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WHAT DOES THE DYAD ADD? AN EXAMINATION OF MATERNAL

RESPONSIVENESS AND DYADIC DYSSYNCHRONY IN HIGH-RISK FAMILIES

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ABSTRACT

Recent research has acknowledged that parenting process disruptions may explain similar outcomes across many distinct disorders. Low maternal responsiveness in particular has been identified as a factor present across many disorders that involved maladaptive parenting such as child maltreatment. Although maternal responsiveness has proven to be a potent predictor, it may only give insight into part of the family. Little research has examined the utility of maternal responsiveness in predicting maltreatment in comparison to bidirectional dyad-based measures of conflict, disengagement, and intrusiveness. Such a question is important to considering whether child maltreatment is best conceptualized as a parental pathology or the extreme of familial dysfunction. An examination of dyssynchrony between mothers and children in at-risk populations during difficult, but normative parenting tasks was conducted to further inform our understanding of family interactions in high-stress situations. The present study examined the possible unique association between dyadic dyssynchrony and maltreatment history. This study replicated previous findings associating higher parental burden with decreased parent-child interaction quality as measured by maternal responsiveness and dyadic dyssynchrony. The dyads with mother perpetrated maltreatment did in fact demonstrate lower responsiveness and higher dyadic dyssynchrony, but there was not any evidence of an interaction effect contrary to predictions. Finally, it was found that dyadic dyssynchrony was associated with maltreatment status even after accounting for the contributions of maternal responsiveness. This study provides preliminary support for the utilization of dyadic dyssynchrony in observational studies as a more proximal measure of parenting and family risk.

TABLE OF CONTENTS

LIST OF FIGURES

LIST OF TABLES

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Introduction

Parents hold responsibility for the wellbeing of their children, which is largely mediated by how a parent responds (or does not respond) to their child. As such, child maltreatment is often conceptualized as a discrete parenting pathology. However, while problematic parenting practices are most proximal to child maltreatment, they may not be the only factor that is important in understanding the pathology. It is therefore important to examine the possibility that child maltreatment may be best described as a dyadic (or familial system) dysfunction. Maternal responsiveness alone may not fully capture the bidirectional influences on family dysfunction that may escalate to child maltreatment. There has been a large focus in the literature on responsiveness during child infancy and toddlerhood, but scant research has addressed the question of how overall bidirectional markers of parent-child discord may be associated with child maltreatment.

In the general child development literature, it is widely accepted that parenting is a bi-directional process. Furthermore, community, economic, family, and child factors have all been linked to the occurrence of child maltreatment (Cancian, Slack, & Yang, 2010; Eckenrode, Smith, McCarthy, & Dineen, 2014; Slack, 2004). Children's temperaments and behavioral styles elicit different types of parental behaviors and vice versa. There is compelling evidence, even, that children with disabilities or chronic health needs are at significantly elevated risk for child maltreatment due to their higher caregiving needs (Sullivan, & Knutson, 2000). It is curious therefore why emphasis continues to focus on individual parenting beliefs and practices almost exclusively. Specifically, it may be useful to conceptualize child maltreatment as another consequence of high contextual burden on high-risk families rather than individual parental

pathology. In this study, a context-oriented approach to child maltreatment that considers overall dyadic discord (dyssynchrony), task difficulty, and maternal-specific behaviors in high-risk samples will be examined.

The Importance of Maternal Responsiveness

First highlighted by the attachment literature, maternal responsiveness is hypothesized to contribute to child functioning by providing a predictable and appropriate response to the educational, safety, and emotional needs of a child (Ainsworth, 1979). Although parental responsiveness has been defined differently across authors, responsiveness can generally be defined as the process in which a caretaker appropriately and sensitively recognizes and reacts to a child's signaling and needs in a situation (Ainsworth, Blehar, Waters, & Wall, 2015). In this study, maternal responsiveness will be defined as the degree to which both warmth (emotional sensitivity) and flexibility are displayed (behavioral responsiveness) towards a child.

Lower responsiveness has been associated with a general breakdown of parenting abilities (Azar, Barnes, & Twentyman, 1988). Many reviews (Belsky, 1993; Milner & Chilamkurti, 1999; Milner & Dopke, 1997; Stith et al., 2009) have implicated impaired maternal responsiveness as a consistent characteristic of maltreatment perpetrators. Evidence demonstrates that maternal responsiveness in early childhood plays a role in later cognitive development (Smith, Landry, & Swank, 2006), later behavior problems (Wakschlag & Hans, 1999), social engagement (Harker, Ibanez, Nguyen, Messinger, & Stone, 2016), and language development (Down, Levickis, Hudson, Nicholls, & Wake, 2015; Levickis, Reilly, Girolametto, Ukoumunne, & Wake, 2014).

Maternal responsiveness during infancy and toddlerhood often dictates the quality of the home environment, which provides the foundation for a child's early development. Low responsiveness from one individual may initiate cycles of negative interactions & attention-

seeking behavior, which may make conflict more likely to occur. While it may be apparent that neglectful mothers may have less interactions with their children, evidence also suggests that result physically abusive mothers speak less and interact less with their children in lab settings (Conron, Beardslee, Koenen, Buka, & Gortmaker, 2009; Kluczniok et al., 2016; Schindler & Arkowitz, 1986). Similar findings across domains have been seen as evidence of the core role of maternal responsiveness in the occurrence of extreme deviations in caregiving such as maltreatment (Teti & Cole, 2011).

Gaps in the High-Risk Parenting Literature

While there are many theoretical and practical reasons to consider maternal responsiveness a key factor in maltreatment, there may be solid reasons to consider that other factors may be more proximal or reliable predictors. Some studies have found that low levels of responsiveness index higher risk of abuse and neglect (Burgess & Conger, 1978; Shipman & Zeman, 1999; Webster-Stratton, 1985), but many such studies that assess this link rely solely on self-reported attitudes or behavior as indicators of abuse and neglect (Stith et al., 2009). One study found that 21% of parents with a very highly probability or confirmed history of abuse deny any such history while 47% partially underreport the extent of allegations (Lanyon, Dannenbaum, & Brown, 1991). With such a high level of non-reporting among families who have confirmed involvement with child protective agencies, there is little information on the prevalence of maltreatment or extremely damaging parenting outside of families who have not yet been investigated.

Some researchers have proposed that lower maternal responsiveness is one of the main mediators for explaining why poverty can negatively affect early child development (Evans, et al., 2008). However, determining casualty for child outcomes within research where both child

maltreatment and poverty are present can be especially difficult. While it has been shown that maltreating parents demonstrate lower responsiveness, it has not been demonstrated that low-responsiveness in itself justifies the label of maltreatment. A lack of responsiveness is highly comorbid with maltreatment, but also much more prevalent in the context of chronic stress and poverty even in the absence of maltreatment (Evans, Boxhill, & Pinkava, 2008). Recent theory has posited that hostile, but non-maltreating family environments (often co-occurring with poverty-related stress) may still put families at heavy risk of negative child outcomes (Repetti, Taylor, & Seeman, 2002).

Furthermore, much of the literature on maternal responsiveness based on parent-child interaction observations has been conducted with infants, where the relationship between current responsiveness and maltreatment or related outcomes may be more proximal. However, these findings in relating maltreatment to parenting quality as measured by in-the-lab observations has been quite inconsistent, especially for the preschool age range (Bennett, Sullivan, & Lewis, 2006; Mash, Johnston, & Kovitz, 1983).(Bennett et al., 2006; Mash et al., 1983). Bennett, et al. (2006) found that questionnaire based assessment of parenting quality was much better at predicting maltreatment grouping than observations of parent-child observation. They posited that parental behaviors towards children may vary significantly based on the difficulty or stress of the situation. The influences of social-desirability may also be an equally large confound in both questionnaires and behavioral observation. Questionnaires also often take a "bird's eye view" of relationship quality where observations may only give a small sample to a relationship that can be very inconsistent. Nonetheless, social desirability may still be a large confound.

It is important to note that maltreatment occurrence is an event that involves the entire family system. While maternal affect and behaviors are important to predicting maltreatment, examining this alone may not tap into how family relationships decline in the context of stress and high-risk situations. The overall bi-directional relationship between the mother and child is

key to the development of self-regulatory capacities, social competencies, and prosocial behavior in both infancy and childhood (Davis, Bilms, & Suveg, 2016). While child behavior has been addressed in some studies on maternal responsiveness, few studies have addressed the overall dyadic relationship between mother and child. As much of the responsiveness literature is based on infants and toddlers, it is only natural that the quality of the parent-child relationship can be determined almost exclusively by parenting style and beliefs. However, as children grow older it becomes increasingly important to examine the contributions of both individuals to the coordinated interaction (synchrony) between mother and child. Synchrony includes not only the mother's responsiveness, but also the child's (Leclère et al., 2014). Overall relationship quality may also be more difficult to "fake" than just observed parental behavior or reported beliefs. It is therefore important to examine the overall relationship, not just parenting quality.

Another common pattern in the parenting literature is that there is a focus primarily on adaptive parenting behaviors during dyadic observations. However, the presence of maladaptive factors may be more proximal to pathology than just a lack of positivity or responsiveness. Examining the contributions of negative cues may provide important information that low levels positive behaviors may not. However, as mentioned earlier negative behaviors or beliefs may be much more likely to be confounded by social desirability. Synchrony alone may not be enough to truly attain the most proximal measure of parenting risk. Therefore it is important to go beyond low levels of synchrony, and instead examining parent-child discord directly. Dyssynchrony is not simply the opposite end a synchrony scale. Dyssynchrony describes the presence of behaviors (from either or both participants) that disrupt the course of an interaction, demonstrate a lack of regulation, and increase negative affect. Such behaviors consist of measures of conflict, intrusiveness, and disengagement (Johnson & Azar, 1998; Azar,Stevenson, & Johnson, 2012), which may characterize dysfunctional interactions with more accuracy. Both parents and child may have the natural reaction to "flee" (disengage) or "fight" (intrude on others or display

hostility). Both of these types of response are directly reflected within the construct of dyssynchrony.

