Emotional Flexibility and Shared Expressions in High-Risk Dyads: Unpacking the Processes Underlying Mother-Child Nonverbal Emotion Communication in Middle Childhood

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ABSTRACT

Emotional Flexibility and Shared Expressions in High-Risk Dyads: Unpacking the Processes Underlying Mother-Child Nonverbal Emotion Communication in Middle Childhood

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The present dissertation was designed to unpack the moment-to-moment processes of mother-child nonverbal interactions during middle childhood. Through innovative methodological and statistical procedures, the structure (emotional flexibility) and content (expressions) of positive, neutral, and negative processes underlying nonverbal emotion communication between mothers and their school-age children were captured.

Participants were mothers and their 9- to 13-year-old children (Study 1: $n = 51$; Study 2; $n = 75$) from the Concordia Longitudinal Risk Project: a prospective, intergenerational study of high-risk children from disadvantaged neighbourhoods. Boys and girls from the Concordia Project (the mothers in this dissertation) were rated on measures of aggression and social withdrawal in childhood and followed into parenthood.

Observational measures were used to code moment-to-moment displays of mother and child nonverbal behaviors (e.g., facial expressions, eye movements, gestures, vocalizations) during videotaped conflict (Study 1) and game-playing (Studies 1 and 2) tasks. Study 1 included positive, neutral, and negative facial expressions, while Study 2 clustered discrete nonverbal behaviors into positive and neutral nonverbal emotion communication constructs (Enjoyment, Enthusiasm, and Engagement).

Results from Study 1 indicated that mothers' childhood histories of aggression predicted less maternal emotional flexibility and shorter durations of shared expressions.

Similarly, mothers' childhood histories of aggression and withdrawal predicted less maternal flexibility. Mothers and children with greater emotional flexibility shared longer durations of positive expressions. Furthermore, greater child emotional flexibility, longer positive expressions, and shorter negative expressions were associated with better mother-child relationship quality and fewer child behavior problems. Neutral expressions were found to be adaptive for the conflict task but maladaptive for the game-playing task. Results from Study 2 indicated that, in general, greater dyadic or individual flexibility (more transitions, greater dispersion, less average mean duration) was related to more frequently shared enjoyment, enthusiasm and engagement. Similarly, greater flexibility was associated with longer durations of enjoyment and enthusiasm, but shorter engagement. Results from comparison analyses varied based on the valence of the nonverbal emotion behaviors and whether the flexibility variables were dyadically or individually measured.

Results highlight the need for detailed examination of the emotional flexibility and expressions displayed during mother-child interactions to better understand the mechanisms underlying *how* (dys)functional relationships are perpetuated across development.

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Contributions of Authors

In the development of the manuscripts provided for Chapters 2 and 4 of the present dissertation, the first author did the writing and analyses and the first two authors contributed to the conceptualization, design, analysis, and editing of the studies. The third author, Dr. Serbin, co-directs the Concordia Longitudinal Risk Project (Concordia Project) with Dr. Stack, and they are both integrally involved in all aspects of the Project, (e.g., collaboration in the conceptualization, design, analysis, and development of the protocols for the intergenerational studies). The final two authors in Chapter 2 and the final author in Chapter 4 are included as they are (Dr. Schwartzman) or were (Dr. Ledingham) the primary investigators for the original children of the Concordia Project having originated the study (G1) and thus having had significant conceptual input in the design and methods of this original (G1) study. The Concordia Project originated in 1976 under the direction of Jane Ledingham and Alex E. Schwartzman. The intergenerational project is currently directed by Lisa A. Serbin, Dale M. Stack, and Alex E. Schwartzman.

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Chapter 1: General Introduction

Emotional competence, which is the development of contextually appropriate expression, recognition, regulation, experience, and understanding of emotion, has a profound impact on children's functioning across domains (e.g., social, behavioral, academic; Denham, 2005; Denham, von Salisch, Olthof, Kockanoff, & Caverly, 2002; Raver, 2002). Social competence is intricately tied to emotional development (e.g., Halberstadt, Denham, & Dunsmore, 2001). As a result, a critical component for the development of emotional competence is the awareness that relationships are largely defined by how emotion is communicated (Saarni, 2008). Emotion communication, which can be verbal and/or nonverbal, includes the appropriate expression, recognition, and regulation of emotions in social situations. Notably, *nonverbal* emotion communication has been widely accepted and studied in the emotional development literature; however, the focus of such developmental research tends to be on nonverbal interactions between mothers and children in early childhood, with much more attention provided to verbal communication as children begin to master language. Given this propensity, there is a gap in the literature with respect to the continued importance of nonverbal emotion communication in older children's development and how it evolves in their relationships. How emotion is expressed and its consequences (i.e., the reactions that follow) help children learn to regulate the behavior and emotions of self and to react to the emotion of others (Denham et al., 2002; Saarni, 2008). Furthermore, a sole focus on the verbal content of emotional communication can result in overlooking the influence of context on behavior: the rhythm and intensity of nonverbal expressions that convey

how and *how much* an event impacts each member of the dyad as well as the dyad as a whole (Dougherty, 2003).

Nonverbal emotion communication can be displayed using many nonverbal channels (e.g., facial expressions, eye movements, posture; Planalp, 1999). The most common approach to the study of nonverbal emotion communication has been discrete behaviors, particularly facial expressions (Nelson & Russell, 2011; Widen, 2011), but also eye gaze (Schofield, Parke, Castaneda, & Coltrane, 2008), posture and body movements (Gross, Crane, & Fredrickson, 2010), and vocalizations/tone (Bloom, 1990). Individuals tend to exhibit a wide range and combination of nonverbal behaviors during social interactions, providing considerable information about arousal levels, attitudes regarding a specific situation, and what is being attended to in that context (Gratch & Marsella, 2006; Planalp, 1999; Planalp, DeFrancisco, & Rutherford, 1996). Being able to encode and decode nonverbal behaviors is an integral feature of overall social competence, as competent emotion communication skills are critical for developing and maintaining adaptive relationships (e.g., relationship quality in parent-child, sibling, and peer relationships), prosocial skills, and self-control (Denham et al., 2002; Hart, Newell, & Olsen, 2003; Saarni, 2008). Nonverbal skills in displaying and reacting to emotions during interactions (i.e., nonverbal emotion communication) are taught and modeled both directly and indirectly in the context of parent-child interactions.

Despite the importance of nonverbal (and verbal) emotion communication to the socialization and development of emotional competence (Saarni, 2008), there are several gaps in the research that need to be addressed. One such area is the focus on the relation of verbal and/or nonverbal communication to outcomes (i.e., what happens), thereby

overlooking the *processes* through which these outcomes occur (i.e., how it happens; Kuczynski, 2003). Given the bi-directional nature of parent-child interactions, recent research has emphasized several key components when analyzing the pattern of their exchanges: the processes underlying the dynamic transformation of interactions; the shared influence of parents and children as active agents during these interactions; and how the context impacts the developing processes taking place within the interactions (e.g., Saarni, 2008). To address these points, the present dissertation was designed to elucidate the transactional nature of the processes underlying nonverbal emotion communication during moment-to-moment mother-child interactions.

Processes of Change: Dynamic and Transactional Interaction

Studying the process of change over time provides fine-grained information regarding the transactional influence members of a dyad have on each other and how they are influenced by the context in which they are interacting (Sameroff, 2009). Broadly defined, transactional models allow us to consider not only changes across time and development, but also the context in which change occurs, past and present. Put in another way, transactional models highlight the dynamic nature of relationships across development, showing how a mother's behavior will provoke a reaction from her child, which then changes the mother's behavior, or vice versa. From moment-to-moment throughout the exchange, these interchanges create patterns of relating over time. A transactional model suggests going beyond the differences in emotional responding in the mother-child relationship based on age and developmental level of the child to include other factors. Additional factors to consider may include the past and present history of the mother-child relationship, mothers' own childhood histories, and the children's

histories outside of this subsystem (Fogel, 2009; Sameroff & Mackenzie, 2003). This interplay between child, parent, and environment over time is also emphasized in many developmental theories, including the developmental psychopathology framework (e.g., Cicchetti & Toth, 2009), the interactional transfer of risk (e.g., Sameroff & Mackenzie, 2003), and a dynamic systems perspective (e.g., Fogel et al., 1992; Hollenstein, 2007; Lewis, Zimmerman, Hollenstein, & Lamey, 2004).

