternal sensitivity and responsiveness. Just as the attachment literature (Ainsworth et al., 1978) suggests that sensitivity is required for the development of a secure attachment, dyads displaying higher levels of synchrony are more likely to have high levels of maternal sensitivity and responsiveness.

## **2.2 CORRELATES OF SYNCHRONY**

Much of the research on the correlates of synchrony seems to touch upon constructs of child development that are more easily operationalized, and for which there is an existing body of literature. While synchrony may indeed be greater than the sum of its parts, it seems likely that a number of individual parent and child characteristics are associated with its development. Given that maternal responsiveness and affect are considered to be aspects of synchrony (Cohn & Tronick, 1987; Isabella & Belsky, 1991; Vizziello et al. 2000; Weinberg et al., 1999), parent characteristics that affect caregiving sensitivity and responsiveness should also be associated with the development of synchrony. Similarly, characteristics of the child that facilitate active and cooperative participation in mother-child interactions should be associated with synchrony.

### **2.2.1 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 maternal responsiveness and positivity by a compromised capacity to optimize caregiving abilities (Cohn et al., 1990; Field, 1995; Field et al., 1990), and has also been associated with impairments in children's social-emotional development (Carter et al., 2001; Kochanska, 1991; Leadbeater et al., 1996; Radke-Yarrow et al., 1992; Teti et al., 1995). Given this body of research suggesting that maternal depression contributes to impairments in both the mother and the child, it is likely that maternal depression would contribute to poorer dyadic synchrony.

Some research has indicated that characteristics of a parent's personality may be associated with parenting (Clark et al., 2000; Egeland & Farber, 1984; Ispa et al., 2002; Kochanska et al., 1997). For example, a personality style in mothers characterized by aggressive and hostile tendencies has been found to be associated with behavior problems in young boys (Shaw et al., 1994) and changes in infant attachment classification from secure to insecure (Egeland & Farber, 1984). Further, a mother's negative personality traits may be more challenging for children to negotiate, promoting decreased contact and 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). As is seen with maternal depression, aspects of personality may be associated with lower levels of synchrony through an impaired ability of the mother to interact contingently with her child.



Additionally, mothers who lack social support from partners and extended family have been shown to demonstrate more maladaptive caregiving patterns, in the form of higher rates of rejecting and negative parenting (Rodgers, 1993; Simons et al., 1993) and lower rates of maternal sensitivity and warmth (Crockenberg & McCluskey, 1986; Jennings et al., 1991) compared to mothers with adequate social support. The absence of maternal social support has also been associated with insecure attachment in young children (Atkinson et al., 2000; Crittenden, 1986). Given the link which has been established between low social support and compromised parenting, it follows that the presence of maternal social support may be associated with more synchronous parent-child interaction.

### **2.2.2 Parenting.**

Sensitive and responsive parenting may be associated with more synchronous interactions as mothers who are better able to respond quickly and warmly to their children will have children who are more eager and willing play partners. Parenting characterized by warmth, sensitivity and responsivity has been associated with secure attachment in young children (Smith & Pederson, 1988; Susman-Stillman et al., 1996), increased infant positivity (Kivijarvi et al., 2001), and lower levels of child emotional negativity and irritability (Bell & Ainsworth, 1972). As young children are less able to lead and initiate interactions with their parents, a mother's emotional availability is hypothesized to play a crucial factor in the development of synchrony.

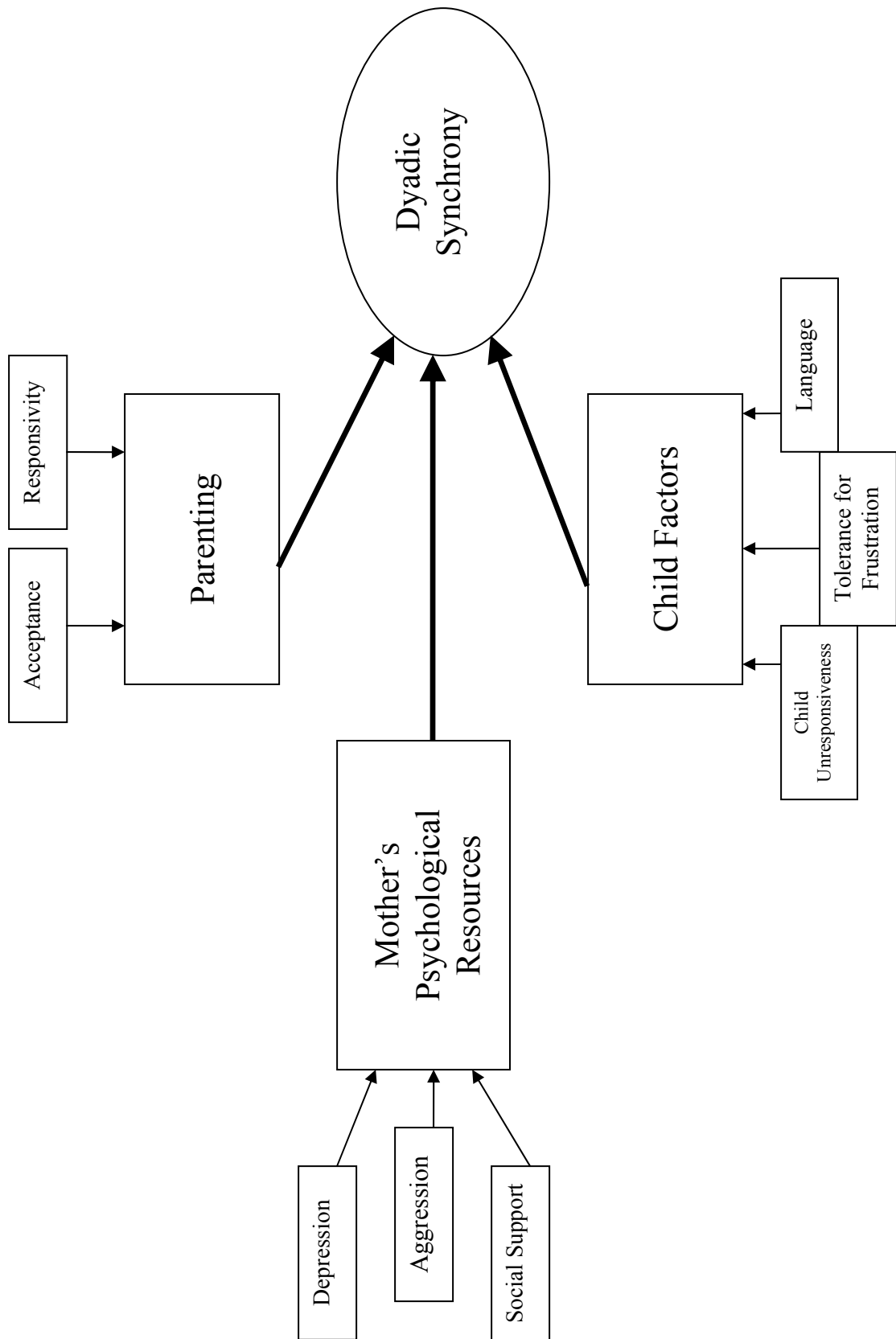
### **2.2.3 Child Factors.**

Child attributes may also facilitate or impair the development of synchrony. Three such factors are negative emotionality, unresponsiveness and language ability. Negative emotionality

is a term that has been used to describe irritability and fussiness in young children. Children who display more negative emotionality are more likely to have mothers who are less responsive (Crockenberg & McCluskey, 1986; Owens et al., 1998; van den Boom & Hoeksma, 1994), report greater maternal stress (Calkins, 2002) and higher rates of maternal intrusiveness (Lee & Bates, 1985). One aspect of negative emotionality is lower frustration tolerance. Children who have lower tolerance to frustration spend greater amounts of time in angry and dysregulated states than do children who are better able to navigate stressful situations (Calkins, 1994). Children who display lower levels of frustration tolerance may be more challenging for parents to engage; hence, mothers of fussy children may derive less pleasure and enjoyment from interacting with them (Shaw & Bell, 1993). Additionally, mothers may find it more difficult to engage children who are emotionally unresponsive. Such children would theoretically be less attentive to their mother's attempts at engagement (Olson et al., 2000). These factors suggest the possibility that low levels of frustration tolerance in young children will occur more frequently in less synchronous dyads.

There is also evidence that expressive language delays may compromise the quality of parent child interactions as children with language delays are viewed as more challenging to engage than are children without such delays (Caulfield et al., 1989; Irwin et al., 2002; Paul & James, 1990). Research has found that children with expressive language delays are more likely to have higher levels of behavior problems (Carson et al., 1998; Caulfield et al., 1989; Kaiser et al., 2000, 2002), lower levels of social-emotional competence (Irwin et al., 2002) and less optimal parent-child interactions (Stansbury & Zimmerman, 1999). Given that toddlers with language delays may not only be both more challenging to engage and less able to verbally contribute to interactions with their mothers, these language delays may also be associated with

lower levels of dyadic synchrony. The proposed relationship between the psychological resources of the mother, parenting, and the child's attributes is illustrated in Figure 2-1.



**Figure 2-1: Model of Parent Child Correlates of Dyadic Synchrony**

### 2.3 SYNCHRONY AND CHILDHOOD ADJUSTMENT

A dyadic relationship characterized by greater synchrony has been found to be associated with greater competence and fewer behavior problems in children from middle-class populations (Feldman et al., 1999; Harrist et al., 1994; Lindsey et al., 1997; Mize & Pettit, 1997). There is a growing body of literature suggesting that synchronous relationships throughout childhood lead to better adjustment and outcomes in middle income populations. However, this body of literature is modest, and the effects of dyadic synchrony on different types of childhood adaptation remain far from conclusive. Constructs that may be seen as correlates of dyadic synchrony, such as maternal sensitivity and responsiveness, and childhood compliance, have been related to positive child outcomes (Braungart-Rieker et al., 2001; Steelman et al., 2002). Similarly, characteristics associated with asynchrony, such as rejecting parenting, child noncompliance and negative emotionality, have been associated with increased behavior problems in children (Bates et al., 1998; Earl & Jung, 1987; Keenan & Shaw, 1994). Given this body of research, it is not surprising that more synchronous interactions between mothers and their children may be associated with better outcomes. For example, Isabella and colleagues (1989, 1991) found that infants who spent a greater proportion of time in synchronous interaction with their mothers at one, three, and nine months of age were more likely to be rated as having secure attachments at one year of age.

Harrist and colleagues (1994) found that greater dyadic synchrony between kindergarten-age children and their mothers was associated with a number of positive school outcomes. For example, children of more synchronous dyads were more likely to be rated by their parents and teachers as being more socially competent. Similarly, Mize and colleagues (Lindsey et al., 1997; Mize & Pettit, 1997) found, that in a sample of preschool children, those from dyads with higher

ratings of both mother-child and father-child synchrony were better liked by their peers and rated by their teachers as being more socially competent. Clark and Ladd (2000) also found that higher levels of synchrony were associated with a greater number of peer friendships and greater social-emotional competence among five-year-olds.