These factors also may play an especially important role in predicting maltreatment due to the large conceptual overlap between maltreatment behaviors and dyssynchronous actions. By definition, an interaction or pattern of interaction that is characterized as maltreatment requires the presence of conflict and intrusiveness (i.e. physical or psychological abuse) or disengagement from a child's needs (i.e. neglect). Furthermore, there may be an important distinction between interactions that lack positive indicators and those filled with negativity, conflict, or disruptions. In high-conflict homes, even neutral or low-stress tasks may activate a negative interaction. While responsive parenting may serve as incompatible replacement behavior for patterns of interaction that cause maltreatment, dyssynchrony may be a more analogous construct to describe the types of interactions implicated in child maltreatment. Initial evidence supports the importance of dyssynchrony in neglect specifically, even as a stronger predictor than commonly identified social information processing factors such as unrealistic expectations and appraisals of child behavior (Azar, Read, Biancaniello, Callen, & Martinez, 2011). In this study, it was also found that dyadic dyssynchrony was more strongly associated with maternal SIP factors than maternal responsiveness.

The construct of dyssynchrony may provide a more consistent method of differentiating families that experience high-stress and the type of family dynamics that go beyond just non-optimal parenting. There are likely to be many parents who may enact low levels of positive parenting, but also do not pose a significant risk for the safety and wellbeing of the child. On the other hand, dyssynchrony may represent a necessary antecedent of maltreatment, which may still be quite harmful for a child's development. A family-systems approach that considers the overall presence of dyssynchrony in the dyad may provide more information than examining the mother's actions alone. Acute Stress Associated with Parenting

Literature suggests that poverty and maternal stress makes mothers less effective at responding sensitively to children, playing a major role in predicting maltreatment and negative outcomes in poverty (Duva & Metzger, 2010; Repetti, et al., 2002; Repetti & Wood, 1997; Slack, 2004). To fully understand and prevent the occurrence of maltreatment, it is first necessary to understand the antecedents and situations where it is most likely to occur. Parenting can be quite stressful for mothers. Parents must manage a child's (or multiple children's) safety, provide all essential basic needs (shelter, bed and bedding, clothing, food, water and shelter), confirm proper hygiene, ensure medical treatment is always promptly provided, give appropriate limits and discipline, and of course be financially responsible for their children (Crnic & Booth, 1991; Crnic & Greenberg, 2010;Repetti & Wood, 1997).

Acute stressors play a clear role in parenting. However, the behavioral and emotional response to stressors may play an equally important role (Sanders et al., 2004). While many families in poverty experience elevated stress levels and a high number of external stressors, not all parents fall subject to committing maltreatment. Parents who have lower frustration tolerance in response to stress have been posited to pose a higher risk of physical abuse to their children (Rodriguez, 2016; Rodriguez, Russa, & Kircher, 2015; Vasta & Copitch, 1981). It has also been shown that endorsement of physical punishment increases as anger and frustration with a child increases (Rodriguez et al., 2015). A caretaker's ability to respond dynamically and appropriately to the needs of children relies upon the utilization and coordination of multiple cognitive systems. All of these systems may become strained in the presence of frustration or stress. In fact, under conditions of frustration it has been shown that cognitive processing linked to neglect becomes more common (Russa, Rodriguez, & Silvia, 2014). Few studies have examined how maternal responsiveness dyad dysregulation may vary with different levels of frustration.

Links between Poverty and Maltreatment

Decades of research and widespread evidence have linked poverty to child and family outcomes (Bornstein, 2002; Nikiema, Gauvin, Zunzunegui, & Séguin, 2012; Petterson & Albers, 2001; Sharkins, Leger, & Ernest, 2016). Such children have poorer language and cognitive development by age three, later behavior problems, deficits in school readiness, aggression, anxiety and depression (Goodnight et al., 2012; Kohen, Leventhal, Dahinten, & McIntosh, 2008; Reiss, 2013). Effects of exposure continue through the lifespan affecting self-regulation, cognitive processing, and general health to name a few factors (Browne, Plamondon, Prime, Puente-Duran, & Wade, 2015). Children exposed to poverty-related stress have even been shown to demonstrate negative alterations in brain structure (Danese & McEwen, 2012; Holz et al., 2015).

Poverty is a distal risk factor. It is a complex construct that consists of many co-occurring events, problems, and struggles. Recent research has attempted to better conceptualize by addressing the complexity and heterogeneous nature of families considered "poor" (Nikiema et al., 2012; Pascoe, Wood, Duffee, & Kuo, 2016). In this manner, chronic stress and negative events that often manifest in adverse economic circumstances may be considered sequela of low income. Poverty-related stressors related to adversity may actually overlap quite heavily with child maltreatment populations. Poverty and child maltreatment are both prominent societal ills that have been linked to many of the same academic, psychological, and health outcomes. Similar to poverty, maltreatment has been linked to higher rates of internalizing disorders academic and cognitive deficits, withdrawal, and physical health (Anda et al., 2006; Dinkelman, Lam, & Leibbrandt, 2008; MacMillan, Jamieson, & Wathen, 2007; Teicher et al., 2003).

The difficulty and stress of parenting is exacerbated in single-parent or low income homes. While most parents would agree it is important to provide support and encouragement, it is easy

to see why this may not always be a priority for parents. The resources and energy required for optimal parenting may be especially strained when exposed to situational stress (Rodgers, 1998). In fact, it may be in some cases preferable for a mother to put their limited focus or energy on ensuring bills are paid rather than directly on maintaining a positive parent-child relationship. Emotion-regulation is in itself a parenting task, and one that can be most difficult for parents who have many other responsibilities to balance. Emotion-regulation may also be more difficult for low-income families as such children often display higher behavioral problems and riskier decision-making (Sharkins et al., 2016; Yoshikawa, Aber, & Beardslee, 2012). Conceptualizing child maltreatment as a parental pathology does not account for the direct ways that external factors such as stress and poverty may directly influence the occurrence of child maltreatment through the child or family unit.

Child maltreatment is more than five times more likely to occur in Low-SES families when compared to families of higher-SES (Sedlak et al., 2010). Some have argued for a causal relationship between income and maltreatment due to longitudinal differences in maltreatment rates after welfare support increases relative to those who did not receive such increases in support (Cancian, Slack, & Yang, 2010). In contrast, multiple studies have failed to find an association between income and child protective services involvement within high-risk populations (Cancian et al., 2010; Slack, 2004). Poverty may be a potent predictor in the general population, but income does not seem to be a strong predictor in populations that are already considered high-risk.

Around one third of children in the United States will be reported as being a victim of maltreatment to child protection agencies before adulthood (Kim, Wildeman, Jonson-Reid, & Drake, 2017). Around 13 percent of U.S. children will experience a confirmed case of maltreatment (Wildeman et al., 2014). This statistic does not include many children who experience maltreatment or extremely damaging parenting that may not be reported. These

statistics are further evidence that child maltreatment may not be a simple parental pathology, but rather a factor that may be present in many families at some time before a child reaches adulthood. In daily-life, neglectful and abusive behaviors exist on a spectrum that makes it difficult to identify an exact tipping point in high-risk populations. Yelling, purposely ignoring a child's pulls for affection, or otherwise making a child feel unloved, fearful, or unsafe may occur in many families during high stress situations. This is not to mention the many ways that high-risk children may upset their parents or introduce synchrony disruptions themselves. While these behaviors may occur in families with more resources or stability, they may not lead to the same detrimental outcomes that risky environments may facilitate.

These behaviors and may be exceptionally common in poverty due to the higher stress and higher disarray that may be introduced by low-income communities (Ross & Mirowsky, 2001). Some limited early evidence suggests that positive parenting practices may vary based on situational stress or difficulty (Feldman, Greenbaum, Mayes, & Erlich, 1997; Isabella, 1998). Maternal responsiveness may break down in times of frustration or stress, but this may just be part of a more general synchrony disruption that can occur in families. These disruptions may unequally predispose high-risk families to maltreatment occurrence & reporting due to poverty related stress. Dyssynchronous family relationships and interactions may contribute to these poverty-related outcomes.

Based on current literature it is unclear how situational stress may influence dyadic relationships. There is an especially large dearth of research that examines how families with different levels of parenting risk may respond to high-difficulty tasks. The intertwined nature of poverty and maltreatment makes clear causal statements about child maltreatment outcomes tenuous based on mostly correlational research. To better understand child maltreatment (and high-risk parenting more generally) it may be necessary to examine the effect of realistic and naturalistic stressors on the parent-child relationship.

Teaching: A difficult and Essential Parenting Stressor

A parent's approach to teaching their children is a key determinant of how that child will approach learning in the school setting. Parents who associate learning with positive emotions and experiences rather than frustration may better position their child for school success. Children exposed to less responsiveness, more conflict, and hostility have been shown to demonstrate increased aggression towards peers in school age children (Dunsmore, Booker, & Ollendick, 2013). Preschool age is a key time-point for understanding how parents teach their children, because such children often have no formal education at this age. In early childhood, parents play a foundational role in socialization and development of early self-regulatory capacities. Preschool children of mothers who scaffold learning experiences have been shown to have better executive functioning (Hammond, Müller, Carpendale, Bibok, & Liebermann-Finestone, 2012). This may be especially true for children who may demonstrate hyperactive or inattentive behaviors, as maternal responsiveness has shown the same link among children with ADHD (Pauli-Pott, Schloß, & Becker, 2017). Likewise, research has demonstrated that families from adverse environments often enter the school system with less social-emotional competencies and may face more peer difficulties (Yoshikawa et al., 2012).