One theoretical model that epitomizes the study of processes of change and change over time is a dynamic systems perspective, which in the case of emotional development focuses on the nature or processes underlying children's developing emotional competence (e.g., Hollenstein, Granic, Stoolmiller, & Synder, 2004; Lewis et al., 2004). A dynamic systems perspective views emotions as relational and transactional, not individual and unidirectional; as *processes* of change, not static states; and emotion behavior as highly context-specific in its patterning. A dynamic systems approach suggests that patterns of interactions develop in relationships, influencing behavior and development over time (Fogel, 2009). Research using a dynamic systems perspective has brought to life the interactions between infants and mothers (e.g., Fogel et al., 1992), preschoolers and mothers (e.g., Lewis et al., 2004; Martin, Fabes, Hanish, & Hollenstein, 2005), middle- to late-childhood/pre-adolescents and mothers (e.g., Granic & Lamey, 2002; Hollenstein & Lewis, 2006), and parent-child triads (e.g., Granic, Hollenstein, Dishion, & Patterson, 2003; Lukenheimer, Olson, Hollenstein, Sameroff, & Winter, 2011). One way in which these and other studies capture the transactional nature of dyadic interactions and the underlying process of mothers' and children's emotion communication is through examining *emotional flexibility***.**

Processes of change: The structure of interactions. Emotional flexibility, which refers to the *structure* or the *organization* of the interaction, is a process variable highlighting the ability of dyads to shift from one emotional state to another according to the specific context (Granic & Lamey, 2002; Hollenstein, 2007). Some research suggests that it is not only, or even necessarily, the content of emotions that predicts future problematic behavior, but the inability to experience a variety of emotional states as the context shifts (Hollenstein, 2005). Examinations of emotional flexibility during mother-child interactions suggest that this process variable is indeed important to healthy development, as it teaches children to regulate and repair the experience and expression of negative emotions (Granic & Hollenstein, 2003; Granic & Lamey, 2002). Flexible mother-child interactions have also been linked to more adaptive psychosocial functioning, including fewer adjustment problems (Hollenstein et al., 2004), fewer externalizing problems (Lukenheimer et al., 2011), greater improvement in treatment for behavior problems (Granic, O'Hara, Pepler, & Lewis, 2007), better relationship quality (Branje, 2008), lower stress levels in girls (Hollenstein & Lewis, 2006), and less conflict between mothers and their adolescent daughters (Lichtwark-Aschoff, Kunnen, & van Geert, 2009). Consequently, examining emotional flexibility in mother-child interactions is worthy of further investigation, as it allows for the study of recurrent, stable patterns of nonverbal emotion communication, or emotion behaviors (e.g., facial expressions and other nonverbal cues to emotion such as gestures, posture, and vocalizations). In addition, studying emotional flexibility provides evidence of *how* patterns of emotion behaviors in mother-child interactions (for the dyad as a whole as well as its individual members) are associated with its content (e.g., the positive, negative, or neutral expression of emotion),

as well as social and behavioral outcomes (e.g., relationship quality between mothers and children, behavior problems).

To date, the majority of studies examining emotional flexibility during mother-child interactions have focused at the level of the dyad. The bi-directional nature of socialization (i.e., mothers *and* children as active agents during their interactions; e.g., Granic, 2000; Kuczynski, 2003) emphasizes the unique role that each member plays during an interaction. Examining the relative influence of *each* member's flexibility across the interaction is therefore not only warranted but necessary to facilitate and augment our understanding of the structure (i.e., organization) of social interactions. During mother-child interactions, the mother could theoretically display very few behaviors (i.e., less flexibility), while the child may show great variability in the behaviors displayed. This dyad may be labelled as flexible, even though one member of the dyad (the child) is actually displaying flexibility, and therefore pulling the other (the mother in this case) through the interaction. Teasing apart the potentially unique influence of each individual's emotional flexibility would allow for a better understanding of the mechanisms underlying stability and change between mothers and their school-age children. In addition, studying mother and child emotional flexibility separately provides additional evidence of *how* patterns of emotion behaviors in mother-child interactions are associated with the expression of emotion, as well as the mother and child overall relationship quality and child behavior outcomes in middle childhood. The use of dynamic systems methods, such as state space grids (e.g., Hollenstein, 2007), enables the analysis of the structure or patterns of emotion communication behavior

during interactions within specific contexts, as well as the specific emotions used (i.e., the content of emotion).

State space grid analyses are ideal for quantifying observational data in graphic form. Through this methodology, it is possible to represent both individual and dyadic behaviors as they change from moment-to-moment. Using this method, researchers are also able to examine the flexibility of emotion behaviors (i.e., emotional flexibility) during mother-child interactions. According to a dynamic systems approach, emotional flexibility may be studied in three ways: (1) the number of transitions between emotion behavior states (i.e., flexibility); (2) a proportion created using the range or number of different states and total duration, which is known as dispersion (i.e., variability); and (3) the tendency to perseverate or get "stuck" in a small number of behavior states (i.e., rigidity; Hollenstein et al. 2012). With a state space grid, flexibility can by examined by quantifying the trajectory lines on the grid (i.e., transitions), creating an index based on proportional duration and number of cells occupied across each grid (i.e., dispersion), and finding the average of all individual cell mean durations (i.e., average mean duration, or AMD). These process variables can be studied individually, or combined for an overall factor score of emotional flexibility (Lewis, Lamey, & Douglas, 1999). Results from studies analyzing the flexibility of emotion behavior patterns in parent-child interactions (e.g., Granic et al., 2007) have shown that dyads with higher transition and dispersion values and lower AMD values display more emotional flexibility, resulting in better outcomes in children over time (e.g., fewer behavior problems).

Processes of change: The content of interactions. While the literature using a dynamic systems perspective argues that examining the structure (i.e., flexibility,

variability, and/or rigidity) of emotion behaviors may predict future problematic behavior more accurately than the *content* (i.e., expression) of emotions (e.g., Hollenstein, 2005), decades of research investigating the expression, recognition, and regulation of both positive and negative emotions and their relation to child development cannot be discounted. Furthermore, the interplay between the structure and content during moment-to-moment interaction appears to have a complexity that requires further exploration. Results from studies that have examined emotional flexibility during mother-child interactions suggest that it teaches children to regulate and repair the experience and expression of negative emotions (e.g., Granic & Hollenstein, 2003; Granic & Lamey, 2002). More recently, Lukenheimer and colleagues (2011) demonstrated the importance of the exchange of positive expressions to better flexibility. However, little is still known about the relationship between positive expressions and emotional flexibility, and even less is known about the flexibility of other emotion behaviors, such as neutral expressions. Yet there is substantial evidence for the argument that children's expressions of emotion are unintentionally socialized every day, through modelling (how to express them, and when), and through others' reactions (e.g., Denham, Bassett, & Wyatt, 2007; Eisenberg, Cumberland, & Spinrad, 1998). As mothers are typically the primary caregivers, children learn much from watching and interacting with their mothers. For example, positive emotion expressions in mothers and well-regulated negative emotion expressions are significantly related to positive emotional expression and understanding of emotion in children (Denham, 1998; Isley, O'Neil, Clatfelter, & Parke, 1999). In contrast, negative expressions used too frequently and too intensely, or sanctioned when expressed, can seriously hamper children's developing emotional competence.

Furthermore, mothers' regulation of their own emotional expressions (i.e., either expressing too much or too little), can make it difficult for children to become emotionally competent in their own expressions of and reactions to emotional situations (Denham & Kockanoff, 2002; Denham et al., 2002).