Not only has synchrony been associated with high levels of social competence among children, it has also been negatively related to the development of behavior problems. Harrist and colleagues (1994) found that kindergartners who had more synchronous interactions with their mothers were rated by their teachers and peers as being less aggressive and less socially withdrawn and had been rated as having fewer adjustment problems when they entered kindergarten. Mize and colleagues (Lindsey et al., 1997; Mize & Pettit, 1997) found that preschoolers who had more synchronous interactions with their parents were more likely to be rated by their teachers as less aggressive. Using a familial study of mutuality, Deater-Deckard and Petrill (2004) found that mother-child mutuality was related to concurrent child externalizing symptoms. Further, mother-child mutuality of one child within the family was not associated with externalizing symptoms for a sibling within the same family (Deater-Deckard & Petrill, 2004). Similarly, Criss and colleagues (2003) found that synchrony was associated with lower levels of antisocial behavior and less deviant behavior among peers in a sample of low-income, school-aged boys. Additionally, the mothers who had more synchronous relationships with their sons engaged in more monitoring behavior and reported greater openness in their relationship. It is possible that the sensitivity and connection facilitated by a synchronous relationship in early childhood allows mothers to be more effective parents in later childhood, reducing the likelihood that children will engage in antisocial behavior (Criss et al., 2003).

Overall, dyadic synchrony appears to be concurrently associated with greater social skills and fewer externalizing problems in children. However, a limitation of the extant research, with few exceptions, is its primary focus on samples of middle-class, European-American children rather than more diverse populations. Given that there is a body of research suggesting that some characteristics of parenting may differently influence child outcome based on the socio-demographic characteristics of the population (Baumrind, 1972; Deater-Deckard & Dodge, 1997), it is important to examine how synchrony influences the adjustment of lower income and ethnically diverse samples. For example, Deater-Deckard and Dodge (1997) found that use of physical discipline, which has been viewed as a variant of harsh parenting, was not associated with increased rates of externalizing symptoms in minority children; however, its use was associated with higher rates of externalizing problems in European-American children. Baumrind (1972) suggested that in some contexts, such as dangerous and violent neighborhoods common for low-income populations, it is beneficial and protective for children to experience hard and controlling parenting.

#### **2.4 MODERATING EFFECTS OF DYADIC SYNCHRONY.**

Research has found that possible correlates of synchrony are associated with later childhood behavior problems. For example, greater levels of maternal psychological resources (i.e., lower rates of maternal depression, aggression and greater maternal social support) are associated with lower levels of child behavior problems (Belsky, 1984; Radke-Yarrow, et al., 1992; Teti et al., 1995). Similarly, higher levels of childhood negative emotionality and language delay have been associated with higher levels of child behavior problems (Calkins, 2002; Kaiser

et al., 2000, 2002). There is also evidence that the combination of the presence of risk factors in parenting *and* child domains (e.g., temperament) contribute unique variance to the prediction of later childhood behavior problems (Bates et al., 1998; Olson et al., 2000; Park et al., 1997.) Given the connection between these parent-child domains and child behavior problems, it is possible that the fit between the domains influences the individual effects of maternal and child characteristics on child behavior problems. Dyadic synchrony could be one such mechanism by which individual maternal and child characteristics contribute to the development of behavior problems. High levels of synchrony between a mother and her toddler may protect a child from later behavior problems while low levels of synchrony may exacerbate their effects. For example, a child whose mother is depressed but is able to participate and play with her toddler may be less likely to develop later behavior problems than a child whose mother is both depressed and unable to interact with her child. This proposed relationship is illustrated in Figure 2-2.



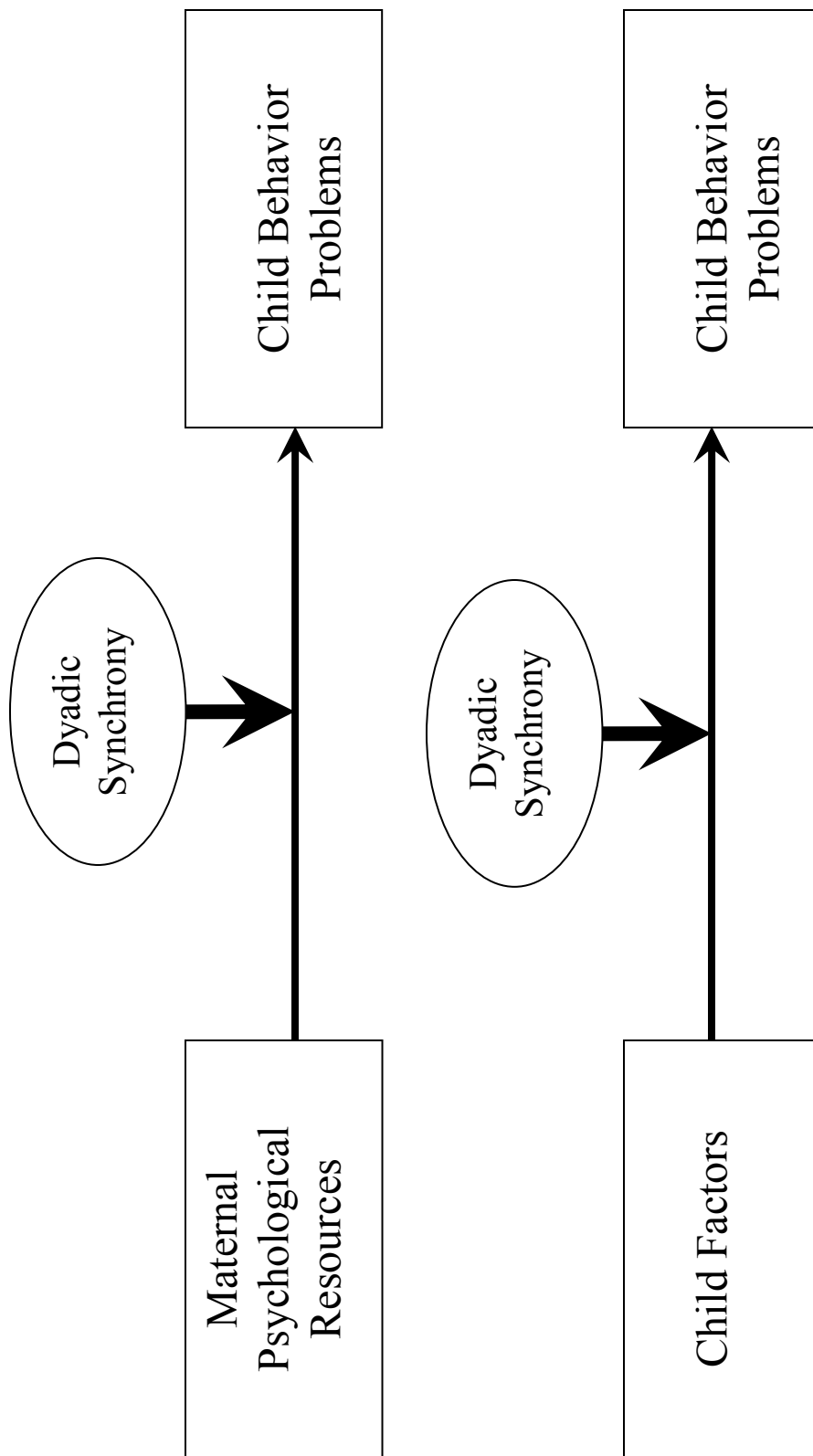


Figure 2-2: Model of Dyadic Synchrony's Role as a Moderator

### **3.0 STATEMENT OF PURPOSE**

Dyadic synchrony has been theorized as a molar construct that captures features of mother-child interaction that are uniquely dyadic beyond individual mother and child attributes (e.g., Criss et al., 2003; Harrist et al., 1994; Harrist & Waugh, 2002). It is thought to be a qualitative descriptor of the overall reciprocity and responsivity between a parent and child. Dyadic synchrony has been found to be associated with high rates child social competencies, (Clark & Ladd, 2000; Lindsey, Mize & Pettit, 1997; Mize & Pettit, 1997) and low levels of aggression and antisocial behavior (Criss et al., 2003; Harrist et al., 1994). However, it remains unclear if synchrony captures a unique construct or is simply an aggregate of existing, better-documented parent and child factors. There has been a dearth research examining the relationship that synchrony has with these established parent and child factors (i.e., maternal depression, social support, lower frustration tolerance, expressive language delay). Without this research, it is difficult to fully understand what the term synchrony means, and how it relates to child adjustment. Additionally, there is a dearth of research investigating how well synchrony predicts to future child behavior problems, particularly in high-risk, low-income populations, as the majority of research has studied middle-class, Caucasian samples. Finally, no known studies have examined the role that synchrony might play as a moderator between parent and child characteristics and later behavior problems.

The primary goal of the present study was to extend current understanding of the construct of dyadic synchrony by examining its correlations with maternal psychological resources (i.e., personality, social support, maternal depression, caregiving) and child characteristics (i.e., expressive language delay, low frustration tolerance, unresponsiveness) as well as its relationship to concurrent and future externalizing symptoms in a sample of boys at risk for behavior problems. In addition to examining the direct relations between dyadic synchrony and child externalizing behavior, the potential moderating role of synchrony on the relationship between both maternal and child factors and externalizing symptoms was considered. The sample includes 120 toddler boys from low-income families who were screened for being at heightened risk for behavior problems.

#### 4.0 HYPOTHESES

Based on the preceding review of the literature, the following hypotheses were tested.

1. Components and Correlates of Synchrony. Based on theory and empirical work (e.g., Criss et al., 2003) suggesting that synchrony should be related to both maternal and child characteristics, it was expected that mother-son synchrony would be related to multiple mother and child attributes, including maternal psychological resources (i.e., depressive symptoms, aggressivity, perceived social support, and responsive parenting), and child attributes (i.e., negative emotionality, emotion regulation and language development.)
2. Synchrony and Child Conduct Problems. Given that previous research has indicated that synchrony should be associated with concurrent and future conduct problems, it was expected that mother-son synchrony at age 2 would be significantly negatively associated with mothers' ratings of externalizing symptoms of their sons at both ages two and three. It was also expected that synchrony at age 2 would contribute unique variance to the prediction of conduct problems at age 3 after accounting for child's age-2 conduct problems.

In addition, it was expected that age-2 mother-son synchrony would continue to be significantly negatively associated with child externalizing behavior at age 3 after controlling for other child factors at age 2 (i.e., language ability, unresponsiveness and

tolerance for frustration), and after controlling for maternal psychological resources(i.e., depression, aggressivity and social support.)

3. Moderating role of synchrony on the relationship between child and parent characteristics and child conduct problems. Based on the theory that dyadic synchrony influences the relationship between maternal and child factors and later child conduct problems, it was expected that synchrony would moderate the association between child characteristics and child externalizing behavior and the association between maternal psychological resources and child factors. It was expected that high levels of dyadic synchrony would decrease the association of maternal and child risk factors on child behavior problems, and low levels of dyadic synchrony would strengthen the association of maternal and child risk factors on child behavior problems.

## **5.0 METHOD**

### **5.1 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 who were a part of a larger intervention study on the prevention of child conduct problems. Families were invited to participate if they had a son was between 17 and 27 months old, following a screen to ensure that they met the study criteria by having at least two socioeconomic, family, and/or child risk factors for future behavior problems (i.e., two of the three risk factors were required for inclusion in the sample).

Of the 327 mothers approached for study recruitment at the 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 assessment, the participating children had a mean age of 24.1 months (range 17.6 to 30.1 months). Mothers were between 18 and 45 years of age. The average family income was \$15,374 per year (range \$2,400 to \$45,000) with a per capita income of \$3,624 (range \$480 to \$13,000). 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 5-1.