The unique contributions of situational teaching tasks on a mother's ability to respond appropriately would be especially important to investigate when comparing high-risk families to families in which child maltreatment has already occurred. Teaching provides the opportunity for a natural experimental task that mimics the difficulties that families may have to overcome to help a child learn a task autonomously.

Teaching and guiding a child may be a particularly difficult stressor for parents who face adversity. Teaching children requires patience and the ability to recognize and flexibly adapt to the behavior and understanding of the child. Parents in poverty often have little educational

attainment themselves (Ferguson, Bovaird, & Mueller, 2007), which may strain the teaching ability of a mother. While guiding a child may be difficult, it is also essential for healthy development. Home learning is an essential process that mediates how young children come to understand the world and develop language skills (Melhuish, Phan, & Sylva, 2008).

Mothers who have a history of maltreatment may become easily frustrated in relatively simple interactions with their children. In maltreating families, children may be seen as inherently stressful or hostile. Evidence does support this notion, as maltreating mothers are more likely to see their children as troublesome or hostile (Azar et al., 2016; Azar, Okado, Stevenson, & Robinson, 2013). As mothers have had negative involvement with child protection agencies, they may also see the child at fault for bringing problems to the family. Mothers might see a child protection investigation as evidence that she is failing as a parent, making even neutral interactions stressful and the relationship especially dyssynchronous.

The difficulty of helping children learn may parents to become frustrated, harsher, and less responsive to their children. As such, their children may become unhappier and more likely to reject interactions or requests or cues from their parents (Rohner, 2004). Evidence suggests that as we are exposed to exclusion or rejection we often "become numb", lethargic, or detached from others (Twenge, Catanese, & Baumeister, 2003). Parents who have maltreated their children may be especially likely to feel detached or rejected due to their involvement with child welfare organizations. Therefore, it is likely that mothers who have committed maltreatment may enact such coercive cycles with their children in ways that lead to early and consistent lack of responsiveness towards their children. Taken as whole, such patterns of evidence indicate it is likely that for maltreating mothers, there is floor effect for responsiveness. Lower-difficulty interactions with their children may elicit equally low responsiveness as difficult interactions due to numbing or disengagement.

Additionally, stressed mothers may lack the ability to properly model effective emotion-regulation skills when facing stressful situations. Mothers who have committed maltreatment have been shown to demonstrate less emotion coaching and more invalidation towards their children. Children of maltreating mothers also demonstrate less emotion regulation in stressful situations (Shipman et al., 2007). Modeling and positive emotion socialization has been associated with development of children's emotion regulation skills and lower conduct issues (Cole, Dennis, Smith-Simon, & Cohen, 2009; Dunsmore et al., 2013). Parental capacity for responsiveness may be a key factor in understanding variation in parental teaching behaviors. High responsiveness during educational moments may increase parental teaching efficacy and increase motivation for children. In contrast, recent findings suggest that negative emotion expression in response to escalating negative child behavior is associated longitudinally with poor social competence, emotion regulation, and increased externalizing problems (Johnson, Hawes, Eisenberg, Kohlhoff, & Dudeney, 2017).

While there is much research examining the consequences of frustration in children during interactions with parents, there is a relative lack of research examining the role teaching task difficulty may play in the overall resulting dyadic interactions between child and mother. While low maternal responsiveness is strong indicator of parent child relationship quality, dissimilarities in dyssynchrony may be an even stronger predictor of maltreatment in extremely high-risk families. High self-regulatory capacities are likely required to avoid dyssynchrony during challenging situations. Being a dyadic trait, it requires a willingness and ability to regulate frustration and not succumb to negativity, complete disengagement, or hostility. In fact, a recent meta-review has demonstrated that dyadic measures interactions are better longitudinal predictors of child self-regulation than either parent or child-focused measures alone (Davis, Suveg, & Shaffer, 2015). These executive functions may often be impaired in both parents and children in families with a maltreatment history.

For chronically stressed parents, every attempt to attend to their child may be seen as potentially problematic or risky. Although a mothers' responsiveness may not alter drastically from situation to situation, it is likely that the dyad's dyssynchrony may vary quite heavily. As stated previously, negative actions towards the other family member may lead to coercive cycles of hostility, disengagement, and intrusiveness. It is still unknown whether maltreatment status families just demonstrate higher baselines of dyssynchrony or whether the change in dyssynchrony is also more dramatic in response to stressors. While chaotic homes may have higher overall baseline levels of conflict and disengagement, the bio-behavior synchrony model would predict dyssynchrony would worsen in response to increased external demands.

Research that addresses the role of maternal responsiveness in relationship to teaching difficulty is scarce. This impaired ability of mothers to respond appropriately may also increase maltreatment incidence. It is also unknown what role dyadic dyssynchrony may play above and beyond just parenting behavior. Understanding how different risk groups respond to the stress of a normative teaching task will also be important to predicting and preventing child maltreatment. The ability to teach and work with children effectively in moments of stress is a skill that often is taxed in high-risk environments. Furthermore, teaching tasks may better approximate the actual interactions that take place in a home. Parents who have difficulty teaching their children may also have difficulty explaining misbehavior, guiding their children through potentially risky situations, and disciplining their children appropriately. In conjunction, these behaviors would likely cause rifts between mother and child, increasing the likelihood of abuse or neglect. Families with a maltreatment history are one naturally defined group that are among the highest-risk families. Exploring how such families differ in response to a teaching task as compared to families of similar SES may help us better characterize high-risk relationships.

Current Study

In the current study, a situation-specific approach to parenting risk was examined among low-SES mothers and their 3-5 year old children. The study aims to integrate a cognitively informed experimental approach to evaluating dyssynchrony, an underutilized construct in parent-child observation research. Although recent research has begun to integrate a family systems oriented approach by utilizing the construct of synchrony, a related construct, dyssynchrony may provide even further value in high-risk parenting. A teaching task was utilized to see whether task burden would trigger different reactions for families with a history of maltreatment compared to a similarly low-SES control group. This study was designed to add additional clarity to the literature by utilizing a teaching-task approach to replicate normative stressors that may occur in the home. Life event stress was included in analysis of the teaching task to see how background stress may affect responses to situational stress.

This study addresses both maternal responsiveness and dyadic dyssynchrony in a single sample of preschool-aged children. This design could provide a better understanding of how both dyadic dyssynchrony and maternal responsiveness may relate to the occurrence of child maltreatment. Although parenting risk can fluctuate situationally, most research comparing maltreatment status groups to similar controls have only a single observational task to measure parent-child interaction quality. In contrast, this study examined how the parent child interaction may change situationally through a quasi-experimental design.

The interaction between the parent-child interaction factors, teaching task difficulty, and maltreatment history was examined to investigate how parenting risk may manifest differently for the two groups. In order to examine whether dyadic dyssynchrony would provide value as a proximal measure of parenting risk, dyadic dyssynchrony was examined a as predictor of

maltreatment group after accounting for variance associated with maternal responsiveness and parent-reported child behavior

Hypothesis 1a: Replicating the findings of previous studies (Burgess & Conger, 1978; Shipman & Zeman, 1999; Webster-Stratton, 1985), lower maternal responsiveness will be associated with a history of maltreatment.

Hypothesis 1b: Due to previously found associations between higher cognitive load and maternal responsiveness (Finegood et al., 2016), it is predicted that maternal responsiveness will decrease in response to increased task difficulty for mothers.

Hypothesis 1c: Due to higher reported life stress levels and higher hostile attributions in describing child behavior among maltreatment families (Azar, Reitz, & Goslin, 2008; Bauer & Twentyman, 1985), it is predicted that maltreatment status mothers will display a floor effect and maintain relatively low responsiveness during all tasks, while the control group will demonstrate a significant drop in responsiveness as difficulty increases.

Hypothesis 2a: In accordance with previously demonstrated associations between lower self-regulation capacities among both perpetrators and victims of maltreatment (Cicchetti & Toth, 1995), it is predicted that maltreatment status will be associated with dyadic dyssynchrony.

Hypothesis 2b: Due to previously demonstrated associations between higher cognitive load and maternal responsiveness (Finegood et al., 2016), it is predicted that dyadic dyssynchrony will also increase in response to increased task difficulty for Low-SES control mothers.

Hypothesis 3: It is hypothesized that maltreatment status will be associated with dyadic dyssynchrony above and beyond the effects of maternal responsiveness, life stress, and parent-rated child behavior.

Methods

Participants

Participants were part of a larger study examining social information processing and parenting risk in a sample of disadvantaged mothers and their children ages 4 to 6 years old. Eighty-five mothers (mean age $M = 28.98$ years, SD = 5.25) participated with their preschool kindergarten age child (mean age $M = 4.51$ years, SD = .68; 39 female and 46 male). Mean annual family income was \$11,541.19 (SD = 9503.26). The majority of mothers (83.5%) were unemployed and 36.5% were married. The majority of the sample (76.5%) identified as Caucasian; the remainder identified as Black (8.2%), Asian American (12.9%), or Latina (2.4%). Institutional review board approval was obtained for the project and informed and consent was obtained to participate in the study and to release information relating to maltreatment history from Child Protective Services (CPS).

Of the mothers included in this study, 43 had a history of child protective services (CPS) involvement for maternal perpetration of child physical abuse and/or neglect, 42 mothers had no such histories. Mothers with a history of CPS involvement were recruited from agencies serving parents with confirmed CPS maltreatment cases, and comparison mothers were recruited from day care programs serving low SES families and Head Start programs. Both groups gave permission to check history of involvement with CPS to verify grouping of participants (maltreatment vs low-income control).

All mothers in the project were paid a nominal amount for their participation.