However, children are not passive recipients of the socializing strategies imparted to them by their mothers: they are active agents in the creation of their own environments and social interactions (Granic, 2000; Kucynzski, 2003) and are therefore key players in their emotion socialization and development. From infancy to adolescence, research has shown that different temperamental characteristics play an important role in children's expression of emotion, influencing their social behavior (Denham et al., 2007). In addition, research conducted by Patterson and colleagues (e.g., Chamberlain & Patterson, 1995; Patterson, 2002) addressing the coercive patterns of interaction that children and parents may engage in, has demonstrated the role children play in these ongoing cycles of negative interaction (e.g., children with more negative emotionality and difficulties regulating angry outbursts elicit negative responses from their parents). Furthermore, some children have above average ability to understand emotional exchanges and are better communicators of their own feelings and goals during social interactions (Denham et al., 2007), promoting positive interchanges in their relationships (e.g., eliciting positive responses from their mothers). In particular, research suggests that shared expressions (also known as affective matching, reciprocity of affect, mutual synchrony; and affective attunement) have been found to play a role in children's development of emotion-related competencies (e.g., Harrist & Waugh, 2002; Thommassin, Morelen, & Suveg, 2011).

Shared expressions include the process of a mother and child experiencing and expressing the same or similar emotions simultaneously. Mutually shared expressions are an important aspect of the socialization of emotion, as they are a reflection of how sensitive and responsive a mother is to her child's cues, and have been demonstrated in both clinical and nonclinical samples (Harrist & Waugh, 2002). In general, it is argued that mutually expressed positive and/or neutral affect models a balanced, synchronized interaction between mother and child, while the display of mutually negative emotions are particularly detrimental in early childhood (Harrist & Waugh). When examining shared expressions between mothers and children, research has generally focused on infants and young children; however there is speculation that affective matching still plays an important, yet perhaps a different role, in middle childhood (Harrist & Waugh), and the contexts during which shared expressions are displayed (Saarni, 2008). For example, in an attachment framework, the notion of shared expressions is an important component in the concepts of attunement (a reflection of how sensitive and responsive a mother is to her child's cues) and mutual regulation (a child's responsiveness to mother's efforts; Colle & Del Giudice, 2011). Shared expressions have also been related to measures of flexibility and rigidity of behaviors during parent-child interactions (Teti & Huang, 2005). More specifically, research suggests that lower levels of shared expressions have been related to a higher arousal level and increased reactivity in infants when interacting with their mothers (Moore & Calkins, 2004). In other studies, lower levels of shared positive affect and higher levels of shared negative affect have been associated with depression in mothers (e.g., Field, Healy, Goldstein, & Guthertz, 1990). Furthermore, the available literature theorizes that children who have internalized the

socialization of emotion of their parents tend to be members of mother-child dyads that synchronize their emotions more often (Harrist & Waugh, 2002). However, few studies have examined shared nonverbal affect across positive, negative, and neutral emotions in middle childhood; rather they have focused on the negative *or* positive emotions.

The importance of shared positive expressions between mothers and children has been a focus of more recent studies in the area of emotional development. For example, Denham and colleagues (2007) have found that positive expressiveness in families promotes emotion understanding because, based on the broaden-and-build theory of positive emotions (e.g., Fredrickson, 2001; Isen, 2008), the experience and expression of positive feelings allows children to be more open to learning and problem-solving. This research is an excellent example of the interplay between the process variables of flexibility and shared expressions: while emotional flexibility helps to teach children to regulate and repair the experience and expression of negative emotions (Granic & Hollenstein, 2003; Granic & Lamey, 2002), flexibility may also help to teach children to be more open, cohesive, and adaptive during positive mother-child interactions (e.g., Lukenheimer et al., 2011). As positive verbal *and/or* nonverbal communication skills facilitate appropriate levels of interpersonal cohesion and adaptability to change (Olson, 2000), one of the goals of the present dissertation was to expand the current literature and underscore the interplay between emotional flexibility and positive, as well as neutral, emotional experiences.

Past and Present Risk Factors

Taken together, competent emotion communication skills are critical for adaptive development across domains, such as social (e.g., relationship quality in parent-child

relationships) and behavioral (e.g., externalizing and internalizing behavior problems) functioning (e.g., Calzada, Eyberg, Rich, & Querido, 2004; Stack, Serbin, Girouard, Enns, Bentley, & Schwartzman, 2012). Understanding the processes behind the development of nonverbal emotion communication during mother-child interactions will provide more information on how social and behavioral outcomes are linked to the socialization of nonverbal emotion communication. However, the development and maintenance of patterns of interacting between mothers and children do not occur in a vacuum: emotion communication is influenced by environmental and family factors including histories of the parent-child relationship (e.g., environmental stressors, social support, mothers' childhood histories of aggression and/or social withdrawal; Serbin, Stack, Kingdon, Mantis, & Enns, 2011; Stack et al., 2012). As previously mentioned, mothers are often the primary caregivers and therefore play a vital role in the socialization of emotion. However, mothers' ability to socialize emotion and adaptive development in their offspring is greatly influenced by their own experiences as children and as adults. For example, intergenerational research has shown that childhood histories of psychosocial and behavior problems, such as aggression and/or social withdrawal, influence subsequent parenting style and increase the probability of a host of developmental and psychosocial difficulties in their children, thus perpetuating a cycle of risk over time and across generations (e.g., Stack, Serbin, Schwartzman, & Ledingham, 2005; Serbin et al., 2002). The Concordia Longitudinal Risk Project (Concordia Project) is a prospective longitudinal community study of children with histories of aggression and/or social withdrawal who have been followed into parenthood and the next generation of offspring.

The Concordia Project is a prospective longitudinal community study of boys and girls who grew up in disadvantaged neighbourhoods in Montréal, Québec, Canada, who were rated on aggression and/or social withdrawal in childhood and who have been followed into parenthood. The Concordia Project is considered a high-risk community-based sample in that the original participants came from communities where levels of economic and social disadvantage were high, and because average family socio-economic status and other demographic characteristics were below the population means. This sample of children was subsequently followed in smaller representative sub-samples at three to five year intervals and into parenthood, as many of the original participants have since given birth to children themselves. A more detailed description of the Concordia Project sample can be found in Schwartzman, Ledingham, and Serbin (1985), and Serbin et al. (1998).

Studies from the Concordia Project and other longitudinal research have shown that aggressive girls are particularly at-risk for negative adolescent and adult outcomes, such as an increase in antisocial behavior (Serbin, Marchessault, McAffer, Peters, & Schwartzman, 1993); early, high-risk sexual activity, and teen pregnancy (Scaramella, Conger, Simons, & Whitbeck, 1998; Serbin, Peters, McAffer, & Schwartzman, 1991); school dropout and truncated maternal education (Serbin et al., 1998); and the development of internalizing disorders (Zoccolillo, Pickles, Quinton, & Rutter, 1992). Once aggressive girls become mothers, they may be more likely to use and convey aggression within their families, increasing the potential for negative outcomes in their children (Serbin et al., 1991; Serbin & Karp, 2004). Similarly, girls who are socially withdrawn are also at-risk for negative outcomes, including peer rejection, negative self-

perceptions, less involvement in social activities, and internalizing disorders (e.g., Coplan, Girardi, Findlay, & Frohlick, 2007; Nelson, Rubin, & Fox, 2005; Schneider, Younger, Smith, & Freeman, 1998). Furthermore, it has been found that girls who exhibit patterns of both aggressive *and* withdrawn behavior have the highest risk for later psychosocial maladjustment (e.g., Stack et al., 2005). When considering parenting practices, research has shown that problematic parenting behaviors, such as elevated levels of hostility, sarcasm, unresponsiveness, and irritability with offspring, are prevalent among mothers with histories of aggression and/or social withdrawal (Serbin et al., 2002; Serbin & Karp, 2004; Stack et al., 2012). In addition to past maladaptive behaviors, research has shown that during parenthood, environmental stressors such as lower SES and lack of social support can prevent parents from providing adequate stimulation and support to their children, further interrupting the socialization process and increasing the probability of detrimental outcomes in their offspring (e.g., lower cognitive ability, poor academic outcomes, more behavior problems; Serbin et al., 2011). For example, a recent study completed by Stack and colleagues (2012) found that less maternal social support and poorer home environment combined with higher parental stress predicted poorer mother-child relationship quality (e.g., more maternal hostility and less sensitivity; less child responsiveness).