Of the 120 families who participated in the first assessment, 112 (93.3%) participated at the one-year follow-up visit when their children were approximately three years old. Three of

the families who dropped out had been assigned to the treatment condition, and three to the control condition.

**Table 5-1: Socio-demographic description of the sample at Age 2 (N=120)**

	Mean	Standard Deviation
Child's Age (Months)	24.1	2.8
Maternal Age (Years)	27.2	6.1
Annual Income	\$15,504.92	8,754.25
Annual Per Capita Income	\$3,624.14	2,058.24
	<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

## 5.2 PROCEDURES

Mothers and their sons 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, the mother's perception of her child, parenting hassles, and maternal depressive symptoms and took 20-25 minutes to complete. Participants who completed this screen received \$10 for their assistance. Families who met criteria 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 visit and their willingness to be randomly assigned to a home-based, family intervention. If risk criteria 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* to increase the probability that parents would desire assistance in this area.

Parents (i.e., mothers and, if available, alternative caregivers such as fathers or grandmothers) and sons 1.75 to 2.5 years of age who met eligibility requirements and who agreed to participate in the study were then scheduled for a 2.5-hour home visit. Each assessment began by introducing the boys to an assortment of age-appropriate toys and having them play for fifteen minutes while the mothers completed questionnaires. After the free play (15 minutes), the mothers were instructed to have their sons pick up the toys without physically helping them. Following the clean-up task (5 minutes) a series of teaching tasks were administered, in which mothers were asked to provide the child as much help as they felt was necessary in working with a shape sorter, puzzle and peg board (3 minutes each). After the dyads had completed these tasks, they completed several additional play interactions that included a second clean-up task (5 minutes), and the presentation of two inhibition-inducing toys (2 minutes each). Finally, mothers were instructed to spend ten minutes preparing lunch for their sons while the children were waiting to eat. The dyad was then given ten minutes (or longer if needed) to eat



their lunch. After lunch, mothers completed an assessment of expressed emotion (5 minutes) and all remaining questionnaires (1.25 hours). Families received \$100 for participating in this home visit. At the end of the visit, after the senior examiner had completed 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" as 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 for 2 or more sessions depending on the family's preference. Treatment consisted of a brief intervention based on motivational interviewing and modeled after the Drinker's Check Up (Miller & Rollnick, 2002). Typically, the intervention included a "Get-to-know-you" Session, and a Feedback session. During the Get-to-know-you meeting, a parent consultant explored parent concerns, focusing on family issues that were currently the most critical to the family and the child's well being. In the feedback session, the parent consultant summarized the results of the initial assessment using motivational interviewing strategies. After the feedback, the parent was offered a maximum of six further follow-up sessions that were focused on areas of parental concern. Families were paid \$25 for completing the feedback session. Out of the families assigned to the treatment condition, 92 percent met with the parent consultant for at least 2 sessions.

When the children were approximately three years of age, families in both treatment and control conditions participated in a second home visit. This visit was identical in structure and measures used in the initial home visit. At the end of the second home visit, families were reimbursed \$125 for their time.

## **5.3 MEASURES**

### **5.3.1 Demographics questionnaire**

A demographics questionnaire was administered to mothers during both age two and three visits. This measure included questions about family structure, socioeconomic status, parental criminal history, child care and areas of familial stress.

### **5.3.2 Child Behavior**

#### **5.3.2.1 Child Behavior Checklist 2/3 (CBCL; Achenbach, 1992)**

The CBCL is a 100-item questionnaire that assesses behavioral problems in young children. Mothers completed the CBCL at both the age two and the age three visits. This questionnaire has two broad-band factors, Internalizing and Externalizing, and six narrow band factors. Test-retest reliability for the CBCL is reported to be .87 (Achenbach et al., 1987). For purposes of this study, only the broad-band Externalizing factor was used and was found to have an inter-item reliability coefficient of .81 for this sample at the age 2 visit.

#### **5.3.2.2 Language Development Survey (LDS; Achenbach & Rescorla, 2000)**

The LDS is a vocabulary checklist of 305 words and questions regarding average phrase-length that is used to assess language development in young children. Mothers completed the LDS at the age 2 visit. Test-retest reliability for the LDS is reported to be .99 over a one-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).

### **5.3.2.3 Maternal Perceptions Questionnaire (MPQ; Olson et al., 1982, 1989)**

The MPQ is a questionnaire, which assesses mothers' perceptions of different components of young children's temperament. Mothers completed an abridged version of the MPQ during the initial screen at WIC, including items comprising the Unresponsiveness factor. The 5-item Unresponsiveness factor is an index of the mother's beliefs of her child's lack of emotional responsivity to her (e.g., "My child doesn't come to me as often as I would like.") Test-retest reliability for the Unresponsiveness scale is reported as being .76. In the present sample, the coefficient for this scale was found to be .57. The Unresponsiveness scale was used based on findings that mothers' ratings of their toddlers on this scale were associated with their child's behavior problems during adolescence (Olson et al., 2000).

### **5.3.3 Maternal Psychological Resources**

#### **5.3.3.1 Beck Depression Inventory (BDI; Beck et al., 1961)**

The BDI, a well-established and extensively used self-report measure of depressive symptomatology, was administered during the age two home visit. The 21 items on the BDI are summed together to form one depression factor. The inter-item reliability coefficient (alpha) for the BDI was found to be .90 in the present study. This measure was used to assess maternal report of depressive symptomatology

### **5.3.3.2 Personality Research Form (PRF; Jackson, 1989)**

The PRF is a self-report measure that assesses different dimensions of personality. An abridged version of the PRF was administered at the age 2 home visit. 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 attachment security (Egeland & Farber, 1984) and later behavior problems (Shaw et al., 1994).

### **5.3.3.3 General Life Satisfaction (GLS; Crnic et al., 1983)**

The GLS was administered to mothers at the age 2 home visit 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 reflect the mother's overall contentment with the quality of her support across contexts. The inter-item reliability coefficient for this scale was found to be .79 for this sample.

## **5.3.4 Parenting**

### **5.3.4.1 Home Observation for Measurement of the Environment (HOME; Caldwell & Bradley, 1984)**

The HOME is a brief measure of the quality of the home environment that was completed by a trained examiner at the end of the first home visit. For purposes of the present study, only items that could be observed were employed 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. Thus, one item from the Acceptance scale was eliminated making it 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 Nurture scale. For this sample, the internal consistency of this single Maternal Nurture scale was found to be .72. This measure was selected as it provides an independent assessment of a mother's warmth and sensitivity during the observed mother-son interactions.

### **5.3.5 Observational Coding Systems**

#### **5.3.5.1 Synchrony Interval and Global Coding System**

There are two methods that have been used to assess synchrony in the literature: a global and an interval system. The majority of methods previously used to assess synchrony with infants and toddlers have evaluated individual aspects of the parent and child separately, such as the responsiveness and reciprocity of the mother and child, respectively. These separate codes have been combined to create a group of behaviors that characterize the molecular contributors to synchrony (Isabella et al., 1989; Kochanska, 1997; Tronick & Cohn, 1989; Vizziello et al. 2000). Researchers have collapsed individual codes of mother and child behaviors to generate a global rating. While the definitions for individual behaviors are more concrete, some of the qualitative features of the dyadic relationship have been more challenging for researchers to operationalize using such a system. Global coding systems have been used primarily in samples of older children (Colwell, 2001; Criss et al., 2003; Harrist et al., 1994; Mize & Pettit, 1997). These systems used a single code to define the overall synchrony of an interaction. Thus, both an interval and global coding system were devised for this study.

The global coding system used in this paper was based on systems used in previous research (Criss et al. 2003; Harrist et al., 1994). The prior coding systems consisted of one global rating of synchrony on a 7-point (Harrist et al., 1994) or 9-point (Criss et al., 2003) scale.

Because these systems were developed to assess synchrony in older children, modifications of the previous coding criteria were required. For example, it was not expected that the balance of the interaction would be equal, as young children require more support and guidance from their mothers than would an older child. Three tasks were coded from video-taped interactions using both the interval and global systems: a clean-up task (5 minutes), two of three cooperative play tasks (6 minutes), and a portion of meal preparation and lunch task (10 minutes.)

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 three observational activities at the age-2 visit. Coders used this single code to rate the reciprocity, shared affect, and mutual focus of the dyad during their interactions. The coders gave four global synchrony ratings during the video-taped interactions. The same scale was used to assign a synchrony code for each task and for the overall synchrony rating. Three synchrony ratings were given to the dyad at the end of the clean-up, cooperative play and meal tasks, respectively. The final global synchrony rating was used to capture the overall synchrony of the dyad across the entire observation. While this code was largely a mean composite of the global synchrony codes given during the three tasks, striking instances of synchrony or asynchrony in any of the three tasks were used to guide the final code. For additional information on the global coding system, please refer to Appendix A.

An interval coding system was devised to help anchor and guide the global ratings of synchrony. Several aspects that were theorized as aspects of synchrony by previous researchers (Deater-Deckard & O'Connor, 2000; Deater-Deckard & Pettrill, 2004; Harrist & Waugh, 2002; Kochanska & Aksan, 2004) were coded at a molecular level based on their presence in ten-second intervals during the clean-up and cooperative play tasks and in thirty-second intervals

during the meal task. Longer intervals were used during the meal task, as the mother and child were more likely to be engaged in separate activities during the meal preparation. During the three selected tasks, mothers and their sons were coded for shared eye contact, positive physical contact, and responsiveness to one another's requests for attention. Additionally, positive and negative affect and both maternal and child responsivity to the partner's affect were coded. For additional information about the interval coding of synchrony, please refer to Appendix B.

The author trained four research assistants on the interval and global coding systems. Coders were trained to become reliable with the lead coder on the 9-point global scale over a period of six months. To assess reliability, fifteen percent of the interactions (N=18) were independently rated by all 4 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 has been in the acceptable range ( $\rho = .70$  to  $\rho = .85$ ,  $p < .01$ ). The inter-rater reliability for the group of 5 coders was also in the acceptable range ( $\rho = .79$ ,  $p < .01$ ) (Mitchell, 1979). All coders were blind to the research hypotheses of this study.

For purposes of this study, only the global code of synchrony for all tasks was used in analyses. As the primary interest of this study was the larger, molar construct of synchrony, the global code that assessed synchrony across tasks was employed

### **5.3.5.2 Child Tolerance for Frustration Coding System**

Child tolerance for frustration, in the form of negative and positive emotionality was coded from videotapes of the no-toys tasks at the age 2 home visit. The coding system was adapted from the child affect coding system devised by Cole and colleagues (1994), which has been more recently modified by Gilliom and colleagues (2002). We further adapted this coding

system for use at the age 2 home visit, when during a 5-minute 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-second intervals by indicating the presence of child positivity or negativity, based on the presence of facial and vocal cues. Negativity was coded by the presence of furrowed brows, frowning, narrowing of eyes, crying, a harsh, raised voice or whining. Positivity was coded by 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.

The author trained four research assistants on the coding system. Coders were trained to become reliable with the lead coder over a period of six months. To assess reliability, twenty percent 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 are blind to the research hypotheses of this study



## **6.0 DATA ANALYSES**

The primary goals of the proposed research were to examine the association between synchrony and individual mother and child characteristics and the role of mother-son synchrony in the development of child behavior problems. For Hypotheses 2 and 3, child ethnicity and/or treatment group status were used as independent variables in regression analyses if upon initial correlational analyses direct relations between either or both of the variables and age 3 externalizing problems was evident.