Procedures

Following recruitment, study procedures were explained and informed consent was obtained. Two sessions were planned to collect all data for the study (one initial home visit and one final in-lab meeting. During the first visit, mothers provided demographic information, including mother and child age and race/ethnicity, maternal marital status, education, and employment status, child sex, and number of children in the family Mothers also completed a number of questionnaires including the Child Behavior Checklist (CBCL) and the Life Events Inventory. All measures were read aloud to the participants to address potential maternal literacy issues. Within a week of this home visit, mothers were transported to the University for a second meeting where depression symptomatology (CESD) and the experimental teaching task were administered. At the start of this second visit, a set of parenting tasks were described in detail to mothers. The child was then brought into a room with the mother and their interactions were filmed. The tasks consisted of two components: A free play activity that served as a neutral baseline and a teaching task with puzzles of varying difficulty: two easy and two hard. Subjective report of frustration level for each task was obtained as a manipulation check using a Likert scale. The following procedure was followed for the tasks:

Free play: The mother was instructed to play with her child as she would normally at home or in a doctor's office waiting room. The mother and child were placed behind a one-way mirror and four sets of toys were placed in a small semi-circle around the dyad. The four sets of toys were provided in a standardized manner from left to right: blocks, (3) books, wooden puzzles, and a shape-sorting cube. The dyad engaged in this activity for five minutes.

Teaching Task: The mother was instructed that she would be evaluated on her teaching ability in a puzzle-completion task. Each mother was explicitly told in a serious tone "We think it's important for a mother to be able to teach their child things. We'd like to see how good you

are at teaching". The mother was provided blocks and four puzzle images: Two original stimulus images (designed to be simple enough that most mothers could teach them to their children) and two adapted from the two most difficult puzzles from the WAIS-III (Wechsler, 1997) block design task. Lines matching the correct block orientation were drawn onto the stimulus image in order to make the task more manageable for mothers to master. Mothers were instructed that they had five minutes to teach each of the puzzles to their child. The mother and child each got a set of blocks. Mothers were told to teach the child the designs by only using their own blocks as a model. Additionally they were given two constraints on their own behavior in the teaching activity: They were not permitted to touch the child's blocks and the design was to be completed to the side of the cardboard puzzle image. The difficult puzzles were purposely designed to be difficult enough that the vast majority of children would fail to replicate the design, while the easy tasks were designed for mothers to easily succeed teaching their child the task. Mothers were also given time to practice the puzzles before the child was brought in. At the completion of the laboratory tasks, mothers were debriefed about the task being designed to be difficult & frustrating for lots of families.

Measures

Demographics (appendix A): Demographic information collected included mother and child date of birth, maternal marital status, education, employment status, family income level, number of children, age and sex of the participating child, and mother and child race/ethnicity.

Dyadic Dyssynchrony (appendix B): Dyssynchrony was assessed in the experimental tasks using a behavioral observational coding system designed by Johnson and Azar (1998). Dyadic dyssynchrony was assessed in the freeplay activity and both difficulty conditions of the puzzle tasks. The original measure is composed of six Likert-rated subscales. The subscales

include level of conflict, extent to which conflict caused dysfunction, inappropriate responses or lack of response to affective cues by the other member of the dyad (disengagement), mismatch of non-affective forms of social interaction, emotional distance, and intrusiveness. Each subscale of dyssynchrony was measured on 4 point Likert scale that assesses the presence of disruptive or disjointed behaviors that may disrupt synchrony between individuals. Analysis of a sample of 15% of cases indicate excellent inter-rater reliability, with total dyssynchrony ratings (across all tasks) showing an intraclass correlation of .99.In this study, intrusiveness, conflict, and disengagement were summed to provide an overall dyssynchrony rating for each task, as per Azar et al. (2012).

Maternal responsiveness (appendix C): Maternal responsiveness was assessed in the free-play and puzzle tasks by averaging the observational coding rating of flexibility & warmth adapted from Landry, Smith, Miller-Loncar, & Swank (1998). The overall rating refers to a mother's ability to recognize her child's signals and respond to them in a prompt and sensitive manner. Responsiveness was rated on a 5-point Likert scale that assess how often that the mother responds adaptably, warmly, and appropriately to the child's needs and interests. Ratings for total responsiveness score showed good internal consistency ($\alpha = .88$). A subsample of videos (15%) were coded by a second rater. The intraclass correlation (ICC) for total responsiveness ratings was 0.99, indicating excellent inter-rater reliability.

Maternal frustration: Mothers rated their how frustrating it was to work with their child during each of the 4 puzzles and the freeplay activity using a 7-point Likert scale *(*1- not frustrating at all, 4- moderately frustrating, and 7 Extremely frustrating). The two frustration scores within each puzzle condition (easy or hard) was averaged to create a measure for overall frustration of each task difficulty.

Child Behavior Checklist (CBCL):

The CBCL is a parent-report questionnaire in which the child is rated on various behavioral and emotional problems. It was first developed by Achenbach & Edelbrock, (1983) and more recently has been adapted by Achenbach & Rescorla, (2001). It has been extensively validated; being one of the most widely used standardized measures in child psychology for evaluating maladaptive behavioral and emotional problems in early childhood. The CBCL contains 118 specific behaviors each scored on a 3-point scale. It assesses two main domains of behaviors, internalizing (e.g. anxious and depressive) and externalizing (e.g. aggressive and hyperactive). Several subdomains are measured including social withdrawal, somatic complaints, destructive behavior, social problems, and thought problems. The questionnaire also has provides multiple forms of assessment including an overall total problem behavior indicator. The internalizing and externalizing domains have been shown to have high retest reliability, .86 and .91 respectively (Achenbach, 1991). Both the internalizing and externalizing domains have demonstrated acceptable construct and internal validity (Achenbach, 1991). In this study, the CBCL total problem behavior score was utilized as an overall indicator of child behavior that may cause dyssynchronous interactions.

Life Event inventory: The Life Event Inventory rates the occurrence of 46 events during the previous 6 months. Thirty-eight items were from Cochrane and Robertson's original (1973) Life Events Inventory. Some items were dropped from the original scale for relevancy and sensitivity to Low-SES populations and further were added to compose the version utilized in this study. This adapted version of the measure has been validated by Egeland, Breitenbucher, & Rosenberg (1980) in maltreatment populations.. The measure assesses the presence and intensity of significant life events that may occur. Each event also has an intensity scale in which the assessor prompts for follow-up questions to assign a score indicating severity on individual scales unique to each stressor. Cronbach's alpha was not calculated as life events are not hypothesized

to load onto a single construct, but the measure has been widely used in many clinical and survey studies allowing easy cross-sample comparison.

Results

Demographics

Prior to performing primary analysis, analyses were performed to determine whether groups differed on demographic variables for descriptive purposes. Independent samples t-tests were run for continuous demographic variables (Table 1) and non-parametric chi-square analyses were run for categorical demographic variables (Table 2). Analyses revealed that family income, ethnicity, and household structure differed between groups. The Maltreatment group demonstrated lower income, higher rates of single parenthood, and lower representation of minority participants. However, supporting the overall similarity of the two groups, unemployment rates were extremely similar. Post-hoc analysis revealed that household income was higher for the control group even among the unemployed (indicating the income differences may be heavily influenced by the presence of other income providers).

Based on prior research (Stith et al., 2009), ethnic minority status was the only group difference seemingly related to sampling error rather than expected differences associated with the condition of child maltreatment. Post-hoc analyses were also conducted to examine whether these differences were likely to contribute to underlie differences in dyssynchrony and responsiveness between groups. Minority status had no relationship to dyadic dyssynchrony or maternal responsiveness within either of the two groups. Within the non-maltreatment group the only significant demographic predictor of the dependent variable dyssynchrony was Income (Table 3). No demographic factor was significantly associated with maternal responsiveness

among non-maltreatment status families. Among families with confirmed maltreatment reports, education was the only significant predictor, being associated with both dyssynchrony and maternal responsiveness in this case (Table 4). However, the lack of consistent association between any of the demographic variables and parent-child interaction variables indicate differences between the groups are unlikely to be explained by demographic factors.

Analytic Approach

Maternal frustration was examined as a manipulation check to see whether task difficulty did in fact indicate increased situational burden for participants. There was a large effect of task difficulty on frustration ratings. $F(1,82) = 184.47$, p < .001, $\eta^2 = .69$. One participant failed to report frustration values and was excluded from analysis. For the total sample, task difficulty explained approximately 69% of the total variance in frustration ratings.

Covariates that would be likely to explain possible associations that could underlie group differences in dyadic interaction quality were considered for the first two hypotheses for illustrative purposes only. Depression and Stressful Life Events were examined in this study as potential covariates due to previously demonstrated associations with parent-child interaction quality (Evans et al., 2008). The Life Event Inventory was included as it may represent important variance associated with parenting burden that may influence maltreatment occurrence Depression symptomatology (CESD) was excluded due to a 3-way interaction between maltreatment status, task difficulty, and maternal responsiveness. Results are presented with and without life event stress as a covariate, as life event stress cannot be disentangled from maltreatment group in this study due to non-randomized group design. For this same reason, demographic variables were not considered as covariates due to issues with interpretation (Miller

& Chapman, 2001). Previously mentioned post-hoc analyses of demographic factors also support their exclusion in analysis.

To evaluate whether dyadic dyssynchrony had value above just maternal responsiveness, parent reported behavior problems were included in analysis as a covariate. 5 participants were missing the CBCL measure. Logistic regression indicated that the participants missing the CBCL did not different significantly from other participants in maltreatment grouping, maternal responsiveness, or dyadic dyssynchrony. Multiple imputation based on chained equations was utilized to account for the missing data. Variables in the imputation model included all variables used for analyses and auxiliary variables such as demographic factors to improve the accuracy of the model. All findings in the model with missing data remained significant when the analyses were conducted imputed values. Results are presented with the imputed values for the life event inventory covariate.