The Concordia Project provides a unique opportunity to study the intergenerational transfer of health, parenting, and environmental stress during childhood, and to determine the processes and protective factors that predict positive outcomes for children within an ‘‘at-risk’’ population. Because the concept of risk is inherently probabilistic, it follows that some individuals from moderate to high-risk backgrounds are

likely to develop well, despite their apparently poor prospects in infancy or early childhood. Hence, within an at-risk population, it is expected that there will likely be a range of outcomes, in terms of adaptation and competence across the lifespan. Results from studies including participants from the Concordia Project and other longitudinal research projects provide strong evidence for the argument that problematic parenting leads to poorer relationship quality between mothers and children, as well as greater externalizing and internalizing behavior problems in school-age children (e.g., Patterson, 2002; Serbin et al., 2011; Stack, Serbin, Enns, Ruttle, & Barrieau, 2010; Stack et al., 2012; Teti & Huang, 2005). Consistent with the developmental psychopathology framework, mother-child interactions have emerged as important indices of risk and resilience (Cicchetti & Toth, 2009; Kim & Cicchetti, 2010). This framework highlights the need to understand the mechanisms behind both dysfunctional as well as functional behavior in order to fully understand the pathways to adaptive and maladaptive outcomes throughout development. Also central to the developmental psychopathology framework is the importance of using multiple levels of analysis. The use of multiple methodologies in research can better inform prevention and intervention practices for those at highest risk for developing later disorders, as well as improve understanding of those who "beat the odds" and are able to protect themselves from transferring the cycle of risk across generations.

There is some research suggesting that parenting behaviors, including emotional expressions displayed to children, are directly affected by parents' own histories of socially deviant behavior (e.g., antisocial behavior, aggression, social withdrawal; Conger, Neppl, Kim, & Scaramella, 2003; Serbin et al., 2002; Thornberry, Freeman-

Gallant, Lizotte, Krohn, & Smith, 2003). Therefore, observing emotion communication behaviors in children of mothers with histories of aggression and/or social withdrawal, as well as examining the influence that children's emotional displays have on their developing emotional competence, are vital to understanding the mechanisms underlying the role of child *and* parent characteristics in perpetuating risk or promoting adaptive social functioning across generations.

Summary. Taken together, the processes guiding nonverbal emotion communication between mothers and their school-age children have not been sufficiently studied and are not well understood. The overriding goal of the present dissertation was to provide a clearer and more comprehensive understanding of the processes underlying nonverbal emotion communication in middle childhood by addressing some of the gaps in the emotion development literature, including: nonverbal emotion communication between mothers and children during middle childhood; the role of individual emotional flexibility in the structure of mother-child interactions; the examination of interactions during a positive, game-playing context; the investigation of shared expressions, particularly neutral expressions in middle childhood; and the methodological implications behind measurement (i.e., variable selection: frequency or duration of expressions; individual behaviors or dyadic behaviors). An additional objective of the present studies was to illuminate the positive role that nonverbal communication may play during mother-child interactions in a high-risk community sample.

Dissertation Goals and Objectives

To this end, the present dissertation contributed to the literature by addressing the aforementioned gaps in the emotion development and shared expression literatures by

examining the structure and content of mother-child interactions in an at-risk community sample that includes children in middle childhood. More specifically, shared positive, negative, and neutral affect (Study 1) and shared positive and neutral affect (Study 2) in at-risk dyads of mothers and their school-age children were examined during moment-to-moment interactions. In addition, mutually expressed emotion behaviors and their relationship with the emotional flexibility that structures interactions were explored in order to better inform our understanding of the complexity and intricacies of moment-to-moment processes underlying aspects of emotional development (i.e., nonverbal emotion communication) during a positive context in middle childhood. The general objectives across studies were to examine: (1) mother and child nonverbal emotion communication via emotional flexibility *and* the dyad's shared expressions (Study 1); (2) nonverbal emotion communication during a game-playing context [playing the game of Jenga (Studies 1 and 2) and a conflict context (Study 1)], in a prospective longitudinal design of at-risk mother-child dyads from the Concordia Project that crosses two generations.

The overarching goal of Study 1 was to improve our understanding of the moment-to-moment processes underlying the expression of emotion during mother-child interactions across two contexts (game-playing and conflict tasks). In addition, emotional flexibility and shared expressions and their association with relationship quality (emotional availability), and children's behavior problems were also investigated. Building on Study 1, the overarching goal of Study 2 was to further investigate the interaction between the moment-to-moment processes (dyad, mother, and child emotional flexibility and the frequency and duration of shared expressions) of underlying positive and neutral nonverbal emotion communication during a game-playing task. Study 2 was

also designed to address gaps in the literature by extending our understanding of the interplay between positive and neutral expressions and their relation to the structure of mother-child interactions during a positive and playful activity. Using innovative methodologies and statistical applications, Study 2 was developed to provide more details on the potential differences in how dyad, mother, and child flexibility variables relate to process variables (i.e., frequency and duration of shared expressions), as well as additional psychosocial and demographic variables (e.g., current social-emotional support and stress experienced by the dyad; maternal education, child gender, duration of dyad verbal communication).

Overall, the objectives of the present dissertation were to provide a more comprehensive understanding of the *processes* underlying moment-to-moment nonverbal emotion communication, a component of emotional development, between mothers and their school-age children in an at-risk community sample.

Chapter 2: Dissertation Study 1

Emotional Flexibility and Shared Expressions during Interactions between Mothers and Children from a High-Risk Sample

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Emotional Flexibility and Shared Expressions during Interactions between Mothers and Children from a High-Risk Sample

Emotional competence is integral to children's social and academic competence and overall well-being across the lifespan (Denham, 2005; Denham von Salisch, Olthof, Kockanoff, & Caverly, 2002; Raver, 2002). Broadly defined, emotional competence is the development of contextually-appropriate expression, recognition, regulation, experience, and understanding of emotion (Saarni, 1999). As it is intricately tied to developing social competence, emotional competence is a key contributor to children's success in relationships, both in and outside the home, concurrently and over time (Denham & Burton, 2003). For purposes of the present study, the focus is on *emotional expressiveness*, which refers to the emotion displayed during an interaction, as well as the rate (e.g., frequency, intensity, or duration) of nonverbally displayed emotion (Denham, Bassett, & Wyatt, 2007). As emotions are overtly expressed to convey messages of feelings, desires, wishes, and goals during interactions, a particularly important component for the development of emotional competence is learning how to effectively communicate emotions in our relationships (Saarni, 2008).

Nonverbal Emotion Communication

Emotion communication includes learning the appropriate expression, recognition, and regulation of emotions in social situations. It is directly and indirectly taught and modelled in the context of parent-child interactions. During social interchanges, the members involved interpret both verbal *and* nonverbal cues. However, nonverbal behaviors and their importance in developing affective communicative skills are often overlooked in favour of verbal cues despite research suggesting that well over

half of the meaning taken from social situations is based on nonverbal communication (Burgoon & Bacue, 2003). Skills in decoding and encoding nonverbal emotions during an interaction are an integral feature of overall social competence. Moreover, competent emotion communication skills are critical for developing and maintaining adaptive relationships (e.g., relationship quality in both parent-child and peer relationships) and self-control (Hart, Newell, & Olsen, 2003; Saarni, 2008).

Nonverbal emotion communication can be displayed using a number of nonverbal channels, including facial expressions, eye movements, and posture (Coan & Gottman, 2007). However, it has been argued that facial expressions, when used to express emotion, are the root of emotionally competent development (e.g., Denham et al., 2002). Accurate judgement of emotions is higher when displayed facially, rather than vocally or from other nonverbal channels (Burgoon & Bacue, 2003), and facial expressions are displayed with far more frequency than verbal cues of emotion (e.g., "I am so angry with you"; Planalp, 1999). Thus, facial expressions are the most common mode of nonverbal behavior shared by individuals during social interactions, and have often been studied in the context of the mother-child relationship. Research in the area of shared expressions (i.e., reciprocity of affect, affective matching, affective synchronicity, dyadic synchrony; Lindsey, Colwell, Frabutt, Campbell Chambers, & MacKinnon-Lewis, 2008; Harrist & Waugh, 2002) underscores the importance of examining mutual or shared expressions during mother-child interactions and highlights their contributions to the relationship.