### **6.1 HYPOTHESIS 1: COMPONENTS OF SYNCHRONY**

To examine the hypothesis that mother-son synchrony was related to maternal psychological resources, child characteristics and responsive caregiving, a series of bivariate Pearson correlations were performed between observed dyadic synchrony at age 2 and maternal depressive symptoms (BDI), aggression (PRF), and satisfaction with social support (GLS) at age 2. A comparable series of bivariate Pearson correlations were performed between age 2 observed dyadic synchrony and child attributes and parenting, including maternal perceptions of child unresponsiveness (MPQ) and language ability (LDS), and observed rating of child frustration tolerance, and observed Maternal Nurturance (HOME).

## **6.2 HYPOTHESIS 2A: RELATIONS BETWEEN SYNCHRONY AND CHILD EXTERNALIZING PROBLEMS**

To examine the hypothesis that mother-son synchrony was associated with externalizing behavior at ages 2 and 3, another series of bivariate Pearson correlations was performed involving dyadic synchrony and maternal report of child externalizing behaviors at ages 2 and 3 (CBCL Externalizing). To examine the hypothesis that age 2 synchrony would continue to be related to age 3 externalizing behavior after accounting for age 2 externalizing symptoms, a partial correlation was computed in which the relation between synchrony at age 2 and externalizing at age 3 was computed while accounting for age 2 externalizing problems. If either child ethnicity or treatment status was found to be related to age 3 externalizing problems, a hierarchical regression analysis was used instead for this analysis, in which child externalizing at age 2, child ethnicity (if correlation was significant), treatment status (if correlation was significant) and synchrony were entered as independent variables and age 3 CBCL externalizing scores served as the dependent variable.

## **6.3 HYPOTHESIS 2B: RELATION BETWEEN SYNCHRONY AND CHILD EXTERNALIZING PROBLEMS AFTER ACCOUNTING FOR CHILD FACTORS**

To examine the hypothesis that synchrony at age 2 contributed unique variance to the prediction of age 3 externalizing problems after accounting for child factors, a hierarchical regression analysis was computed in which the following variables were entered as independent variables: age 2 CBCL Externalizing symptoms, LDS report of expressive language, MPQ child

unresponsiveness and observed child tolerance for frustration, and observed synchrony. Again, age 3 CBCL Externalizing symptoms served as the dependent variable.

#### **6.4 HYPOTHESIS 2C: RELATIONSHIP BETWEEN SYNCHRONY AND CHILD EXTERNALIZING PROBLEMS AFTER ACCOUNTING FOR MATERNAL PSYCHOLOGICAL RESOURCES**

To examine the hypothesis that synchrony at age 2 continued to account for unique variance in age 3 externalizing problems after accounting for maternal psychological resources, hierarchical regression analyses were computed in which the maternal aggression on the PRF, maternal depression on the BDI, maternal social support on the GLS, maternal nurturance on the HOME, and observed synchrony served as independent variables, and age 3 CBCL Externalizing symptoms served as the dependent variable.

#### **6.5 HYPOTHESIS 3A: MODERATING EFFECTS OF SYNCHRONY ON THE RELATIONSHIP BETWEEN CHILD FACTORS AND CHILD EXTERNALIZING SYMPTOMS**

To examine the hypothesis that synchrony at age 2 moderated the relationship between child factors and age 3 externalizing symptoms, three hierarchical regression analyses were computed in which a child factor (i.e., MPQ, LDS, and observed tolerance for frustration), age 2 synchrony, and the interaction between the child factor and age two synchrony were entered, and age 3 CBCL Externalizing symptoms served as the dependent variable. If any of the three interactions proved significant, post hoc analyses were conducted to examine the nature of the

interaction using the test of simple slopes (Aiken & West, 1991). Again, if treatment group status or child ethnicity was significantly related to age 3 Externalizing, either or both of these variables were entered initially in the regression equation as independent variables for these equations and those for Hypothesis 3B.

### **6.6 HYPOTHESIS 3B: THE ROLE OF SYNCHRONY AS A MODERATOR BETWEEN MATERNAL PSYCHOLOGICAL RESOURCES AND CHILD EXTERNALIZING SYMPTOMS**

To examine the hypothesis that synchrony at age 2 moderated the relationship between maternal psychological resources and age 3 externalizing symptoms, a series of four hierarchical regression analyses were computed in which one of the four maternal variables was entered first (i.e., BDI, PRF, GLS, and HOME), followed by age 2 synchrony and the interaction between the maternal factors and age two synchrony, with age 3 CBCL Externalizing serving as the dependent variable. As for Hypothesis 3A, if any of the interactions was significant, a test of simple slopes was performed to examine the nature of interactions between synchrony and maternal psychological resources.

## 7.0 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 7-1 and as expected based on the screening process used to recruit the sample, participants' scores on a number of measures were appreciably higher than published data for normative populations. For example, maternal ratings of child's externalizing symptoms at ages 2 and 3 were approximately 1.5 standard deviations above the published norms for nonreferred samples (mean=13.1) and even slightly higher than mean scores (19.0) reported for referred samples (Achenbach & Rescorla, 2000). Ratings of maternal depressive symptomatology (mean=11.97) were also significantly higher than the mean of 6.56 (SD=7.02) reported in normative samples of adult women ages 18 to 64 (Salokangas et al., 2002). The mean BDI for this sample indicated that on the average, mothers showed moderate levels of depressive symptoms. Similarly, mothers in this sample reported slightly elevated levels of aggressiveness on the PRF with a mean score of 7.38 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 only 6 dyads above a rating of "5" ("moderately synchronous") and no dyad receiving a rating higher than "7" ("mostly synchronous"). With respect to the boys' performance on the LDS, the sample scored at the 45<sup>th</sup> percentile for vocabulary score and below the 20<sup>th</sup> percentile for average length of phrase.

**Table 7-1: Descriptive Statistics for Independent and Dependent Variables**

	<i>N</i>	Mean	SD
<b><u>Independent Variables</u></b>			
<b>Child Factors</b>			
Maternal Perceptions Questionnaire:	120	13.3	5.31
Child Unresponsiveness Scale			
Language Development Scale:	117	2.25	0.98
Length of Utterances			
Language Development Scale:	120	141.24	88.89
Number of Words Known			
Observed Tolerance for Frustration:	114	5.09	7.25
Number of Intervals with Negativity			
<b>Maternal Psychological Resources</b>			
Beck Depression Inventory	120	11.97	9.31
Personality Research Form:	120	7.38	2.92
Aggressiveness Factor			
General Life Satisfaction Scale:	120	46.19	5.38
Satisfaction Scale			
<b>Parenting</b>			
HOME Inventory: Total Score	120	12.58	3.11
<b>Global Rating of Observed Synchrony</b>	115	3.49	1.26
<b><u>Dependent Variables</u></b>			
Age 2 Child Behavior Checklist 1.5-5:	119	21.37	7.21
Broadband Externalizing Factor			
Age 3 Child Behavior Checklist 1.5-5:	110	19.71	7.97
Broadband Externalizing Factor			

Analyses were performed to determine if dyadic synchrony was significantly associated with child ethnicity, but no differences were found between European American, Biracial and African

American families,  $F(2,111)=1.63, p = ns$ . Neither child ethnicity,  $F(2, 107) = 2.76, p = ns$ , nor treatment group status,  $F(1, 108) = 0.74, p = ns$ , were related to child externalizing at age 3, and thus were not controlled for in later analyses

## **7.1 HYPOTHESIS 1: CORRELATES OF SYNCHRONY**

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 maternal perceptions of child unresponsiveness (MPQ) and language ability (LDS), and observed rating of child frustration tolerance, and observed maternal nurturance (HOME). Observed dyadic synchrony was modestly, but 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 on the LDS, higher maternal aggressiveness on the PRF, and higher maternal nurturance on the HOME significantly associated with higher levels of synchrony (see Table 7-2). As children go through rapid language development during the second and third year of life, and as these children ranged in age from 18- to 30-months old, 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 attenuated and no longer statistically

significant ( $r = 0.13, p = ns$ ). While synchrony was associated with a number of these variables across informant and method, few of these variables were correlated with one another.

**Table 7-2: Correlation among Dyadic Synchrony, Child Factors, Maternal Psychological Resources and Parenting**

	2.	3.	4.	5.	6.	7.	8.	9.
1. Synchrony	-0.04	0.19*	0.27**	-0.19*	-0.09	-0.28**	0.16#	0.47***
2. MPQ	--	-0.03	0.02	-0.09	0.11	0.00	0.02	0.01
3. LDS: Length of Utterances		--	0.55***	0.06	-0.04	-0.10	0.13	0.09
4. LDS: Words Known			--	-0.05	-0.11	-0.11	0.21*	-0.05
5. Tolerance for Frustration				--	0.05	-0.03	-0.20*	-0.07
6. BDI					--	0.29**	0.04	-0.01
7. PRF						--	0.10	-0.37
8. GLS							--	0.01
9. HOME								--

To examine the correlates of synchrony in a multivariate framework, an exploratory discriminant function analysis was also completed. Ratings of synchrony were dichotomized into two categories (i.e., scores  $\geq 5$  vs.  $< 5$ ). All maternal, child and parenting variables were inserted stepwise into the equation. The two variables found best to predict synchrony were maternal nurturance and child expressive language ability (Wilks Lambda<sub>(2,106)</sub> = .791,  $\chi^2_{(2)} = 24.55, p < .001$ ). These two variables were able to accurately predict 62.3% of the dyads who had low levels of synchrony and 75.5% of the dyads with high synchrony.



## 7.2 HYPOTHESIS 2: RELATIONSHIP BETWEEN SYNCHRONY AND CHILD EXTERNALIZING PROBLEMS.

To examine the hypothesis that mother-son synchrony would be associated with externalizing behavior at ages 2 and 3, a series of bivariate Pearson correlations were performed. Synchrony was not associated with externalizing behavior at either ages 2 ( $r = 0.01, p = ns$ ) or age 3 ( $r = -0.11, p = ns$ ).

Next, a hierarchical regression analysis was performed to examine the hypothesis that synchrony at age 2 would contribute unique variance in age 3 externalizing problems after accounting for child factors. As no direct relations were found between synchrony and child externalizing problems, null findings were expected but tested anyway to check for the possibility of suppressor effects. After initially entering age 2 CBCL externalizing, MPQ, LDS and child's negative affect, synchrony scores failed to contribute significant variance to age 3 CBCL externalizing,  $F(5,95) = 6.20, p < .001, r^2 \text{ change} = .002$ . Similarly, it was found that synchrony did not add unique variance after accounting for maternal psychological resources, including BDI, GLS, PRF, and HOME scores,  $F(6,98) = 4.46, p < .001, r^2 \text{ change} = .01$ .