Maltreatment group, Task, and Maternal Responsiveness

A repeated measures analysis of covariance (ANCOVA) 3x2 design was used to evaluate how maternal responsiveness varied in relation to maltreatment group membership (control or maltreatment) and task difficulty (Figure 1). Maternal responsiveness during the three task difficulties (free-play, easy, and hard) facilitated the repeated measurement design. Findings are presented for all analyses with and without stressful life events as a covariate. Replicating the findings of previous studies, lower maternal responsiveness was associated with a history of child maltreatment $F(1,83) = 6.01$, p < .05, $\eta_p^2 = .07$. This relationship remained significant after accounting for the variance associated with stressful life events $F(1,81) = 7.94$, p < .01, $\eta_p^2 = .09$. It was also found that maternal responsiveness did decrease in response to increased task difficulty for both groups $F(1,83) = 7.52$, p < .01, $\eta_p^2 = .08$. However, after accounting for the

variance associated with differing levels of stressful life event exposure the linear relationship between maternal responsiveness and task difficulty was non-significant. Follow-up post-hoc analyses revealed there was an even larger quadratic effect of task difficulty on maternal responsiveness $F(1,81) = 15.18$, p < .001, $\eta_p^2 = .16$, that still trended towards significance after accounting for the variance associated with life event stress $F(1,81) = 2.96$, p < .10, $\eta_p^2 = .04$. The quadratic relationship between task difficulty and maternal responsiveness was such that maternal responsiveness increased from free-play to the easy puzzle task and decreased from easy to the hard task. There was no significant interaction between task difficulty and maltreatment status with or without including stressful life events as a covariate.

Maltreatment group, Task, and Dyadic Dyssynchrony

A repeated measures analysis of covariance (ANCOVA) 3x2 design was also used to examine how dyadic dyssynchrony varied in relation to maltreatment group and task difficulty (Figure 2). It was found that dyads with mothers who perpetrated maltreatment, there were higher levels of dyadic dyssynchrony $F(1,83) = 14.14$, p < .001, $\eta_p^2 = .15$. This group difference remained significant after accounting for the variance associated with stressful life events $F(1,81) = 16.17$, p < .001, $\eta_p^2 = .17$ Dyadic dyssynchrony also increased in direct relationship to task difficulty for both groups $F(1,83) = 44.16$, p < .001, $\eta_p^2 = .35$. Adding stressful life events as a covariate did not change this pattern $F(1,81) = 10.07$, p < .001, $\eta_p^2 = .11$. No interaction effect between task burden and maltreatment group was found.

Maternal Responsiveness, Dyadic Dyssynchrony, and Maltreatment Group

A logistic regression was utilized to determine whether dyadic dyssynchrony explained a significant proportion of variance after accounting for the variance explained maternal responsiveness and child behavior as rated by the CBCL (Table 5). In the model, the covariates, maternal responsiveness and CBCL total were entered in the first block and dyadic dyssynchrony was entered in the second block. In the full model, Dyadic dyssynchrony was the only significant predictor, explaining approximately 15% of the variance in maltreatment group $X^2 (3, N = 81) = 32.27$, p <.01.

Discussion

A parent's ability to appropriately respond to their child is a key skill that has long been a factor in conceptualizing parenting risk. Child maltreatment in particular is a social problem that is often addressed by largely focusing on changing parental behavior. However, while parenting practices are of course important, they may not be the only factor that is important in understanding addressing such high levels of parenting risk. Maternal responsiveness alone does not fully capture the bi-directional dyadic nature of family dysfunction. Given the difficulty and stress that can be associated with parenting, this study sought to examine parent-child interaction quality during varying levels of situational stress. There has been a large focus in the literature on responsiveness during observations, but this construct is most useful during child infancy, and does not include bi-directional dyadic indicators of family dysfunction. In this study, an experimental task was utilized to examine how overall patterns of dyadic interaction may change during parenting-specific tasks for families in which maltreatment has occurred and for low-income control families. It was predicted that higher task difficulty would be associated with

higher dyadic dyssynchrony and lower maternal responsiveness. Furthermore, mothers with a history of maltreating their children were predicted to also display lower overall responsiveness and have more dyadic dyssynchrony with their child. Finally, it was also predicted that dyadic dyssynchrony, as a bidirectional interaction quality measure would provide improved model fit in predicting child maltreatment group status as compared to a model based on maternal responsiveness.

As predicted, past child maltreatment perpetration by mothers was associated with overall lower maternal responsiveness across task difficulties. Although mixed findings on this association have been found in the literature (Azar, et al., 2011; Shipman et al., 2007; Stith et al., 2009) this study provides value by demonstrating this association averaged across multiple levels of task difficulty.

In line with previous findings (Finegood et al., 2016), this study also demonstrates that an increase in situational cognitive load may be associated with a decrease in maternal responsiveness. However, the findings in this study demonstrate important nuance in understanding this effect. It was found that while there was a small, significant association, there did not remain a linear significant effect when previous stressful life event intensity was used as a covariate. Although previous evidence does indicate that past stressors, demographic risk, & trauma exposure may influence emotional availability and quality of parent-child interaction (MacKenzie, Kotch, & Lee, 2011; Pianta & Egeland, 1990; Popp, Spinrad, & Smith, 2008), this effect was not significant in this study. Previous research has often conceptualized the long-term effects of stressors within the cumulative risk framework and the general population, possibly explaining why this effect was not present within the limited range of this high-risk sample. However, at the mean stressful life event intensity, there is no significant relationship between maternal responsiveness and task difficulty. This may indicate that increased normative task difficulty may not lead to parenting quality changes for most mothers. Previous evidence does

support that mothers may be especially at risk of maladaptive parenting during stressful situations when they have high chronic stress exposure (Evans et al., 2008; Juster, McEwen, & Lupien, 2010; Katz, Sprang, & Cooke, 2011)

This study's demonstration of a quadratic effect of task burden on maternal responsiveness is a novel finding to the best of the author's knowledge. It was found that maternal responsiveness actually increased from the free-play activity to the low-difficulty teaching task, then decreased once again when the difficulty increased. It seems that mothers seemed to make an effort to engage with their child when a task requires shared attention. However, once difficulty of the situation increased, maternal responsiveness decreased. This is likely due to increased stress and cognitive load associated with the increased task difficulty that made it difficult for mothers to maintain the same level of engagement with their children. Previous studies on parent and toddler interactions have demonstrated a decrease in responsiveness for parents under heavy burden (Nelson, Boyer, Villarreal, & Smith, 2017) and demonstrated the negative effects of non-shared attention on parent child relationship quality (Reed, Hirsh-Pasek, & Golinkoff, 2017). This study adds insight by integrating and clarifying these findings within a single experimental manipulation, rather than focusing on external stress from other domains. This study also expands on these associations by demonstrating the effect for high-risk preschool age children and low-SES mothers.

Although our study did not demonstrate an interaction effect between maltreatment group and task difficulty, the small sample in this study may not have allowed detection of such an interaction. Based on this study, it is unclear whether situational stress may affect mothers who have maltreated their children differently than other similar-SES mothers. Although the evidence suggests different levels of responsiveness between groups, it is possible that they generally display similar responses to stress.

As expected, past child maltreatment between mothers and children was associated with dyadic dyssynchrony between mother and child. Although limited research on dyadic dyssynchrony exists, this study expands upon preliminary findings examining dyssynchrony in predicting a history of neglect specifically (Azar et al., 2011). This study also expands upon previous literature examining micro-level indicators of long-standing coercive cycles of behavior, by demonstrating high-risk families with a history of maltreatment are also likely to display hostility, disengagement, and conflict at the macro-level (Alessandri, 1992; Lunkenheimer, Lichtwarck-Aschoff, Hollenstein, Kemp, & Granic, 2016).

Previous evidence demonstrates high-risk children and families have lower self-regulation capacities (Fay-Stammbach, Hawes, & Meredith, 2017; Sharkins et al., 2016; Yoshikawa et al., 2012). This study demonstrates that the effect from within maltreated families may be more severe than similar SES high-risk families. While individually one member of a dyad being less-regulated may decrease the quality of that interaction, families with a history of abuse or neglect often have multiple individuals with impaired self-regulatory capacities. This may explain in-part why such relations can be so dyssynchronous.

This study also found that dyadic dyssynchrony for mother-child dyads increased in response to increased task difficulty. This finding builds upon previous research demonstrating associations between dyadic relationships under duress or stressful tasks (Evans, Kim, Ting, Tesher, & Shannis, 2007; Repetti et al., 2002). This finding is particularly interesting given that unlike maternal responsiveness, dyadic dyssynchrony was significantly predicted by task difficulty even when including life stress as a covariate. At the mean level of stressful life event exposure in this sample, it would seem like there is not a significant variation in responsiveness based on task difficulty. However, unlike maternal responsiveness, dyadic dyssynchrony seems to directly increase with changes in task difficulty even after accounting for the variance explained by life event stress. An alternative explanation is also that the extended time engaged between

child and mother was the sole cause of dyssynchrony and frustration. In either case this, may indicate that despite higher levels of frustration, mothers can maintain responsive behavior to their children under some conditions. On the other hand, despite comparable levels of maternal responsiveness, the overall quality of the relationship may still decline as evidenced by the presence of maladaptive dyssynchronous qualities such as conflict, intrusiveness, and disengagement.

This study did not demonstrate an overall interaction effect between maltreatment status and task difficulty on dyadic dyssynchrony. This indicates that dyadic dyssynchrony may increase similarly for both families with and without a history of child maltreatment, despite overall different levels of dyssynchrony across all task conditions. However, at the mean level of life event intensity it seems there was an interaction that trended towards significance in which dyadic dyssynchrony increased at a steeper rate for dyads with a history of maltreatment than similar low-SES families without such history. Further research would be required to determine whether this interaction is replicated with a larger sample.