Shared Expressions

Shared expressions, which play a role in the development of emotion-related competencies (e.g., Eisenberg & Eggum, 2008; Harrist & Waugh, 2002), refer to the

process of a mother and child experiencing and/or expressing the same or similar emotions simultaneously. Shared expressions are an important component of the socialization of emotion, as they are a reflection of how sensitive and responsive a mother is to her child's cues (Harrist & Waugh, 2002). In general, it is argued that shared positive and/or neutral affect models a balanced, synchronized interaction between mother and child, while the display of mutually negative emotions are particularly detrimental in both clinical and nonclinical samples in early childhood (Denham et al., 2002; Harrist & Waugh, 2002). In turn, it has been speculated that mothers who promote emotion regulation strategies (including reciprocity of positive emotions) help to enhance children's adjustment and reduce behavior problems (Eisenberg & Eggum, 2008; Lindsey et al., 2008). Synchronized mother-child exchanges develop slowly over time during everyday interactions. However, this process does not occur in a vacuum: patterns of interacting develop within mother-child emotion exchanges, which are shaped not only by previously shared interactions, but also by the past histories and experiences of the mother.

The Influence of Past and Present Interactions on the Current Relationship

Mothers' and children's patterns of interaction over time are influenced by the histories of the mothers' and children's own relationship (Fogel, Garvey, Hsu, & West-Stroming, 2006). For example, while Eisenberg and colleagues (2003) showed that the ability to regulate displays of emotion during middle childhood is mostly explained by children's emotion regulation skills as preschoolers, it was also the case that preschoolers' emotion regulation abilities were predicted by the expressiveness of their mothers. Research has also shown that the parent-child relationship remains relatively

stable from infancy to adolescence (Laursen & Collins, 2004), suggesting that patterns of interaction that occur early in development will continue in a similar manner as the child ages chronologically. However, patterns of interaction between mothers and their offspring are also influenced by mothers' own histories and experiences when they were children; for example, childhood histories of behavior problems, such as aggression, influence subsequent parenting behavior and increase the probability of a myriad of developmental and psychosocial difficulties in their children, perpetuating a cycle of risk over time and across generations (e.g., Serbin et al., 2002, Stack, Kingdon, Mantis, & Enns, 2011; Stack, Serbin, Schwartzman, & Ledingham, 2005; Stack et al., 2012). In elementary school, children who are aggressive, or *reactive*-aggressive (i.e., hostile; Crick & Dodge, 1996), are seen as less socially competent by both peers and teachers (Denham et al., 2003). Furthermore, the relative stability of aggression over time has been found to impact long-term functioning (e.g., poorer social, employment, educational, and family outcomes; Serbin et al., 2011), extending into the mother-child relationship. Research has shown that parenting behavior can be negatively impacted by aggression in childhood, which in turn affects children's outcomes. The links between mothers' childhood histories of aggression, subsequent parenting ability, and children's developmental outcomes, have been heavily supported by research conducted through the Concordia Longitudinal Risk Project (Concordia Project).

Concordia Longitudinal Risk Project. The Concordia Project is a 35-year-long prospective longitudinal community study of boys and girls who grew up in disadvantaged neighbourhoods. They were rated on aggression and/or social withdrawal in childhood using peer nominations and have been followed into parenthood. Studies

from the Concordia Project (e.g., Stack, Serbin, Enns, Ruttle, & Barrieau, 2010; Stack et al., 2012) and others (e.g., Patterson, 2002) have found that childhood histories of aggression can result in problematic parenting, which leads to poorer relationship quality between mothers and children (e.g., less sensitive and more hostile parenting; less responsive children), as well as more behavior problems in school-age children. Furthermore, results from a number of these studies have shown that aggression in girls, particularly when combined with withdrawn behavior, has been related to the poorest outcomes for both mothers and their children (e.g., Saltaris et al., 2004; Serbin et al., 2011). However, the examination of the mother-child relationship in this (and most other) research tends to be based on outcome studies, thus weakening our understanding of the underlying *processes* of mother-child interactions. The examination of process variables that lead to the developmental outcomes identified to date is extremely limited and ripe for investigation.

Underlying Processes: The Structure of the Interaction

One area that is lacking process research is emotionally competent development in middle childhood, specifically with respect to nonverbal emotion communication between mothers and children across contexts (e.g., playing games versus discussing a conflict). Little is known about the impact of these processes across the mother-child relationship, as well as the influence on children's behavioral functioning. Studying the processes of stability and change in real time (i.e., moment-to-moment interaction) provides fine-grained information regarding the transactional patterns of interaction between the members of a dyad, and how they are influenced by the context in which they are interacting (Sameroff, 2009). Results from research using a dynamic systems

perspective (e.g., Fogel et al., 1992; Granic, O'Hara, Pepler, & Lewis, 2007; Hollenstein, Granic, Stoolmiller, & Synder, 2004; Lewis, Zimmerman, Hollenstein, & Lamey, 2004) have suggested that one way to capture the transactional nature of dyadic interactions, particularly their emotion communication, is to examine their emotional flexibility. Emotional flexibility, also referred to as the *structure* of the interaction, is a process variable highlighting the ability of dyads to shift from one emotional state to another according to the specific context (Granic & Lamey, 2002; Hollenstein, 2007). Examinations of emotional flexibility during mother-child interactions suggest that this process variable is important to healthy development, as it teaches children to regulate and repair the experience and expression of negative emotions (Granic & Hollenstein, 2003; Granic & Lamey, 2002). Flexible mother-child interactions have also been linked to more adaptive psychosocial functioning, including fewer adjustment problems (Hollenstein et al., 2004), greater improvement in treatment for behavior problems (Granic et al., 2007), better relationship quality (Branje, 2008), lower stress levels in girls (Hollenstein & Lewis, 2006), and less conflict between mothers and their adolescent daughters (Lichtwark-Aschoff, Kunnen, & van Geert, 2009).

To date, the study of emotional flexibility during mother-child interactions has been at the dyadic level. Given the bi-directional nature of socialization (i.e., mothers *and* children are active agents during their interactions; e.g., Granic, 2000), as well as the unique role that each member plays during an interaction, examining the relative influence of *each* member's flexibility across the interaction is not only warranted but necessary to push our understanding of the structure of social interactions forward. During a mother-child interaction, the mother could theoretically display very few

behaviors (i.e., less flexibility), while the child may show great variability in behaviors displayed. This dyad may be labelled as flexible, even though only one member of the dyad (the child) is actually displaying flexibility, and therefore is "pulling" the other (the mother in this case) through the interaction. Teasing apart the potentially unique influence of each individual's emotional flexibility allows for a better understanding of the mechanisms underlying stability and change between mothers and their school-age children. In addition, studying mother and child emotional flexibility separately would provide additional evidence of *how* patterns of emotion behaviors in mother-child interactions are associated with their relationship and child behavioral outcomes.

Underlying Processes: The Content of the Interaction

While researchers using a dynamic systems perspective argue that examining the *structure* (i.e., flexibility or rigidity) of emotion behaviors may predict future problematic behavior more accurately than the *content* (i.e., expressiveness) of emotions (e.g., Hollenstein et al., 2004), decades of research examining the expression, recognition, and regulation of both positive and negative emotions cannot be discounted. Indeed, shared expressions have also been related to measures of flexibility and rigidity of behaviors during parent-child interactions (Teti & Huang, 2005). However, few studies have examined the interplay between flexibility (i.e., structure) and emotional expressiveness (i.e., content) between mothers and their school-age children (e.g., Branje, 2008; Hollenstein, 2012; Lukenheimer, Olson, Hollenstein, Sameroff, & Winter, 2011), particularly within high-risk samples where mothers were identified as having behavior problems in childhood (i.e., being aggressive or aggressive and socially withdrawn). Furthermore, the majority of research on shared expressions has been carried out when

children are between infancy and early childhood (e.g., Harrist, Pettit, Dodge, & Bates, 1994; Laible & Thompson, 2000). While relatively few studies have examined shared expressions between mothers and adolescents (e.g., Bronstein, Fitzgerald, Briones, Pieniadz, & D'Ari, 1993; Lindsey et al., 2008; Sheeber, Allen, Davis, & Sorensen, 2000), the evidence suggests that the levels of shared expressions between mothers and their adolescents are highly inter-correlated. Even fewer studies (if any) have examined mother-child shared expressions during middle childhood, despite speculation (and some support) for the notion that this synchronized interchange remains an important aspect of mother-child interactions as the child ages (Harrist & Waugh, 2002). Finally, studies examining emotional exchanges between mothers and children tend to focus on either positive *or* negative emotion (Hareli, Shomrat, & Hess, 2009) neglecting the potential role that neutral affect may play during interactions. Results from a study conducted by Adams and Laursen (2001) suggest that neutral affect becomes a larger part of disagreements between parents and children as they reach adolescence. However, further exploration of the processes underlying the exchange of neutral affect between mothers and their school-age children has yet to be undertaken.