**Table 7-3: Summary of regressions predicting age 3 externalizing symptoms from child factors with synchrony as a moderator**

Model	B	SE B	$\beta$	<i>t</i> -score
<u>Child</u>				
<u>Unresponsiveness</u>				
Step 3:				
MPQ	0.055	0.393	0.14	0.14
Synchrony	-1.851	1.415	-1.308	-1.31
Interaction	0.093	0.102	0.914	0.91
<u>Language</u>				
<u>Development</u>				
Step 3:				
LDS	-0.017	0.027	-0.181	-0.62
Synchrony	-1.124	1.365	-0.173	-0.82
Interaction	0.003	0.007	0.167	0.44
<u>Tolerance for</u>				
<u>Frustration</u>				
Step 3:				
Negative Affect	0.126	0.324	0.107	0.39
Synchrony	-0.588	0.754	-0.091	-0.78
Interaction	0.032	0.095	0.093	0.34

### 7.3 HYPOTHESIS 3: MODERATING ROLE OF SYNCHRONY.

To test the hypothesis that synchrony at age 2 moderated the relationship between maternal and child variables and child externalizing problems, another series of regression analyses were performed. As can be seen in Table 7-3, synchrony did not function as a moderator for any of the equations with the child factors. The same was true for variables involving maternal psychological resources, with one exception (see Table 7-4). There was a significant interaction between synchrony and maternal depressive symptoms (BDI). As indicated in Table 7-4, maternal depressive symptoms were positively related to child

externalizing symptoms in dyads displaying high levels of synchrony (slope = .286,  $p < .05$ ), but were unrelated to child externalizing symptoms at low to mean levels of synchrony (slopes = -.815 & .234,  $p = ns$ , respectively). Thus, high levels of synchrony strengthened the relationship between maternal depressive symptoms and child externalizing symptoms. Interestingly, there was also a significant association between higher levels of dyadic synchrony and lower levels of depression.

To further clarify this relationship, another follow-up analysis was conducting in which synchrony ratings were dichotomized into a high and low synchrony groups. Dyads with a synchrony score of “4” or higher were placed in the “High” group ( $n = 53$ ) and those with a score of “3” or lower were placed in the “Low” group ( $n = 61$ ). There were significant differences in the correlations between the BDI and CBCL. For “Low” synchrony dyads, there was no significant correlation between BDI and CBCL ratings ( $r = -0.02$ ,  $p = ns$ ), while for “High” synchrony there was a sizable positive correlation between BDI and CBCL ratings ( $r = 0.49$ ,  $p < .0001$ ). A follow-up Fisher Z test indicated that the relationship between BDI and child externalizing was significantly stronger for those dyads with higher versus lower levels of synchrony ( $Z = 2.88$ ,  $p < .01$ ).

**Table 7-4: Summary of regressions predicting age 3 externalizing symptoms from maternal characteristics with synchrony as a moderator**

Model	B	SE B	$\beta$	<i>t</i> -score
<u>Maternal Depression</u>				
Step 3:				
BDI	-0.249	0.212	-0.292	-1.18
Synchrony	-2.165	0.962	-0.333	-2.23*
Interaction	0.113	0.055	0.554	-2.07*
<u>Maternal Aggressiveness</u>				
Step 3:				
PRF	-0.774	0.79	-0.281	-0.98
Synchrony	-2.464	1.746	-0.379	-1.41
Interaction	0.223	0.202	0.357	1.11
<u>Social Support</u>				
Step 3:				
GLS	-0.237	0.514	-0.158	-0.46
Synchrony	-1.37	6.992	-0.211	-0.20
Interaction	0.017	0.152	0.130	0.11
<u>Maternal Nurturance</u>				
Step 3:				
HOME	0.234	0.735	0.086	0.32
Synchrony	-0.090	3.059	-0.014	-0.03
Interaction	-0.052	0.221	-0.146	-0.24

## **8.0 DISCUSSION**

The purpose of this study was two-fold. The first was to identify maternal and child factors associated with the development of synchrony. The second goal was to look for the presence of relationship between dyadic synchrony and the development of externalizing symptoms in a sample of toddler boys at-risk for trajectories of early conduct problems. First, maternal and child correlates of synchrony were examined. Second, the association between age-2 synchrony and externalizing problems at age 3 investigated. Finally, synchrony was examined as a potential moderator of relations between maternal and child characteristics and later conduct problems.

Regarding correlates of synchrony, it was found that several mother and child variables were modestly associated. However, synchrony was not significantly associated with mothers' ratings of children's externalizing symptoms concurrently or one year later. Additionally, synchrony did not moderate the relationship between mother and child variables and later conduct problems with the exception of maternal depressive symptoms.

### **8.1 CORRELATES OF SYNCHRONY**

It was found that both child and mother variables were significantly associated with dyadic synchrony. These findings support the idea that a number of mother and child variables

are associated with the development of synchrony. One maternal psychological characteristic, self-reported aggressiveness, was negatively associated with synchrony, such that mothers who rated themselves as more aggressive were more likely to be in dyads with lower synchrony scores. Further, two child factors, child language ability and observed ratings of child frustration tolerance, were modestly associated with observed synchrony. Boys who were reported by their mothers as knowing more words and speaking in more complex sentences were more likely to be in dyads with higher ratings of synchrony. Similarly, boys who displayed lower levels of negative emotions during a frustration task were more likely to be in dyads with higher levels of synchrony. The strongest predictor of synchrony was examiner ratings of maternal nurturance on the HOME inventory, a rating that was completed at the end of the assessment.

Interestingly, few maternal or child factors were associated with one another. With the exception of the two measures of child language ability that were taken from the LDS, there were only three significant correlations amongst the maternal and child variables. The fact that the majority of the variables showed no association with each other while showing an association with synchrony is one indication that synchrony is related to a wide breadth of maternal and child factors that are independent and distinct constructs.

Further, examiner rated maternal nurturance was the variable most strongly associated with synchrony, suggesting that synchrony may be similar to other aspects of the parent-child relationship. Given that the maternal nurturance scale on the HOME inventory was a measure of responsive and accepting parenting, one of the maternal aspects of synchrony, the high correlation supports, at the very least, the face validity of the measure of synchrony.

## 8.2 SYNCHRONY AND EXTERNALIZING SYMPTOMS

There was no relationship found between synchrony and either concurrent or later externalizing symptoms, an unexpected finding. One possible explanation may be the sample selection. All of the mothers of toddlers in this sample were reporting heightened levels of externalizing symptoms in their sons at the time of initial screen, as one of the criteria for their inclusion was an elevated score on either the Eyberg or the CBCL. Thus, one possible explanation for the lack of association between externalizing symptoms and synchrony is the elevation in the scores of externalizing symptomatology. Mean ratings of externalizing symptoms on the CBCL were elevated even in comparison to *referred* samples reported by the authors of the measure (Achenbach & Rescorla, 2000). Given that all of these children have somewhat elevated ratings of behavior problems, it is possible that the examination of only the tail end of the distribution of externalizing symptoms masked the association between externalizing problems and dyadic synchrony. Perhaps a normative sample, with a wider range of externalizing symptoms would be better able to discern the relationship between synchrony and conduct problems, as previous research on lower risk samples have found a significant association between synchrony and externalizing problems (Harrist et al., 1994; Lindsey et al., 1997; Mize & Pettit, 1997).

Similarly, this sample appeared to have somewhat diminished levels of synchrony. While the synchrony rating system was designed to have a mean score of “5,” this sample’s mean rating was considerably lower (mean=3.49, SD=1.26). A more normative sample may have a broader distribution of scores as there are more likely to be dyads on both the high and low extremes of the coding system. However, within this high-risk sample, the full range of the 9-point coding system was not used, as no dyads seemed to be highly synchronous. If this sample

did have a reduced range, this may have also contributed to the lack of a relationship between externalizing symptoms and synchrony. However, it is not possible to conclusively determine if the range was reduced, since no normative sample of toddlers has been coded on this system. It is possible that the combination of elevated ratings of externalizing symptoms, in addition to lower levels of synchrony, attenuated the relationship between these two variables. A replication of this study using an identical coding system in a normative sample may yield different results.

The absence of an association between synchrony and child behavior problems may also be a result of the sociodemographic characteristics of the families in this sample. As previously stated, there is research suggesting that characteristics of parenting associated with lower behavior problems in middle-class samples do not function identically in ethnic minorities and low-income populations (Baumrind, 1972; Deater-Deckard & Dodge, 1997). Synchrony may function in a similar way in low-income populations, as responsiveness and sensitivity between the mother and child are less important than control and obedience for mothers raising their children in dangerous and stressful environments.

Alternatively, much of the research examining relationships between synchrony and child adjustment has been focused on developmental competencies rather than problem behavior. Synchrony has been found to be associated with better peer relationships (Lindsey et al., 1997; Mize & Pettit, 1997), higher levels of parent-child openness (Criss et al., 2003), secure parent-child attachments (Isabella et al., 1989, 1991), and higher levels of child social-emotional competence (Clark & Ladd, 2000). Thus, it is possible that synchrony may be a more reliable predictor of child competencies than psychopathology. Synchrony may increase a child's likelihood of developing more prosocial skills, rather than directly decrease the likelihood of developing externalizing symptoms. Additionally, as this sample was selected for the presence



of externalizing symptoms, it is possible that high levels of synchrony, while not associated with externalizing symptoms, may prevent the further escalation of externalizing problems.

### **8.3 MATERNAL DEPRESSION AND SYNCHRONY**

Synchrony was not found to moderate the relationship between most maternal and child variables and externalizing problems in this study, with one exception. The relationship between maternal depressive symptomatology and externalizing symptoms was found to be moderated by synchrony. The effects of maternal depression on child externalizing symptoms were strengthened in the context of high levels of synchrony, while the association between maternal depression and externalizing symptoms was significantly weaker at lower levels of synchrony. These findings suggest that children are more affected by maternal depressive symptoms when they are particularly attuned to their mothers. When a mother and child are less in synch with one another, a child may be less influenced by maternal depressive symptoms. In addition, children from less synchronous dyads may be less aware of their mother's emotional well-being, and thus the withdrawal, irritability and sadness commonly seen among depressed mothers may have less direct influence on a child. In the context of a more synchronous mother-child relationship, a child may be more sensitive to and more affected by the effects of maternal depression. However, this finding is not entirely consistent with existing research on maternal depression. The latter (Campbell et al., 2004; Cummings et al., 2000) suggests that maternal depression has deleterious consequences on children due to impaired maternal sensitivity in depressed mothers. When depressed mothers are able to respond warmly and sensitively to their children, effects of maternal depression on children is likely attenuated (Campbell et al., 2004). However, both the

existing body of research and this finding provide no evidence that maternal depression alone increases the risk of behavior problems; rather it appears to be the combination of the existing mother-child relationship quality and the consequences of maternal depression. The current findings suggest that only in a synchronous relationship in which a toddler boy notices his mother's depression and is impacted by it is maternal depression related to higher rates of externalizing problems.

## 9.0 LIMITATIONS

There are a number of limitations to the findings of this study. First, as previously mentioned, this sample represents a sample of boys at risk for trajectories of early conduct problems. Similarly, there was a restricted range of scores on parent-child synchrony. Thus, because of these issues, it is unclear if the present findings would generalize to more normative samples of boys. As this sample contained no girls, it is not possible to generalize these findings to girls at all.

A second limitation of this study is the reliance on maternal report for some independent and all dependent measures, creating the potential for reporting bias (Fergusson et al., 1993). Relying primarily on maternal report of child behavior problems may lead to inflated correlations as low-income mothers in this sample may rate their children much higher on behavior problems than would an outside observer.