Lastly, this study found that dyadic dyssynchrony was a factor associated with child maltreatment even after accounting for the variance associated with maternal responsiveness and parent-rated child behavior. This finding replicates previous studies demonstrating the value in thinking beyond just parental factors when examining observational parent-child interactions (Davis et al., 2016; Feldman, 2007). While there have been studies demonstrating the importance of synchrony in predicting child self-regulation longitudinally, few have directly measured the presence of discordant behaviors as they relate to parent-child synchrony across multiple situations. This may be essential to fully understanding parent-child relationships outside of the infancy developmental period.

This study provides several implications for future clinical research and practice. One of the key implications of this study is that dyadic dyssynchrony may offer important insight into the

quality of a parent-child relationship, especially in cases when maternal responsiveness is less useful. For example, under clinician or researcher observation parental behavior may change to be more socially desirable. Due to the contributions of the child and continuation of past coercive cycles in which parent-child interaction quality is generally poor, dyadic dyssynchrony may still indicate risk even when a caregiver is purposefully altering their behavior for social desirability purposes. It is likely that mixed findings in the literature may be explained in part by differences in situational stress of tasks between studies or desirability effects from parents.

The demonstrated importance of dyssynchrony is especially valuable given that most families contain more than a single child or partner and maltreatment often occurs under chaotic conditions. Indicators of positive parenting may be similarly deficient for risky and non-risky families under chaotic conditions or high burden situations. In these situations, dyssynchronous behaviors that disrupt familial synchrony may be much more proximal to risk and maltreatment. Asking parents to interact with their child under lab conditions may not be reflective of daily interactions between parent and child when additional stressors or tasks are involved. Knowing how different levels of burden on a parent will affect their responsiveness and dyadic dyssynchrony will be important for clinicians who incorporate parent-child observations in their assessment process.

While this study only examined by bidirectional dyssynchrony between mother and child, it provides an essential first step in demonstrating the importance of the dyssynchrony measure in predicting risk of child maltreatment. Social synchrony between individuals may be extremely difficult to measure in complex family units. In many ways, research examining social synchrony is in its infancy, and questions of how best to represent synchrony in a home do not have a clear theoretically supported answer. However, dyssynchrony provides a key glimpse into conceptualizing how synchrony between individuals can be blocked or disrupted. Clinically, moving beyond just singular indicators of parent-child relationship quality will be necessary to

more fully capture the construct of family risk. While many studies have demonstrated the importance of maternal responsiveness in providing adaptive learning and home environments, dyssynchrony may offer a glimpse into how risk can occur or be magnified even when a parental figure is responsive to their child.

In summary, this study demonstrates that the construct of dyadic dyssynchrony may have important utility in research on family risk and child maltreatment. This study provides preliminary evidence that task burden may affect maternal responsiveness and dyadic dyssynchrony differently despite high correlation between the constructs. Finally, this study also demonstrates that dyadic dyssynchrony may predict child maltreatment beyond individual parenting behavior and parent report of child behavior problems.

Limitations

Despite the value of these findings, several limitations must be considered. While this study demonstrates that previously perpetrated maltreatment by parents can later predict dyadic dyssynchrony during observation, this association is not based on a randomized design. While quasi-experimental design provides valuable insight for aspects of the investigation where random-design is not feasible or ethical, it has many downsides. One consequence is that clear causal statements cannot be made as to whether the occurrence of child maltreatment decreases parent-child interaction quality or if the effect of dyssynchronous interactions make child maltreatment more likely from this study alone. Although no statements of directionality can be made in response to this question, previous research demonstrates the association between family conflict and child maltreatment is likely bidirectional (Begle, Hanson, Dumas, & Hanson, 2010; Li, Chu, Ng, & Leong, 2014). Future research addressing familial or child risk should examine

dyssynchrony longitudinally as a predictor of child maltreatment or beliefs associated with child maltreatment.

Quasi-experimental designs also greatly limit the use and interpretation of results that contain covariates. While analysis with life event stress as a covariate was provided for illustrative purposes, interpretation of those findings should be especially cautious. While covariates may be useful to assess what portion of group differences may be mediated by other factors, they must be interpreted with some key qualifiers. For example, standards that state an effect is only truly significant if it remains after controlling for key covariates do not apply when such covariates may have directly influenced how the groups were formed. Aside from the experimental teaching task, this study is also based on a cross-sectional design that does not provide a longitudinal assessment of familial risk by which to validate dyadic dyssynchrony. While this study provides key insight into the relationship between child maltreatment, parenting task burden, and parent-child interaction quality, future investigations may provide more specificity if assessing familial risk more dynamically. Binary categorizations of higher-risk and lower-risk (maltreatment group and control group) may not be the most precise measure of risk or outcomes, as many more indicators of risk may vary substantially longitudinally.

Lastly, this study included a relatively small sample. This study may not have been able to detect small effects or interaction effects between task burden and maltreatment condition. Furthermore, despite best attempts to sample equivalent groups there remains important differences in income and demographics that may be inseparable from the occurrence of child maltreatment. Although the low-income control group is in many ways a strength of this study, it may limit generalizations about aspects of maltreatment in comparison to normative samples. Despite the findings in this study, it is possible that the very narrow income band of participants recruited may not represent normative samples. Finally, although this study used rigorous methods to the presence of past child maltreatment by government record, there may be many

families in which maltreatment has occurred, but remains undiscovered. It cannot be assumed that

our control group had no perpetrators of child maltreatment.

Future Directions

The novel contributions of this study lead naturally to some future directions for research

to improve our understanding of this topic area and address some of the above limitations. First

and most importantly, future studies should collect longitudinal data in utilizing the above

approach in order to make more sound casual statements about the directionality of the effects

reported in this study. By examining how family risk evolves both longitudinally and

situationally, research may be better able to address and identify predictors of family conflict and

disengagement to better inform prevention and intervention efforts.

Future investigations that examine changes in dyadic interactions based on task burden,

would be better served by including biomarkers of stress response. Although parenting task

burden provides a naturalistic situation to examine parenting stress and changes in parenting

behavior, biological indicators of stress could offer much more insight into examining both

biological and behavioral responses to stress and self-regulation. Such studies should also attempt

to isolate how responsiveness and dyssynchrony may change over time naturally during parent-

child interactions. Markers of the stress response system would also better inform statements

about how the presence of coercive of dyssynchronous actions may affect stress levels differently

than just the lack of positive interaction indicators.

The current study provides support that dyadic dyssynchrony may be a key construct in

understanding familial risk. With few adjustments it will be possible to measure (and test the

predictive utility of) dyssynchronous behaviors in family units larger than just mother and child

dyads. Dyssynchrony can provide key advantages to using maternal responsiveness and

synchrony in future studies examining family risk. If future research validates dyssynchrony as a valid measurement tool that continues to have clear benefits to maternal responsiveness alone, many other fruitful future directions are plausible. Examining dyssynchrony within the larger family unit may offer key insights that examining individual dyads within that larger unit alone may not. Research that utilizes markers of dyssynchrony may be able to map complex family systems rather simply by recording the source and target of cues or behaviors that disrupt synchrony. Such studies will be necessary to fully examine and test aspects of the family systems model

Conclusion

In summary, this study found group differences in parent-child interaction quality between families with a history of child maltreatment and comparable families without such history. Both maternal responsiveness and dyadic dyssynchrony were associated with maltreatment history. However, dyadic dyssynchrony had a larger association with maltreatment history that remained even after accounting for the variance associated with maternal responsiveness and parent-rated child behavior problems. Dyadic dyssynchrony has a strong linear relationship to task burden in this study for both groups, but maternal responsiveness seemed to increase when the mother was given the low-difficulty task and decrease when the burden of the task became difficult to manage. Dyadic dyssynchrony has potential to be a key factor in characterizing familial risk, especially as one that seems to directly parallel increases in parenting task burden.

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Appendix A: TABLES AND FIGURE

Table 1

Differences in Demographic Variables by Maltreatment Status

	M (SD)		
	Maltreatment (n = 42)	No Maltreatment (n = 43)	
Mother Age (years)	29.14 (5.98)	28.82 (4.48)	t (83) = -.285
IQ	82.36 (13.21)	85.33 (9.67)	t (83) = 1.186
Number of Children	3.12 (1.57)	2.74 (1.88)	t (83) = -.998
Family Income	$8666.67 ($5466.83)	$14,348.86 (11,623.93)	t (83) = 2.89**
Child Age (years)	4.47 (0.73)	4.54 (0.63)	t (83) = .429
Life Event Stress	23.02 (11.85)	15.93 (8.36)	t (82) = -3.157**

** p<.01 * $p < .05$ + $p < .10$

Table 2

Differences in Demographic Variables by Maltreatment Status, Continued

	n (%)		$\chi^2(1, N = 84)$
	Maltreatment (n = 42)	No Maltreatment (n = 43)	
Household Structure			7.565*
Single Parent	28 (23.8)	16 (48.8)	
Dual Parent	10 (76.2)	21 (51.2)	
Employment			.002
Employed	35 (88.3)	36 (83.7)	
Unemployed	7 (16.7)	7 (16.3)	
Maternal Education			6.733**
Less than High School	20 (47.6)	9 (20.9)	
High School Graduate	22 (52.4)	34 (79.1)	
Ethnicity			6.235**
White	37 (88.1)	28 (65.1)	
Black	1 (2.4)	6 (14.0)	
Asian	4 (9.5)	7 (16.3)	
Latino/a	0 (0)	2(0)	
Child Gender			.977
Males	25 (59.5)	16 (44.4)	
Females	17 (40.5)	20 (55.6)	

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

a. Ethnicity was recoded into White and minority status for analysis due to small cell sizes (<5) for non-white groups.

Table 3

Correlations Among Selected Demographic Variables and Dependent Variables within Non-

Maltreatment Group Families.