Objectives

The present study was designed to contribute to the literature by directly addressing a number of these shortcomings. Both individual emotional flexibility (structure) and shared positive, negative, and neutral expressions of emotion (content) in high-risk mother-child dyads were examined when children were in middle childhood. The overarching goal of the study was to improve our understanding of the moment-to-moment processes underlying the expression of emotion during mother-child interactions

across two contexts (game-playing and conflict tasks). In addition, emotional flexibility and shared expressions and their association with relationship quality (emotional availability), and children's behavior problems were also investigated. For the first objective, it was hypothesized that mothers' childhood histories of aggression and aggression *and* social withdrawal would predict less mother and child emotional flexibility than mothers without these histories who were drawn from the same neighborhoods. For the second objective, it was hypothesized that mothers and children with greater emotional flexibility would be members of dyads that shared longer durations of positive expressions and shorter durations of negative expressions. Furthermore, mothers' childhood histories of aggression and aggression and withdrawal were expected to predict shorter durations of shared positive expression and longer negative expressions. For the final objective, it was hypothesized that greater emotional flexibility, longer shared positive expressions, and shorter shared negative expressions would be associated with better mother-child relationship quality and less behavior problems in children. No hypotheses were explicitly articulated for the duration of shared neutral expressions, given the lack of research on this construct to date.

Method

Participants

The current study included a sub-sample of mothers enrolled in the Concordia Project. Data collection for the Project began in 1976-1978. At this time, 4,109 students (who were in 1st, 4th, or 7th grade) were recruited from inner-city French-speaking public schools located in low SES neighborhoods in Montréal, Québec, Canada. The children were screened for aggression and social withdrawal via a French translation of a peer

nomination measure, the Pupil Evaluation Inventory (PEI: Pekarik, Prinz, Liebert, Weintraub, & Neale, 1976). The PEI, which is a reliable (internal consistency above .70 for all factors) and valid (concurrent validity ranges from .54 - .65) measure for assessing children's social behavior, includes 34 items that factor into components of Aggression (e.g., those who start a fight over nothing), Social Withdrawal (e.g., those who are too shy to make friends easily), and Likeability. Children nominated up to four boys and (separately) four girls who best matched each item on the PEI (see Appendix A for sample items). Oversampling at the extremes of the sample (i.e., the upper tails of the aggression and withdrawal dimensions) was done deliberately when arriving at the final sample of 1,774, allowing for a range of scores, including children from across the continuum on aggression and withdrawal drawn from the same schools and neighborhoods. This sample of children was subsequently followed in smaller representative sub-samples at three to five year intervals. A more detailed description of the Concordia Project sample can be found in Schwartzman, Ledingham, and Serbin (1985), and Serbin et al. (1998, 2011). The Concordia Project provides a unique opportunity to study the intergenerational transfer of health and psychosocial risk during childhood, and to determine the processes and protective factors that predict positive outcomes for children within an ‘‘at-risk’’ population. Because the concept of risk is inherently probabilistic, some individuals from moderate to high-risk backgrounds are likely to develop well despite their apparently poor prospects in infancy or early childhood. Hence, within a high-risk population, it was expected that there would likely be a range of adaptation and competence across the lifespan.

Fifty-one mothers (who were among the original sample of female participants; mean age = 37.52 years), drawn from a larger sub-sample of 119, participated in the present study with their 9- to 13-year-old children (mean age = 10.92 years; 47% boys). Of the 68 mothers who did not participate, 17 completed questionnaires, but did not participate in the videotaped observations, and 32 were spouses of original male participants and thus were not the parent with childhood histories of aggression and/or social withdrawal. In addition, 19 of the videotaped observations could not be included due to videotaping issues (e.g., poor lighting; camera angle or set-up prevented a clear view of a dyad member's face). As with past studies of the Concordia Project, maternal childhood aggression and withdrawal scores were treated as dimensions rather than categorical predictors in order to maximize power. Mothers in the present sample corresponded to the full-range of aggression and withdrawal scores. The majority of children were first- (22; 43%) or second-born (23; 45%), while six (12%) were third-born. Fathers were present in 39 (76.5%) of the children's homes. Finally, the majority of children were in middle childhood: 36 (70%) in Grades 4 or 5, 10 (20%) in Grades 6 or 7, and five (10%) in Grades 2 or 3.

It was important to assess the representativeness of the current sample compared to the larger sample of those who did not participate. The mothers who participated in the present study were compared to: (1) a sample of 75 mothers who originally participated and were part of the larger sub-sample tested at the same time as the current sample of 51; (2) 119 mothers (original participants and spouses of original fathers); (3) 309 women (who were part of the original sample of the Concordia Project) from the larger Concordia sample who were known to be mothers. These samples of women were

compared along dimensions of aggression and social withdrawal. No significant differences were found along the dimensions of aggression. $F(3, 550) = 0.51$, $p > .10$, and social withdrawal, $F(3, 550) = 0.44$, $p > .10$. The present sample is therefore considered to be representative along these dimensions.

To further assess the comparability of the present sample to the $n = 75$ and $n = 119$ sub-samples, years of education, $F(2, 242) = 0.35$, $p > .10$, occupational prestige ratings, $F(2, 242) = 0.44$, $p > .10$, and age at birth of first child, $F(2, 242) = 0.07$, $p > .10$, were examined. There were no significant differences. The 51 mothers from the current sample were also compared to the 68 mothers who did not participate in the present study, but who had children of the same age. The women were compared along dimensions of aggression, $t(117) = 0.17$, $p > .10$, and social withdrawal, $t(117) = -1.71$, $p > .10$, years of education, $t(117) = -0.99$, $p > .10$, occupational prestige, $t(117) = -1.40$, $p > .10$, and age at birth of first child, $t(117) = 0.88$, $p > .10$. No significant differences were found across variables. Table 1 provides the means, standard deviations, and ranges on each of these measures for the present sample.

Procedure

The present study was part of a larger project in which interviews, questionnaires, and semi-naturalistic observations were obtained over one home visit and two school visits. The home visit was conducted by one PhD-level experimenter and one research assistant both trained in the administration of the testing protocol and blind to the mothers' childhood histories. Mothers were provided with a description of the procedure and provided informed consent (Appendix B). During the home visit, mother and child were videotaped during several tasks and completed a range of questionnaires to assess

socio-demographics and various aspects of relationship quality and child behavioral problems (refer to Stack et al., 2012 and Serbin et al., 1998 for more detail).

The current study focused on a game-playing task and a conflict task. For the game-playing task, dyads engaged in a four minute game of Jenga (a game created by Parker Brothers whereby players take turns removing a block from a tower and balancing it on top). This task was used to assess mothers' and children's emotion behaviors when presented with a playful situation (Appendix C). For the conflict task, dyads discussed an issue of conflict in their relationship. Prior to videotaping the conflict task, mothers and children each completed a conflict questionnaire where they rated topics they considered to be most problematic in their relationship (e.g., homework, chores, relationship with sibling). The common highest ranked issue for each dyad was used as the topic of discussion for the subsequent task. The dyad had six minutes to discuss and work toward resolving the shared conflict. This task was used to assess mothers' and children's emotion behaviors when faced with a potentially stressful situation (Appendix D).