A third limitation of this study was the suboptimal internal consistency (i.e.,  $\alpha = .57$ ) found for the Child Unresponsiveness factor on the MPQ. As reliability was below established criterion, it may not have been a valid indicator of unresponsiveness. The low internal consistency also suggests that this set of items may not function in the same way as it did with the normative sample, which was comprised of predominantly middle-class, European American young children (Olson et al., 1982; 1989).

## **10.0 CONCLUSION**

In summary, this study provides new information about the correlates of synchrony in toddler boys at high risk for the development of conduct problems. Synchrony was modestly associated with several mother and child factors. Synchrony was not found to be associated with concurrent or future externalizing symptoms, nor was it found to moderate the relationship between child and maternal characteristics and externalizing symptoms, with the exception of maternal depression. These findings support the concept that synchrony is a construct comprised of both maternal and child characteristics. Synchrony did not appear to be associated with increased maternal ratings of behavior problems in this sample. As this sample did not include a more normative sample of boys, it is not possible to determine if the absence of findings is a result of characteristics of this sample or a more general lack of association between dyadic synchrony and externalizing problems in boys.

## Appendix A

### GLOBAL SYNCHRONY CODES FOR AGE 2 EARLY STEPS VISITS

This rating system is designed to give a single code to describe the overall dyadic synchrony of a mother-child interaction. Synchrony is a measure of the responsiveness of the mother and child to each other's behavior and affect. It is also a measure of the balance and give-and-take between the dyad. This is a *dyadic* coding system, meaning that both the mother and the child must be considered when making a final rating and should reflect the interaction that is occurring between the mother and the child. A global code of synchrony is to be given for each task that is coded (i.e., clean-up, cooperative play, and the meal task) as well as a final global score for the entire period of observation. The following guidelines should be used for making *all* global codes.

NOTES ON THE FINAL GLOBAL SCORE: While the final global score will most likely be an average of the global scores given to each task, specific *striking* instances of synchrony or asynchrony should be taken into consideration and may guide this final score. For example, a child becomes very angry and out of control during the clean up and his mother ignores him while she fills out her questionnaires. The overall synchrony code for the clean-up task is a "1." The cooperative play tasks and meal task are unremarkable and

both receive scores of “4.” In this situation, the clean-up task should lower the overall interaction beyond what would be an average of the three tasks, most likely receiving a code of “2” due to the extreme asynchrony during the first tasks. Additionally, if the mother and child are in separate rooms for a great deal of one of the tasks (e.g., during the meal task, the mother is in the kitchen while the child is in the living room) that particular global code should be considered *less* than the codes for the other tasks. This is particularly true if one of the tasks is uncodable (see the description for the code of “0”).

## A.1 CODING GUIDELINES

**0.** A rating of “0” indicates that no synchrony code can be given. Mother and child spend the majority of the interaction in separate rooms. (This should occur primarily during the meal task.) If the mother and child spend more than two-thirds of a task in separate rooms and are not interacting in any way during their separation, do *not* assign a global synchrony code for the task. (This should be 7 or more minutes of the meal task, 4 or more minutes of cooperative play or 2 minutes of the clean up). However, if the dyad is interacting even though they are in separate rooms, give a synchrony code (e.g., child is sitting at dining room table/ high chair in living room while mother is cooking and she is periodically checking in on him and talking to him throughout the task). This type of interaction will probably receive a lower score because of the decreased probability of shared affect and eye contact, as well as less mutual focus but the interaction should still be coded. \*\*\*If one task does not receive a global synchrony code, that interaction should not be heavily weighted when making the across-task global synchrony code (i.e., if mother and child are not interacting

during the meal task and you do not assigned a synchrony code for this interaction, weigh that particular interaction less than the other two interactions when determining the final synchrony code.)

**1.** Both mother and child are in the same room, but are engaged in different or parallel activities and are not interacting with one another throughout the task (e.g., child is cleaning up toys while mother is filling out questionnaires; mother is cooking dinner while child is sitting in their highchair near mother and no dialogue or interaction is occurring between them).

Another possibility is that the mother is trying very hard to engage the child with the activities and the child is not responding to the mother's bids for attention (e.g., mother is giving the child instructions during the clean-up task, but child is turned from mother and continues to play with the toys/tantrums on the floor while mother speaks to child) or the mother appears to be consistently ignoring her child's attempts to interact with her. The mother's responses to her toddler during the interaction are consistently carried out in a way that do *not* seem attuned to her child's needs or requests (e.g., yelling at him when he becomes particularly distressed, but not responding to more prosocial bids for attention; redirecting his activities in such an abrupt or harsh way that it completely disrupts what the toddler is doing).

A code of "1" should be given when the dyad seems to be acting as two separate individuals during the interaction, rather than a team [or dyad]. There is little reciprocity—one member is doing all the work and is not able to effectively engage the other member of the dyad, or both members appear to be ignoring one another.

The prototypic dyad who receives a code of “1” is a dyad that is consistently not sharing a focus on the task together, is not interacting together, and has little eye contact or shared affect. OR A code of “1” can be given if one member of the dyad is trying to interact with the other, but the interaction is *consistently* one-sided. The mother or child is the only member of the dyad communicating and the partner is not responding in anyway (i.e., usually the mother at this age). The overall interaction should feel disjointed and rough, and at least one member of the dyad should appear to have no interest in participating in the interaction, demonstrating extremely low levels of interest in both the activity and the other person.

2. The mother and child are interacting but don’t seem to be on the same wave-length. One condition that suggests a rating of “2” is if the mother and child are interacting, but they do not have a shared focus throughout the majority of the interaction (e.g., child may show the mother the pegs on his fingers and the mother continues to talk about building a tower). The dyad is interacting but in a disjointed manner that completely hinders the overall interaction. There should be little shared interest between the play partners during the interaction. Comments about the shared activities should not focus on what the other person is doing, but focus solely on the individual’s own activities.

Another possibility is that the mother and child do not respond to each other’s bids for attention at several notable times (e.g., child is clearly quite distressed or positive, mother is extremely negative) throughout the segment, one member of the dyad must make a number of attempts to get the other’s attention before the other person responds or that one member of the dyad may appear to be largely ignoring the other or superficial responding to bids for attention (e.g., child is trying to get mother’s attention during the meal task, and she is



responding to him with “That’s nice!” or “Yes, I see you,” without looking at him; the mother tells the child to put the tool box away and the child continues to play with the tool box until she moves closer to him and repeats her request several times.)

It may feel as if one member of the dyad is being pulled along throughout the entire interaction by the other member of the dyad, rather than both the mother and toddler mutually participating in the activities. The mother and child tend not to share eye contact or affect. A code of “2” can also be given if one member of the dyad dominates the interaction such that the other member is consistently hindered from participating in the interaction (e.g., the mother is manipulating and guiding the child’s hands during the cooperative play tasks, but the dyad is not interacting otherwise). In comparison with a dyad who received a synchrony score of “1,” a dyad who receives a score of “2” should have slightly more signs of both members of the dyad interacting together; however, the members of the dyad should still not be consistently attuned to one another.

A prototypic dyad who receives a score of “2” should have a few bouts of mutual focus during the interaction; however, the dyad generally does not appear to interacting together. The interaction largely does not have conversational-style or flow; rather for much of the time it is as if two people are separately participating in the same activity at the same time. There is a modest degree of shared affect or eye contact. There is also little reciprocity and clear bids for attention are overlooked by the dyad most of the time. OR The mother (or possibly, the child) is dominating most of the interaction such that it has more of a “monologue” feel than a flowing conversation -- the other person is being carried along through the interaction although s/he does not really appear to be an active participant.

3. Mother and child are inconsistently and infrequently showing eye contact or sharing affect; however rules out a code of “2” even if they are engaged in different tasks. (If there are several clear instances of shared eye contact or affect during the interaction, do *not* assign a rating of less than “3”).

There is some mutual focus on the activity and the dyad does minimally interact together although the participants will feel as if they are more focused on completing the task than interacting together. One member of the dyad may be unequally involved with the task in comparison to the other, making the balance between the partners of the dyad seem off. One partner may lead or dominate the interaction more than the other although this should be less notable than in dyads receiving a rating of “2.” The mother may dominate the interaction most of the time, but there are moments when the child appears to be taking on a role as full, active participant in the interaction.

There are a number of notable miscues during the interaction. A “3” would be assigned if one member of the dyad abruptly interrupts the interaction or the other’s focus consistently throughout the interaction, especially if this seems very inappropriate throughout the interaction (e.g., a mother interrupts a child’s attempts to put in one puzzle piece in by handing him another puzzle piece, rather than providing guidance or structure to put in the first piece; a child is picking up the tool box, and the mother stops him and tells him to pick up another toy; a mother is giving instructions during the clean-up task, and the child interrupts her with “No!” or a temper outburst). These interruptions should greatly disturb the flow of the interaction. Interruptions should be more notable in ratings of “3” as dyads

receiving a score of “1” or “2” are not interacting together consistently enough to make interruptions likely to occur.

The dyad may be unresponsive to one another on occasions, ignoring clear signs of negativity and bids for attention such that the overall harmony of the interaction is disrupted. However, there may be a few instances where the one partner attempts to quickly respond to the other person although these responses may be less than ideal and not have the desired effect (e.g., a mother trying to respond to her child’s negativity in a somewhat appropriate manner escalates her child’s negativity rather than reduces it.).

A prototypic “3” is a dyad that might be described as “minimally synchronous.”

Synchronous behaviors such as eye contact, physical contact or shared affect occur very infrequently. While both members of the dyad may be jointly focused on the task at hand, their focus seems superficial, and the mother and child may not be consistently working together as a team. Verbal and physical interruptions may occur a number of times throughout the interaction, and these interruptions should greatly affect the flow of the interaction. Similarly, the mother and child may seem minimally attuned and responsive to one another or responses may seem notably inappropriate.

**4.** One way to receive a “4” is for a significant portion of the interaction to look like a “3” (or less), but for other portions of the interaction look like higher levels of synchrony.

Another way to receive a “4” is for most of the interaction to look fairly synchronous, but for there to be one or more notable, obvious miscues (e.g., for most of the cooperative play, mother and child are synchronous, but there is one or more instances where the mother

mocks, taunts or teases the child; child becomes extremely angry/frustrated while waiting in the meal preparation and hits his mother).

A rating of “4” may be assigned if both members of the dyad are playing/working together on the same task with a mutual focus, but the focus of the dyad’s attention is still primarily on the task rather than the actions, affect, etc. of their play partner (e.g., mother and child are working on cleaning up the toys together, but mother is mainly directing the child’s actions and the child is following the mother’s instructions with minimal referencing and praise between the two.) This preoccupation with the task rather than the play partner will disrupt the harmony and flow of the interaction, making both partners less able to contingently respond to the other. Similarly, the balance of the interaction may still be unequal with one partner (generally the mother) leading or guiding the interaction more than necessary.

A mother throughout the interaction may inconsistently respond to her child’s bids for attention, and at points may fail to respond to her child’s bids for attention or distress. Although responses are inconsistent, the dyad should respond to one another approximately half of the time with few instances of clearly inappropriate responses. Unlike dyads receiving a lower rating, there should be a number of clear instances of appropriate responses to bids for attention by the mother and/or toddler.