	Dyssynchrony Total	Responsiveness Total	Education Level	# of Parents in Home	Income	Minority Status
Dyssynchrony Total		-.628**	-.062	-.10	-.628**	-.016
Responsiveness Total			.162	.074	.136	.123
Education Level				.088	.470**	-.128
# of Parents					.097	-.180
Income						-.107

* p < .05   ** p < .01

Table 4

Correlations Among Selected Demographic Variables and Dependent Variables within

Maltreatment Group Families.

	Dysynchrony Total	Responsiveness Total	Education	# of Parents in Home	Income	Minority Status
Dysynchrony Total	--	-.750**	-.385**	-.083	-.229	.175
Responsiveness Total			.404**	-.026	.149	-.173
Education				-.080	.161	-.238
# of Parents in Home					.179	-.194
Income						-.235

* *p* < .05   ** *p* < .01

Table 5

Logistic Regression of Dyadic Dyssynchrony Predicting Maltreatment Status

	χ^2	Nagelkerke R^2	β	Odds ratio	95% CI
Block 1	18.537**	.057			
Maternal Responsiveness			-.288 (.001)	.750**	.65-.87
CBCL total			.010 (.123)	1.010	1.00-1.02
Block 2	32.27**	.150			
Dyadic Dyssynchrony			-.415 (.402)	3.574**	2.24-5.71

$+p < .10$ $*p < .05$ $**p < .01$

One-tailed tests.

B, SE, odds ratio, and 95% CI values are those for the final model with all variables
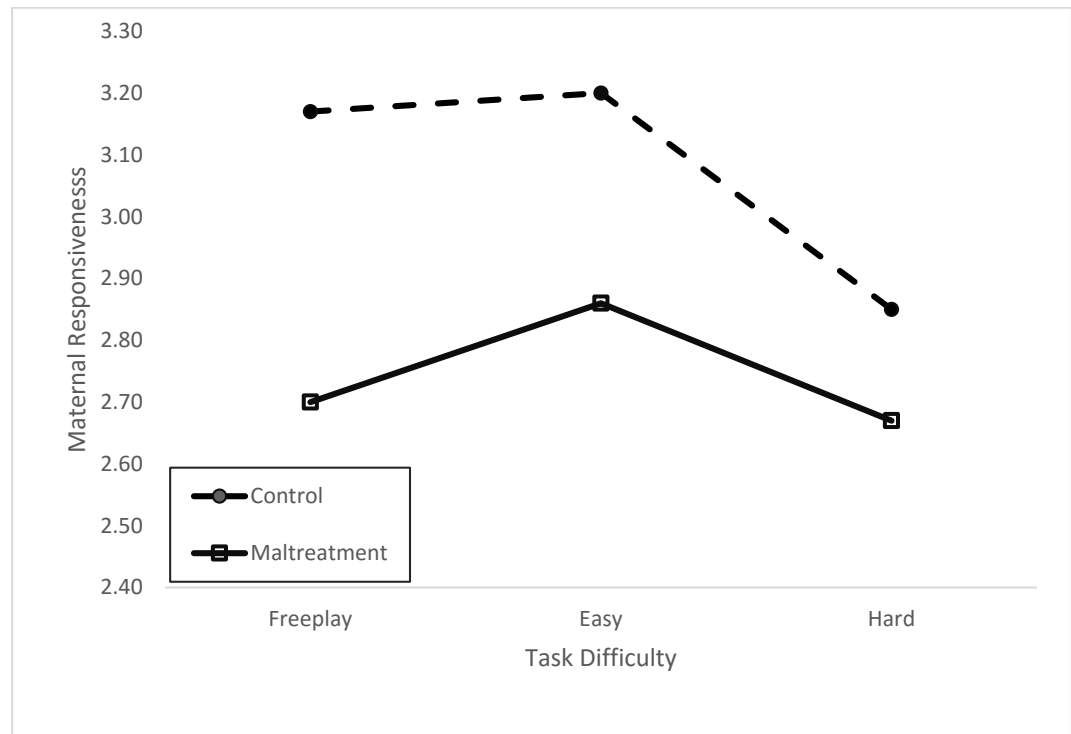
included

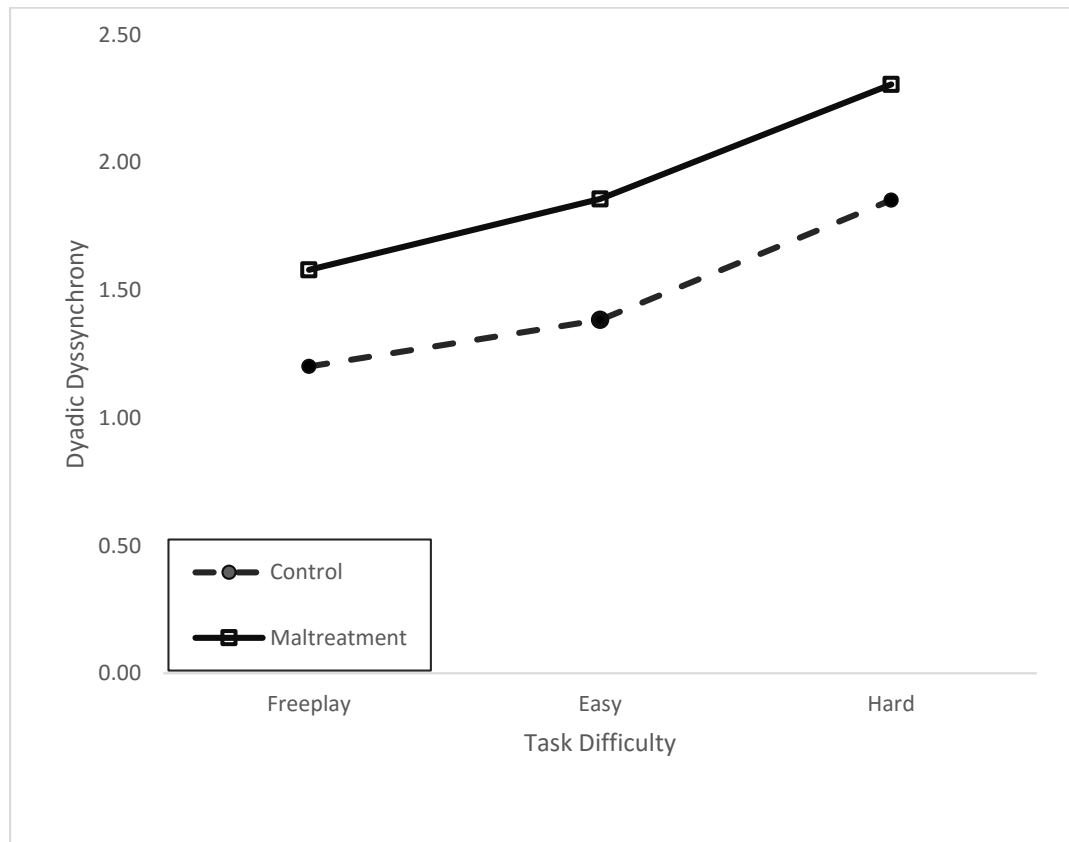Figure 1. Maternal responsiveness across maltreatment groups and task condition

Figure 2. Dyadic dyssynchrony across maltreatment groups and task condition

Appendix B: MEASURES

Background Information Sheet

Mother's name or # _____ Date _____

Date of Birth _____

Marital Status   M   Div   Sep   Single   Other

Education (last grade completed) _____

Employed? Yes (1)   No (0)   Part-time No. of hours _____

Profession_____ (even if not currently working)

Father's birth date _____

Father's Education (last grade completed) _____

Father's occupation _____

Family Income

01.	Less than 8,000 a year		11.	26,011 to 28,000
02.	8,001 to 10,000		12.	28,001 to 30,000
03.	10,001 to 12,000		13.	30,001 to 35,000
04.	12,001 to 14,000		14.	35,001 to 40,000
05.	14,001 to 16,000		15.	40,001 to 45,000
06.	16,001 to 18,000		16.	45,001 to 50,000
07.	18,001 to 20,000		17.	50,001 to 55,000
08.	20,001 to 22,000		18.	55,001 to 60,000
09.	22,001 to 24,000		19.	Over 61,000
10.	24,001 to 26,000			

Number of siblings _____   Number of Pregnancies _____

Names, birthdates, ages, and sexes of children:

_____

_____

_____

Index child's age _____

Index child's sex   Male (1)   Female (2)

Birth order of index child: 1st   2nd   3rd   4th   5th

Mother's age when index child was born: _____

Mother's age when oldest child was born: _____

Was index child full term: Yes (1) No (0)

If no, weeks premature _____

Index child birth complications _____ Yes (1) No (0)

Nature of complication

Other Children	Full Term	Weeks Premature	Birth Complications
Name	Yes (1)/No (0)		Be Specific

Index child in daycare/Head Start/nursery school?   Yes (1)   No (0)

Hours per week: _____

Other Caretakers:

_____   hrs/week_____
_____   hrs/week_____
_____   hrs/week_____
Total number of hours in the care of others   _____
Any counseling?   Yes (1)   No (0)

Other children in school information

Hours	Name Total	Daycare/School Hours	Other Caretakers

Race: Caucasian   Afro-American Hispanic   Other_____
Urban   Rural
Have any of your children ever been in placement outside of the home, such as in Foster
Care?
            Yes   No
Who?   When?   For how long?

_____
_____
_____

Warmth & Flexibility Coding

Warmth

*Warmth ratings are based on the **mother's** acceptance of the child's needs and interests*

as evidenced by the presence of positive talking, enthusiasm, and physical affection.