Questionnaire Measures

Demographic Information Questionnaire (DIQ). The DIQ was employed to collect the participating families' socio-demographic information, such as mother's current age, age at birth of first child, marital status, number of years of education, and occupational status. This measure has proven effective in collecting participant demographics and has been used in past studies of the Concordia Project (e.g., De Genna, Stack, Serbin, Ledingham, & Schwartzman, 2007; Serbin et al., 1998).

Child Behavior Checklist (CBCL). Mother ratings of children's social and behavioral problems were obtained using the Child Behavior Checklist (Achenbach &

Rescorla, 2001). Mothers rate the child on categorical items ranging from 0 (Not true) to 2 (Often/Very True). The ratings are then summed to create three problem behavior scores (Total, Internalizing, and Externalizing) and are considered reliable (internal consistency ranges from .78 to .97) and valid (discriminant analyses ranges from .80 to .88) measures of children's behavioral problems (see Achenbach & Rescorla, 2001). The Total behavior problems score was the only score used in the analyses.

Behavioral Measures and Coding

Emotional Availability Scales (EA scales). The quality of the mother-child relationship was assessed using the EA scales (Biringen, Robinson, & Emde, 1988; 1993) during observation of the game-playing task. Global measures were created to capture relationship quality via dyadic interactions during the game-playing task and codes were rated on 5-, 7-, or 9-point scales (refer to Stack et al., 2012 for more detail). Mothers were coded on the dimensions of sensitivity (a more sensitive parent will be attuned to the child's ability to regulate emotional and physiological states and provides stimulation or soothing as needed), structuring (the degree to which the mother structures the child's play, follows the child's lead, and sets limits), and (non)hostility toward her child (the presence and degree of overt and covert hostile behavior expressed during the interaction with the child). Given our sample, two adjustments were made: (1) the scores for the EA dimension of 'nonhostility' were inverted and the term 'hostility' was subsequently used, and (2) the structuring dimension operated as a linear scale from 1 (non-optimal structuring) to 5 (optimal structuring). Children were coded on the dimensions of responsiveness (willingness to engage with the mother and follow her bids, as well as clear pleasure within the interaction with the mother), and involvement of his or her

mother during the interaction (the degree to which the child attends to and engages the parent in play). Training was conducted via the Biringen tapes (Stack et al., 2012).

To assess the reliability of the coding, an undergraduate student who was blind to the study's hypotheses and mothers' risk status (i.e., childhood histories of aggression and aggression *and* social withdrawal) was trained on the EA Scales by the primary coder until a high degree of reliability was reached ($r > .90$). To ensure the accuracy of coding, 25% of the sample was randomly selected and double-coded following completion of both the game-playing task. Intraclass reliability coefficients were then conducted to assess per category agreement between the two coders (Shrout & Fleiss, 1979). Reliability was at a highly satisfactory level for all EA dimensions ($r_k = .87 - .97$).

Upon inspection of the intercorrelations between variables (see Table 4 or 5), it was found that among the EA Scales, maternal sensitivity and structuring were correlated at .75. Similarly, child responsiveness and involvement were correlated at .72. Given the likelihood of some redundancy incurred in using variables that are correlated above .70 (Tabachnick & Fidell, 1996) and to reduce the number of analyses that were conducted, maternal structuring and child responsiveness were dropped from all analyses. Similar strategies have been undertaken with other studies from the Concordia Project (e.g., Bentley, 2002).

Emotion Behavior Coding Scheme (EBCS). The EBCS (Enns & Stack, 2007) is a 2-part observational measure of mother and child emotion behaviors during the game-playing and conflict tasks, and was developed based in part on existing literature (e.g., Batum & Yagmurlu, 2007; Hubbard, 2001; Perez & Riggio, 2003; Planalp, 1999; Posner & Rothbart, 2000). It captures the frequency and duration of emotion behaviors displayed

during mother-child interactions. Part 1 of the EBCS identifies a number of mother and (separately) child emotion behaviors coded second-by-second, including individual facial expressions, eye movements, physical contact, body language, gestures, and vocalizations. The mutually exclusive facial expressions category (smiling, neutral expressions, unfelt smiling, frowning/looking upset, and looking sad/ distressed) was the focus of the present study (detailed operational definitions of these codes can be found in Table 2). Following filming of the tasks, videotaped records of the mother-child interactions were coded using the facial expressions codes from the EBCS. Videotapes were viewed twice for each task; children's facial expressions were coded on the first pass and mothers' facial expressions were coded on the second pass.

To assess the reliability of the coding of mother and child facial expressions, 26% of the sample for the game-playing and conflict tasks was randomly selected and coded by an undergraduate student who was blind to the study's hypotheses and mothers' childhood histories of aggression or aggression and social withdrawal. Intraclass reliability coefficients were then conducted to assess per category agreement between the two coders (Shrout & Fleiss, 1979). The overall values obtained for mother and child facial expressions during the game-playing task were $r_k = .91$ and $r_k = .84$, respectively. Similarly, the overall values obtained for mother and child facial expressions during the conflict task were $r_k = .87$ and $r_k = .86$, respectively. These are considered very good levels of agreement above chance (Fleiss, 1981).

Dynamic Systems methods: State space grids. State space grids enable the analysis of the structure or patterns of nonverbal emotion communication during interactions within specific contexts, as well as the specific emotion behaviors displayed.

Analyses using state space grids are ideal for quantifying observational data. Through this methodology, it is possible to graphically represent both individual and dyadic behaviors as they change from moment-to-moment and it allows researchers to examine the flexibility of emotion behaviors (i.e., emotional flexibility) during mother-child interactions. According to a dynamic systems approach, emotional flexibility is studied in three ways: (1) the number of transitions between emotion behavior states; (2) a proportion using the range or number of different states and total duration, which is known as dispersion; and (3) the tendency to perseverate or get "stuck" in a small number of states, or average mean duration (AMD). With a state space grid, flexibility can by examined by quantifying the trajectory lines on the grid (i.e., transitions), creating an index based on proportional duration and number of cells occupied across each grid (i.e., dispersion), and finding the average of all individual cell mean durations (i.e., AMD). Results from studies analyzing the flexibility of emotion behavior patterns in parent-child interactions (e.g., Granic et al., 2007) have shown that dyads with higher transition and dispersion values and lower AMD values display greater emotional flexibility, resulting in better child outcomes over time (e.g., fewer behavior problems). Furthermore, these process variables can be studied individually or combined for an overall factor score of emotional flexibility (Lewis, Lamey, & Douglas, 1999). As the transitions, dispersion, and AMD variables in the present study were found to be highly and significantly correlated, a principal component factor analysis was conducted for both tasks. For the game-playing task and for the conflict task, one factor was retained for mothers' emotional flexibility variables, which had eigenvalues of 2.45 (game-playing task) and 2.26 (conflict task) and explained 81.63% and 75.43% of the variance, respectively. One

factor for each task was also retained for the child's emotional flexibility variables, which had eigenvalues of 2.46 (game-playing task) and 2.33 (conflict task) and explained 81.96% and 77.53% of the variance, respectively. The variables included in these factors represented the transitions, dispersions, and AMD's that mothers and children in the study were demonstrating during the tasks; the factors were thus considered indices of emotional flexibility and subsequently used in all analyses.

Results

Prior to conducting statistical analyses, descriptive statistics were used to assess the normality of the distribution, skewness for each variable, and to identify outliers. Significant outliers were systematically brought in by converting them into a value that was one, two, or three standard deviation(s) above the mean. In the case of mothers' AMD values, there was a participant in each task where the outlier was so extreme, that it was considered an anomaly. In these instances, the aberrant case was removed and subsequent analyses involving mothers' emotional flexibility variables were conducted with the remaining 50 participants.

In addition, given the low occurrence of the unfelt smiling, frowning/looking upset, and looking sad/distressed variables, it was elected to collapse these variables into a combined negative expressions variable. By creating a single negative expressions variable, the number of analyses was also reduced. Finally, if fewer than 10 percent of mother-child dyads demonstrated a particular behavior, it was deemed unrepresentative of the sample and was therefore excluded from further analysis. This was only the case for the negative expression variables in the game-playing task: 94, 96, and 100 percent of

dyads did not display sad/distressed, frowning/looking upset, and unfelt smile expressions, respectively.