There will be at least a few clear instances of shared eye contact, physical contact or affect. However, overall the interaction may feel somewhat disjointed and rough. While there should be some positivity during the interaction, at times the dyad may appear disinterested in interacting with one another and may demonstrate a lack of enthusiasm for the interaction.

**5.** A rating of “5” is assigned to dyads that are typical in regards to synchrony. Partners are engaged in the same activity and have a joint focus. The mutual focus seems to be on both the other play partner as well as the task at hand.

To get a “5”, both members of the dyad must be responsive to each other at times, noticing cues, bids for attention, partner’s affect and responding with at least minimal appropriateness (e.g., not ignoring clear instances of distress/frustration, bids for attention or otherwise doing something bizarre). However, a mother may fail to respond to her toddler’s more subtle bids for attention and distress. While the interaction involves more contingent responsivity, segments of the interaction may not be perfectly smooth, and at times the balance may seem off. There is often some balance and mutuality in the leading and following, but not a perfect balance. At the age of two, mothers should still be doing most of the leading and guiding of the interactions, but to receive a score of “5” a mother needs to be moderately responsive to her child, allowing her child at some points of the interaction to guide it. Throughout the interaction, both the mother and child may make bids for attention, gestures or comments and receive positive responses from their partner.

The dyad may have eye/physical contact and shared affect and receive a “5”, but can also receive a “5” without shared affect or eye contact.

**6.** A rating of “6” is given when the dyad is engaged in the same activity and there is considerable balance and mutuality in leading, following and responsiveness throughout the interaction. To get a code of “6”, there must be *at least a few* instances of eye contact, physical contact or shared affect (e.g., looking at each other and smiling/laughing, smiling

and snuggling together), but it does not need to occur consistently throughout the entire interaction.

A mother should generally be perceived as being attuned to her toddler although she may be unresponsive to a few less clear bids for attention or she may overlook one or two clear bid for attention. The balance during the interaction should feel generally reciprocal with an appropriate give-and-take between the toddler and mother during the interaction. The mother (or toddler) should not feel as if she were dominating or controlling the interaction.

Additionally, negative affect on the part of the child during stressful interactions (e.g., meal preparation and clean-up) does not necessarily rule out a code of “6”. If a child becomes very distressed or frustrated during an interaction (e.g., not wanting to put the toys away or becoming impatient when waiting for his food), a score of “6” can still be given, if the mother appropriately responds to the child’s distress/frustration. While the child may not be completely consoled or comforted by his mother’s response to his negativity, the child’s negativity should diminish somewhat.

An interaction receiving a rating of “6” should overall be perceived as positive interaction with minimal conflict or frustration between members of the dyad. Both the toddler and mother should appear to be interested in both the task at hand and their play partner.

Minor miscues and misreadings by the dyad may occur during the interaction; however, they should not interrupt the overall flow of the interaction.

**7.** A rating of “7” is given when both members of the dyad are engaged in the same activity throughout the interaction and there is considerable balance and mutuality in leading, following, and responsiveness throughout the segment. While eye contact and shared affect may not be consistently present, there must be considerable eye contact/physical contact and shared affect at a number of points throughout the interaction.

The mother is expected to lead the majority of the interactions; however, her responses are generally well timed to suit the pace of her child and the child seems to respond appropriately and positively to her pacing. Any miscues between the dyad generally seem inconsequential or trivial in the overall context of the interaction. For instance, clear signs of negativity or distress are appropriately responded to during interaction although a few subtler signs of negativity may be overlooked by the dyad.

A mother in a dyad receiving a rating of “7” should be quite attuned to her toddler although she may fail to respond to a few subtle bids for attention. Responses by the mother to the child should be appropriate and somewhat successful in meeting the child’s needs. There should be very few clear instances of inappropriate responses to bids for attention, positivity or negativity by either the mother or the child. The interaction should overall be a positive interaction with few clear instances of conflict, tension or frustration. If conflict does occur, the dyad should be able to resolve it in a timely manner (e.g., child upset because of nothing to do while waiting for food to be prepared, but mother quickly able to comfort him).

**8.** A rating of “8” is given for partners who are engaged in the same activity, are mutually responsive to one another, mutually balanced in offering leads and following leads, and have

an appropriately balanced (i.e., the child should contribute appropriately to the interaction as well as the mother) responsibility for maintaining the interaction. In addition, the dyad needs to have shared affect, physical contact, and/or eye contact a good bit of the time although it may not occur consistently throughout the interaction. (Note: Shared affect, eye contact, and physical contact may be displayed briefly throughout the interaction, and some types of contact may not occur at all, but when reviewing the entire interaction, some form shared contact should be consistently occurring throughout the interaction.)

The mother and child should appear to be attuned to one another and should respond quickly to each other's bids for attention if not in every situation, the vast majority of the time. Only extremely subtle bids for attention should be overlooked by the dyad.

Minor miscues can occur but they are inconsequential to the interaction. The interaction should generally be positive and neither partner ignores or fails to respond to the other's negativity. If a child does demonstrate any negativity during the interaction it should be short lived, as the mother will respond quickly to the child's negativity in ways that diminishes the child's negativity.

**9.** A rating of "9" is given for partners who are engaged in the same activity, are consistently mutually responsive to one, mutually balanced in offering leads and following leads (as is appropriate for a mother and toddler dyad), and have shared affect, eye contact and/or physical contact consistently throughout the interaction. Both members of the dyad should be actively involved in the interaction and the interaction should be quite positive. Both partners should quickly respond to the other's bids for attention and appear to be attuned to one another. Minor miscues occur rarely if at all, and there should be little



evidence of conflict or frustration during the interaction. Few if any instances of asynchrony should be noted during the interaction. \*\*\*This rating is given to represent a dyad that is highly synchronous and thus the interaction needs to contain mutual focus, dyadic attunement, appropriate responsivity, eye contact, and shared affect.

## **A.2 BEHAVIORS THAT TEND TO RAISE RATINGS:**

1. Eye contact
2. Physical contact for comfort seeking (not including: physical aggression, forcing the child to sit on his mother's lap, hand guiding during the cooperative play task.)
3. Shared positive affect
4. Responsivity to partner's affect and bids for attention
5. Mutual focus in the activity or task at hand
6. Balance or give-and-take in the dyad's exchange (again, this balance should not be 50/50, and it is expected that the mother will have a more active role in the interaction than her child, but in a synchronous dyad, a mother should allow her child to guide and lead the interaction when appropriate.)

### **A.3 BEHAVIORS THAT TEND TO LOWER RATINGS:**

1. One partner dominating or leading the entire interaction (NOTE: Mothers should be more dominant than children during these interactions, but should allow her toddler to contribute to the interaction when appropriate.)
2. Ignoring or responding inappropriately to a partner's positivity, distress or frustration.
3. Failure to respond to one another's bids for attention or play cues during the interaction.
4. One partner interrupting or interfering with the other partner's activities.
5. One partner refusing to participate in the task.
6. A mother spending the majority of the time talking to the camera, examiner or alternate caregiver about the child rather than engaging in an exchange with the child (e.g., [To examiner/camera], "He is a horrible picker-upper! I knew he wouldn't do it. Look, he's still playing with the toys.")
7. The sense of underlying tension or conflict between the members of the dyad.
8. Physical aggression or verbal aggression (e.g., mocking, teasing or taunting).

### **A.4 OTHER THINGS TO CONSIDER WHEN CODING:**

While these codes are *dyadic*, and synchronous interaction do involve a give-and-take/balance between the mother and toddler, the role of the mother and the child should not be

completely balanced (50/50) as the mother is better able to guide and initiate interactions than is her toddler. A mother also has more skills when it comes to being able to contingently respond to her play partner. A synchronous and balanced interaction is one in which the mother allows her child to lead the interaction *when appropriate* and consistently responds to her child in an appropriate manner. Both the mother and toddler should feel like active participants of the interaction. It should not feel as if the mother is dominating or controlling the interaction, despite the fact that the majority of the time the mother will be the “leader” of the interaction.

Negative affect *generally* lowers a synchrony rating; however, a toddler’s displays of frustration and distress may be associated with the demand of the task rather than his synchrony with his mother. A mother’s responsiveness and ability to soothe and comfort her child during a stressful task need to be considered as a part of the synchrony rating. A more synchronous dyad will be more likely to have a mother who appropriately responds to her child’s negativity and a child who is successfully comforted by his mother’s response. In general, the higher the synchrony rating, the more likely that the dyads will have less negative affect and if/when the toddler displays negativity, and the distress/frustration will be briefer due to the mother’s responsiveness to her child. Similarly, in more synchronous dyads, toddlers will be more likely to respond to their mother’s negativity in a way that ameliorates the mother’s frustration/distress.

Synchrony is *dyadic* code and ideally is coded in interactions that involve only the mother and the child. Because of the nature of home visits and the nature of some tasks, in particular the meal task, other members of the family or the examiners may become involved in some parts of the interaction. If an alternate caregiver, sibling or examiner becomes involved in the interaction, please make a note of it on your coding sheet and consider the aspects of the

interaction that involve only the mother and the target child. If another person makes it impossible to assign a synchrony code (e.g., mother is feeding infant sib during meal task and does not interact with target child at all while the child is eating b/c she is focused on the infant), make a note in the comments field, and do not assign a code (the tape can be reviewed and discussed at a later date).

If the mother or child significantly alters the directions of the tasks (e.g., mother and child begin to play with multiple toys during the cooperative toys task; the mother does not make the child pick up the toys but plays with him instead), you should still assign a global synchrony code for the interaction. It is more important to consider the dyadic interaction than it is to consider the extent to which the family complied with the examiner's instructions. A dyad in which both members accept the changed task and continue to interact together should receive a higher synchrony score. Dyads in which one member attempts to change the directions of the task, but the other member of the dyad resists should have lower synchrony scores. However, if the standard task directions are changed by the dyad, make a note of the changed task in the comments field.

If anything highly unusual occurs during the interaction that strongly influences your global code (e.g., a mother spanking a child; a mother saying something surprisingly harsh; a child striking his mother), please make a note of this in the comment field. Harsh, negative interactions that occur only briefly should influence synchrony scores, but it is helpful to note what led to your score—particularly, if the rest of the interaction was generally positive, so that the discrepancies between the interval and global codes can be better understood.

## Appendix B

### **SYNCHRONY INTERVAL CODING SYSTEM FOR AGE 2 EARLY STEPS VISITS**

The following coding guidelines are to be used when coding dyadic synchrony in intervals. Specific characteristics of the dyad's overall synchrony are represented in these interval codes. As synchrony is conceptualized as the responsiveness of the mother and child to each other's behavior and affect, each interval will be coded for both the mother and child's attempts to engage their partner and their responses to one another. Additionally, affect and response to affect are coded. Other behaviors that are associated with dyadic synchrony, such as eye contact and positive physical contact, are coded. These interval codes are designed to be used as anchors for the global coding system. There are 10-second intervals for the clean-up and cooperative play tasks and 30-second intervals for meal preparation and eating tasks. Coding should begin when the mother and child begin the tasks together, not when the examiner is going over the instructions. Do *not* use the "beep" of the stopwatch as an indication that the task has begun. With the clean-up task, the coding should begin as soon as the examiner has finished giving the mother the instructions, and the mother has redirected her attention to the child and the task at hand. With the cooperative play task, the coding should begin when the mother or child first picks up the animal puzzle, not when the stop watch beeps. If the segment is shortened by the examiner or filmer, please make a note of it on the coding sheets. There are 2 ways to set up the

timing for the intervals. 1) Make a note of the time stamp (if there is one) and add 10 or 30 seconds to it for each interval (e.g, clean-up starts at 15:45, the next interval starts at 15:55, then 16:05, etc.) 2) Reset the counter and code using the intervals indicated on the coding sheet. Finally, since the visits do take place in the home, outside distractions can occur during intervals, please try very hard to code every interval. However, if it is impossible to code an interval because of the presence of another family member, one member of the dyad leaves the room for the entire interval, or filming problems (e.g., you cannot see either family member and cannot hear the dialogue), leave the interval blank, and make a note of it at the bottom of the coding sheet.