Steps to Coding Warmth:

1. **During Observation**
   - Make notes related to W1 to W9 on the coding sheet
   - Tally Praises and Encouragements as they occur
     - These are statements or sounds by mom that offer encouragement or praise to her child. Context and tone should be taken into account. Do not code if they are said in a flat tone or for a purpose not intended to praise or encourage
     - Tally missed opportunities for praise/encouragement.
       - E.g., child figures out a challenging task, looks up to mother and mother remains quiet.
     - Things that *are* P/E: yeah, good work, smart girl, OK/it's OK, that's it, there you go, very good, you can get it, thank you, pretty girl/you're so pretty
     - Things that are *not* P/E: are you showing off, come and get it, "ooh, ahh".
   - Tally Positive Nonverbal Behavior as it occurs
     - For example, proximity to the child, patting on the back, kind touches, notable smiles, high-fives.
2. **After Observation**
   1. Consider the *entire* observation
   2. Complete +/-/~ for W1 to W9

      + = positive (warm)

      - = negative (not warm)

      ~ = neutral (neither cold nor warm)

3. **Final: Complete 1-5 rating**

   A ***general*** template to consider is the following:

5	almost always
4	> half the time
3	half the time
2	< half the time
1	almost never

- Remember that some criteria are weighted more heavily than others (i.e., agenda in free play). For example don't give moms too much credit for engagement/leaning forward and proximity to child. By themselves these do not warrant ratings in the middle or upper range of the scale.
- Cold, cruel moms should always be rated down to a 1 or 2 even if you have indicated a positive presence on some of the criteria (i.e., mom continually used negative language and lacked enthusiasm but she managed to kiss the child once and sat near them).
- Even if child is very active, base warmth on what you see. In other words, do not infer that because child is so active mom has no opportunity for physical affection etc. For extremely active children where affection would actually be intrusive and distracting you need to weight other warmth criteria more heavily such praise and encourage, positive tone, and acceptance of interests.
- Remember that moms can be involved with the child but show little warmth. In other words you will see moms who are frequently interacting with their child and are not punitive who will still lack warmth (consider a child sitter who plays with a child but may lack the warm connection that their mother has with them).
- Reserve "1" on warmth scale for overt negative interactions or if the mother does nothing that can be counted on the warmth scale.
- Only consider her interactions with other children if mother displays an extreme negative behavior towards another child. The issue here is that mothers can, at times, behave differently with the target child because that is the child that we are observing.

2. Flexibility

*This rating refers to the **mother's** ability to recognize her child's signals and respond to them in a prompt and sensitive manner. High ratings should reflect a mother who is able to adjust her behavior to meet the individual needs of her child and expand on their attention and interests.*

Steps to Coding Flex/Resp:

1. **During Observation**
   - Make notes related to FR1 to FR8 on the coding sheet
   - Tally Attending/Agenda as it occurs during the observation
     - Maintaining versus Redirecting
       These always occur when child is actively attending to toy or object.

       Each time mother attempts to direct her child's attention, observers will code this attention directing behavior for whether it maintains versus redirects her child's focus of attention.

       - Maintaining: If the child is already looking at and/or physically engaged with the same toy/object or activity to which his/her attention is being directed, the mother will be coded as *maintaining* her child's attention. For example, if the child is looking at and/or reaching for a ball and Mother says, "Get that ball," mother's behavior would be coded as maintaining.
       - Redirecting: If the child is involved with a different toy from the one to which his/her attention is being directed, the mother will be coded as *redirecting* her child's attention. For example, in the situation described above, if mother had said, "Look at this rattle," her behavior would be coded as redirecting. For those times when the child is not attending to or engaged with any toy/object or activity, the mother will be coded as *introducing* a toy.
         - Child actively involved physically and/or visually in play with object different from one mom presents/references. Mother is "shifting gears" by referencing a new object when the child is actively attending to another object. This does not imply a "negative" interaction.
           - The child is focused on an object and mother comments about a different object.
           - The child is playing with a toy and mother brings in a new toy without relating to the first toy.

- o The child is playing with a toy and mom says, "What else do you want to play with?"
  - o <u>Agenda</u>: How much does mother's agenda/interests override child's agenda/interest? Who is driving the play?
    - This is a KEY code in free play flexibility, but is not counted in the puzzle activity (which requires that the mom push her agenda).
    - Keep in mind that the mother may be playing with the same toy that the child is interested in but she may be controlling what it is they do with the toy/activity.
    - E.g., Repeatedly asking the kid to tell the color or letter or shape when the kid just wants to play with the puzzle/blocks.

- Tally Response to Child Cues as they occurs during the observation
  - o <u>Expansion</u>: Builds upon what the child is doing
    - E.g., "Where did we see a dog like that?" "Wow, isn't this like a toy we have at home?" "What do you have there?"
  - o <u>Following Child</u>: When the child switches activity, the mother immediately follows the child, as opposed to redirecting her/him back to the activity.
  - o <u>Acknowledge</u>: When the child says something and the mother responds minimally ("yep", "uh huh")
    - This is a low-level flexible response
- Tally Zaps
  - o Restrictions/zaps are maternal verbal or nonverbal behaviors that limit, restrict, or discipline the child's behavior in some way. Restriction strategies are not always negative. Do not rely on maternal affect or tone of voice as clues that discipline has occurred as discipline can occur with mother being "nice".
    - <u>Examples of Verbal Restrictions:</u>
      - Be careful / Careful / Watch it / Watch out
      - No / Stop / Don't do that / No, that can hurt you
      - Hold on / Wait
      - Shhh
    - <u>Examples of NV Restrictions:</u>
      - Unless an exception, mom taking anything away from child is a zap
      - Mom shaking head or finger at child
      - Taunting by mom - mom purposely holding an object out of child's reach when child wants it and they are not engaged in a game.
  - o See the Appendix for more information on "zaps"

2. **After Observation**
   1. Consider the entire observation
   2. Complete +/-/~ for FR1 to FR8
      + = positive (flexible/responsive)

- = negative (not flexible/responsive)

~ = neutral (sometimes flexible/responsive, or unclear)

- FR1 - The anchor "**pacing**" is looking at whether or not the mother is giving the child enough time or if she is rushing. Is the mother letting the child go at her/his own pace?
- Keep in mind that because some criteria carry more weight than others you will not be able to base your rating on an exact proportion of + to –
- FR1 to FR8 are there as *informal* checks on which to base your ratings. Use them as tallies if necessary (ex. Some raters like to tally redirects under flexibility, or kisses, hugs, pats next to physical affection).

3. **Final: Complete 1-5 rating**

A *general* template to consider is the following:

5	almost always
4	> half the time
3	half the time
2	< half the time
1	almost never

- Learn to recognize the difference between a mom who's letting the child play (but is interested and attentive) and a mom who's not doing anything because she isn't paying attention and is disengaged.
- Remember that mom picking up signals is only one component of responsiveness. This rating is more heavily dependent on *how appropriately mom responds to cues* (sensitive to affective cues or expands on interests/agenda).
- If mother is *ignoring or not paying attention to a child this would be a "2" for flexibility if the child is contented in their activity* (e.g., watching TV), still expect the mother to make a comment or two to give the child attention.

Dyadic Dyssynchrony Coding

Remember to consider the **dyad** when making judgments. Although it is likely that the interaction will be more mother driven, it is not sufficient to make judgments solely on her behavior.

Please assign a rating (1 being the lowest level of dyssynchrony) to each segment along the following dimensions:

1. **Level of Conflict**:
   Conflict is dyadic (e.g., "power struggle", argument), but most often is initiated by the child (e.g., noncompliance, talking back, refusal). The scale begins with unilateral conflict, and a 4 should be reserved for high levels of dyadic conflict (wherein both the child and mom are engaged in the conflict).

   1. None
      - No evidence of conflict from either mother or child.
   2. A Little
      - Some evidence of conflict initiated by either mother or child.
      - Simple child noncompliance fits best here (more than one time; non-compliance occurs at least 5 seconds after directive)
      - Passive noncompliance (non-compliance occurs at least 5 seconds after directive)
   3. Some
      - Moderate level of conflict initiated by either mother or child with low-levels of dyadic conflict.
      - Child non-compliance followed by a non-responsive or demanding maternal response will fit best here.
      - Dyads in this category will not maintain negative interaction throughout the observation.
   4. Mostly
      - High level of dyadic conflict.
      - Both mother and child engage in the conflict. This could be either child or mother-initiated, but must include the other party responding in a way that leads to escalation.

2. **Intrusiveness**:

Intrusiveness is dyadic, but typically is initiated by the mother (e.g., grabbing toys from the child, physically moving the child to the "right" position, talking over the child), however a child's behavior can also be intrusive (e.g., yelling over the mother, throwing blocks to interrupt the mother's activity). The idea behind intrusiveness is that the other member of the dyad is interrupted or dominated via behavior or words.

1. None
   - No evidence of intrusiveness.
2. A Little
   - Some evidence of intrusiveness initiated by either mother or child.
3. Some
   - High level of intrusiveness initiated by either mother or child
   - OR both members of the dyad are mildly/moderately intrusive throughout the observation
4. A Lot
   - Member(s) are almost always intrusive throughout the observation.

3. **Disengagement**

Disengagement is dyadic, but can be seen primarily in one member of the dyad. Disengagement can be considered as the opposite of an engaged, dyadically-involved dyad. Disengagement can be both behavioral (e.g., low levels of behavioral responsiveness) and affective (e.g., low levels of returning smiles or low levels of affect). A member of the dyad can be disengaged when s/he (1) does not respond to the other's attempts at interaction, (2) shows little to no warmth towards the other member, (3) ignores the verbalizations of the other person

1. None
   a. No evidence of disengagement
   b. The dyad is engaged both behaviorally and affectively throughout the observation.
2. A little
   a. One member of the dyad is disengaged for some of the observation
   b. OR both members of the dyad are mildly disengaged throughout the observation
3. Some

         a. Complete disengagement of one member throughout the observation (the other member may attempt to interact, but such attempts would be ignored by the disengaged member)

         b. OR both members of the dyad are mostly disengaged throughout the observation

4. A Lot

         a. Both members of the dyad are disengaged throughout the observation

               i. E.g., Little to no verbal communication, shared attention, or positive affect