### **B.1 SHARED EYE CONTACT:**

Both partners in the dyad make eye contact with one another at least momentarily during the interval (e.g., during cooperative play task, child looks up at mother for help with the puzzle piece, and mother makes eye contact with him.) This is a dyadic code and both partners need to be making eye contact with one another (e.g., child looking up at mother for help while the mother works on questionnaires would *not* be coded as shared eye contact.) This code can be used in conjunction with an affect code (e.g., the dyad is laughing together and making eye contact) and the mother/child bid for attention codes. (Note: In order to give this code you must be able to see *both* mother and child in order to give this code.)

## **B.2 MOTHER/CHILD INITIATED PHYSICAL CONTACT:**

Physical contact included cuddling, kissing, hugging, touching or leaning during the interval. The primary purpose of the contact is comfort-seeking and affection, not attention-seeking (e.g., a mother grabbing a child to redirect his attention or a child tugging on his mother's pants for attention). Additionally, physical contact should not be coded if it is being used as in a negative fashion or to physical restrict the child's movement (e.g., a mother puts a child in her lap in order to keep him from running around the room and the child is struggling to free himself; a mother grabs her child's hand to guide or correct him during the cooperative play tasks). Similarly, acts of physical aggression (e.g., hitting, shoving, biting, etc.) by the child or physical punishment by the parent should not be coded.

The code can be given together with an affect code and a bid for attention code (e.g., a child putting his hands up to be held and crying would be given this code along with a bid for attention code and a child's distress code; or a mother saying, "Give me a kiss!" followed by the child kissing her would receive a code for both maternal bid for attention and physical contact). Additionally, if the play partner responds to the bid for attention with physical attention, the response would be double coded with the physical contact code and an appropriate/inappropriate response code (see below.)

## **B.3 CHILD'S BID FOR ATTENTION/ MOTHER'S APPROPRIATE OR INAPPROPRIATE RESPONSE:**

Bids for attention from children can involve verbal and physical actions. A verbal child may say, "Mommy!" or "I can't do it!" to his mother while a preverbal child may gesture or grunt to

indicate needing attention. Children may also use completely physical methods of attention seeking (e.g., holding an object up to his mother's face; pulling on a mother's pants' leg; grabbing her hand). The goal of these actions is to elicit a response from the play partner. These bids for attention can occur in a number of different circumstances. A child may attempt to gain instrumental help from their parent (e.g., "I can't do it;" or showing the mother a puzzle piece and gesturing for assistance), share their actions with their mother (e.g., a child saying "Doggy, mommy," while holding up a puzzle piece; pointing to a toy and grunting), seek information about an activity (e.g., "What's that;" pointing to a toy and babbling with a questioning inflection). There should be some indication that the child is requesting attention from his mother for this code to be given. Nonverbal gestures or comments that are not clearly intended to elicit a response from the mother should not be coded (e.g., a child babbling or singing to himself; a child talking about the ongoing task; or a child struggling with a puzzle piece, but not gesturing or speaking to his mother).

When a child makes a bid for his mother's attention, the presence or absence of the mother's response to the child's bid for attention is also coded. A mother may ignore a child's bid for attention and not respond in anyway, so that no response code is given (e.g., the child may be crying and holding his hands up, indicating that he would like to be picked up, but she does not respond to his actions). Similarly, a mother may appropriately respond to her son's bid for attention (e.g., after the child says, "What's that?" the mother responds with, "That's an elephant") or inappropriately (e.g., teasing or mocking a child who incorrectly labels an animal or color). An appropriate response is one that meets the child's needs as well as providing comfort and continuing the positive exchange between the dyad (e.g., the child is crying and tugging on the mother, and the mother picks him up and comforts him), while an inappropriate



response is one that increases the child's negative emotions. If a child does not become upset from an inappropriate response, it should still be coded as inappropriate. A mother would be coded as having an inappropriate response to her child's bid for attention if she fails to reinforce or fuel the child's positivity, increases the child's negativity or actively discourages the child from continuing to seek attention from his mother. Inappropriate responses need to be active rather than passive behavior. However, if a response seems neutral or not clearly inappropriate, but the mother does actively respond to the child, code the response as appropriate (e.g., the child says, "Look, Doggie, Mommy!" and the mother says, "No! That's not a doggy, it is an elephant.") A mother who does not respond to her distressed child who continues to become more distressed would not be coded as responding inappropriately; no response code would be given.

#### **B.4 MOTHER'S BID FOR ATTENTION/ CHILD'S RESPONSE:**

A mother's bid for her child's attention can also involve verbal statements or physical actions. Mothers are more likely to use verbal methods of seeking attention, but some mothers may gesture or grab their children (e.g., a mother grabbing her child's arm to make him look at her; tapping a child on his back). As with the child's bid for attention, the goal of a mother's actions is to elicit a response from her child. A mother may be attempting to get her child to respond directly to her or to encourage him to engage with the task at hand. These bids for attention can occur in a number of different circumstances. A mother may try to get her child's attention through commands/requests (e.g., "Please pick up that tool box," or "Get over here right now!"), calling the child's name, questions (e.g., trying to redirect the child to the puzzle by

asking “Where is the camel?”), and reprimands (e.g., attempt to redirect her child’s behavior with “We don’t throw the toys!”). As with the child’s bid for attention code, do not code if the mother’s behavior is not clearly intended to elicit a response from the child (e.g., on-going dialogue about the toy).

The child’s response to his mother’s bid for attention is also coded. There is wide range of appropriate responses, but primarily an appropriate response needs to include some level of acknowledgement (verbal or nonverbal) and compliance with the mother’s bid for attention. Appropriate responses are ones that lessen the negativity of affect (if expressed) or increase the mother’s positivity. If a mother makes a directive or command without any affect, an appropriate response is one that does not promote negativity (or noncompliance) and/or encourages positivity (e.g., a child turning to look at his mother when she calls his name; putting the toys away when the mother requests him to, picking up the elephant puzzle piece when his mother asks him to find the elephant; getting in his booster seat after being asked). A child may respond inappropriately if the response indicates some level form of noncompliance (e.g., after being told to put the toys in the box “nicely,” he continues to throw them; a child who yells “No!” when he is asked to pick up; not turning toward his mother when she calls his name). Inappropriate responses escalate the negativity of the interaction and/or diminish its positivity.

For both Mother and Child Bid’s for Attention, more than one response may be coded. If a mother or child had both an inappropriate and appropriate response to a bid for attention, both response codes should be given. Also, if there are two separate bids for attention during the interval, it is possible to have one inappropriate and one appropriate response. If the response to a bid for attention occurs in a later interval (i.e., a child makes a bid right at the end of a 10-

second interval, and the mother responds at the start of the next interval), code the response in the same interval as the bid for attention.

#### Affect Codes:

Toddlers, especially children with less language, make a wide variety of ambiguous noises. A similar sounding grunt or squeal can be made for both pleasure and frustration/sadness. If a child (or mother) makes an ambiguous noise in the absence of facial affect or physical signs of negativity/positivity (e.g., stomping, flailing the arms, clapping hands), do not code it.

### **B.5 CHILD'S NEGATIVITY/ MOTHER'S RESPONSE:**

A child may demonstrate negativity by crying, whining, frowning, pouting, fussing or throwing a temper tantrum, as well as engaging in acts of physical aggression. In children with some language, negativity can also be present in the tone of voice. Additionally, some children may physically display negativity (e.g., squirming to get out of their mother's arms; stomping their feet, flailing on the floor, hitting the mother). A child may display negativity while waiting for a meal when he is hungry, or when he cannot figure out how to get a puzzle piece into the puzzle. Also, a child may display negativity when he is angry or frustrated, so that the crying appears to be primarily to gain control over the situation and manipulate the mother.

A mother's response is coded as appropriate if she notices her child's negativity and responds to it in a way to help him deal with his negative affect (e.g., asking a child who is crying because he is hungry if he would like a cracker while he is waiting; helping the child put the puzzle piece in), so that the negativity *could* diminish. An inappropriate response is one that belittles or

negates the child's feelings and is designed to worsen the child's negativity (e.g., laughing at the crying child; telling a child who is hungry that he isn't really hungry).

#### **B.6 MOTHER'S NEGATIVITY/ CHILD'S RESPONSE:**

A mother may indicate negativity in the tone of her voice, scowling, sighing or yelling, or via nonverbal gestures (e.g., threatening to hit the child, expressions of anger). Mothers who are reprimanding or scolding their children may sound irritated or annoyed with their children. Mothers who physically swat or grab their child for punishment should also be coded as displaying negativity. Also extremely inappropriate comments or put-downs should be coded as maternal negativity, even if the tone is not strongly negative (e.g., "You are being such a brat"). Any threat by a mother with or without a negative tone of voice should be coded as negativity (e.g., A mother while *laughing* says, "I'm going to trade you in for a different child!" or a mother who says, "If you don't clean-up, I'm going to go bye-bye and leave you here!") Additionally, a mother who is acting exasperated may say something about the child to the examiner/filmer/camera that could be coded as frustration (e.g., "I told you that he wouldn't want to pick up those toys!").

Toddlers do not have as wide of a range of responses to their mother's negativity as mothers have to their children, and subsequently, the frequency of child responses may be rather low. A child may appropriately respond to his mother by complying with her reprimands and lessens her negativity (e.g., a child stops throwing the toys in the basket after she scolds him), or inappropriately respond by further escalating his mothers frustration/negativity (e.g., ignoring the mother's requests; hitting his mother). Just as with the mother's responses to the child's

negativity, a child's appropriate response is one that lessens the mother's negativity rather than escalating it while an inappropriate response worsens or increases the mother's negativity. A child, who does not respond to his mother's negativity should not receive a response code, even if the lack of response increases the mother's negativity.

#### **B.7 CHILD'S POSITIVITY/ MOTHER'S RESPONSE & MOTHER'S POSITIVITY/ CHILD'S RESPONSE:**

Positivity can be demonstrated by the mother and child through laughter, giggling and smiling as well as the tone of voice. If you cannot see the mother's or child's face, but you hear what is unmistakably laughter or giggling, code the mother or child as displaying positivity. Occasionally, when you cannot see a face, you will hear a smile in the person's tone of voice. Only code tone of voice in the absence of facial expression as positivity if it is obvious; do not code ambiguous or weakly positive tone of voice as positivity. Usually, tone of voice in the absence of clear facial expressions needs to be accompanied by praise of some type. Regardless of tone of voice, a mother may indicate positivity by praising her child (e.g., "Good job with eating all your noodles!").

A response from either play partner may be coded as appropriate if the response continues the positivity (e.g., a mother says to her smiling child, "The pegs fit on your fingers!" or a child laughs when his mother laughs).

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