All durations for the facial expressions were adjusted by multiplying each variable by the mean duration of the game-playing or conflict tasks across all dyads and then dividing by the actual duration of the game-playing or conflict tasks for each dyad. This method was employed by Hubbard (2001) to take into account variability in duration of task completion. The means, standard deviations, and ranges for the proportionalized child and mother duration of facial expressions and emotional flexibility indices are reported in Table 3 (see Appendix E for the descriptive statistics for raw scores).

Analyses were conducted using the following statistical programs: (1) Gridware (Version 1.1; Lewis, Lamey, & Douglas, 1999), a statistical application used to create state space grids based on dynamic systems principles; (2) PASW Statistics 18.0 (formerly known as SPSS Statistics 18). Hierarchical regressions using PASW Statistics 18.0 were conducted to examine: (1) the prediction of mothers' childhood histories of aggression or aggression *and* withdrawal to mothers' and children's emotional flexibility, and shared expressions during their interactions; (2) whether mothers' and children's emotional flexibility were associated with shared expressions; (3) whether mothers' and children's emotional flexibility and shared expressions were associated with the quality of the mother-child relationship (EA Scales) and children's behavior (CBCL). All analyses conducted included a minimum of 10 participants per predictor variable, which is the recommended minimum required for a hierarchical regression analysis (Tabachnick & Fidell, 1996). The emotional flexibility variables were created using Gridware. A

separate multiple regression was conducted for each emotional flexibility and shared expression variable, as well as for each context (game-playing and conflict tasks). Significant effects are reported in the text, as were trends if they were in line with hypotheses and the literature. Intercorrelations among all variables are provided in Tables 4 (game-playing task) and 5 (conflict task).

In all regressions, predictor variables were entered chronologically, with maternal childhood histories of aggression initially entered in Step 1, and the interaction between levels of aggression and social withdrawal entered in Step 4. Previous research from the Concordia Project has indicated that the presence of both childhood aggression *and* social withdrawal together may be more strongly predictive of negative outcomes than either alone. When the aggression and social withdrawal term was significant, post-hoc regressions were run where social withdrawal was introduced in Step 1 in order to interpret the interaction. The demographic variables of maternal education and child age were included as control variables in Steps 2 and 3, respectively. Previous studies conducted with participants from the Concordia Project have shown associations between these demographic variables and parenting and child outcomes (e.g., Stack et al., 2012). When the overall model was significant or tended toward significance, it was reported as well as the significant step(s). When the overall model was not significant, only the significant steps are reported (see Appendix F for summary tables for regression analyses).

Objective 1: Maternal Childhood Histories of Aggression in the Prediction of Emotional Flexibility

The regressions examining mothers' emotional flexibility tended toward significance. During the game-playing task, $R^2_{Adj} = .11$, $F(4, 45) = 2.48$. $p < .10$, mothers' childhood histories of aggression *and* social withdrawal tended toward significance (*Beta* = -0.30, $p < .10$, $r^2 = .06$). Simple slope analyses indicated that mothers with higher levels of childhood histories of aggression *and* social withdrawal tended to display the least amount of emotional flexibility (Figure 1; Gradient of simple slope = -0.29, $t(49) = -2.27$, $p < .05$). During the conflict task, mothers with higher levels of childhood histories of aggression displayed significantly less emotional flexibility (Step 4; *Beta* = -0.31, $p < .05$, $r^2 = .10$). The regressions examining children's emotional flexibility were not significant across tasks.

Objective 2: Emotional Flexibility and Maternal Childhood Histories of Aggression in the Prediction of Shared Expressions

Mother and child emotional flexibility indices were entered in separate regressions in Step 5. During the game-playing task, the regressions examining dyads' positive expressions tended towards significance. Mothers with higher levels of childhood histories of aggression tended to be members of dyads who spent less time displaying positive expressions (Step 1; when mother's emotional flexibility index was entered *Beta* = -0.25 $p < .10$, $r^2 = .06$; when child's emotional flexibility index was entered *Beta* = -0.26 $p < .10$, $r^2 = .07$). Furthermore, mothers with greater emotional flexibility were members of dyads who spent more time displaying positive expressions, $R^2_{Adj} = .17$, $F(5, 44) = 2.94$, $p < .05$ (*Beta* = 0.41 $p < .01$, $r^2 = .14$). In addition, the regressions examining dyads' neutral expressions were significant, where both children, $R^2_{Adj} = .15$, $F(5, 45) = 1.62$, $p < .10$ (*Beta* = -0.33 $p < .05$, $r^2 = .10$), and mothers, $R^2_{Adj} =$

.17, $F(5, 44) = 2.94$, $p < .05$ (*Beta* = -0.36 $p < .05$, $r^2 = .11$), who displayed more flexibility were members of dyads who spent less time displaying neutral expressions.

During the conflict task, children with greater emotional flexibility tended to be in dyads that spent more time displaying positive expressions (Step 5; *Beta* = 0.29 $p < .10$, $r^2 = .08$). The regressions examining dyads' neutral and negative expressions were not significant.

Objective 3: Associations between Process Variables and Outcomes of Relationship Quality and Child Behavior Problems

Analyses related to the third objective were divided into two parts: (a) and (b) highlighted the associations between the process variables (i.e., emotional flexibility and shared expressions), mother-child relationship quality, and total child behavior problems. For the analyses related to part (a), mother and child emotional flexibility indices were entered in separate regressions in Step 5. For the analyses related to part (b), the shared expression variables (positive and neutral for the game-playing task; positive, neutral, and negative for the conflict task) were entered in separate regressions in Step 5. Given that the predictor variables entered were similar across analyses repeated findings are only reported once. For example, while maternal childhood histories of aggression consistently predicted maternal hostility, the findings are highlighted only the first time this association arose.

(a) Emotional flexibility. During the game-playing task, children who demonstrated greater emotional flexibility displayed better relationship quality, in that they tended to involve their mothers more throughout the interaction (Step 5; *Beta* = .26, $p < .10$, $r^2 = .07$). Furthermore, mothers with higher levels of childhood aggression

displayed lower levels of sensitivity (Step 1; *Beta* = -.29, $p < .05$, $r^2 = .09$) and higher levels of hostility (Step 1; a trend when child's emotional flexibility was entered in Step 5; *Beta* = .26, $p < .10$, $r^2 = .07$; significant when mother's emotional flexibility was entered in Step 5; *Beta* = .36, $p < .05$, $r^2 = .13$). With respect to child behavior problems, mothers' childhood histories of aggression *and* social withdrawal significantly predicted child total behavior problems when children's emotional flexibility index was entered in Step 5, $R^2_{Adj} = .10$, $F(5, 45) = 2.05$, $p < .10$ (*Beta* = .39, $p < .05$, $r^2 = .11$). The interaction indicated that mothers with higher levels of childhood histories of aggression *and* social withdrawal tended to rate their children as having more total behavior problems (Gradient of simple slope = -5.18, $t(49) = -1.97$, $p < .10$). Similarly, when mother's emotional flexibility index was entered in Step 5, maternal childhood histories of aggression *and* social withdrawal tended to predict more child total behavior problems (*Beta* = .37, $p < .05$, $r^2 = .10$; Gradient of simple slopes = -4.51, $t(49) = -1.75$, $p < .10$).

During the conflict task, children who displayed greater emotional flexibility had mothers who demonstrated significantly better relationship quality in that they displayed less hostility, $R^2_{Adj} = .14$, $F(5, 45) = 2.48$, $p < .05$ (*Beta* = -.31, $p < .05$, $r^2 = .09$). In addition, mothers of older children displayed more hostility during the conflict task than mothers of younger children (*Beta* = .37, $p < .05$, $r^2 = .12$). The regressions examining mothers' emotional flexibility and relationship quality during the conflict task were not significant. With respect to child behavior problems, children who displayed greater emotional flexibility were rated by their mothers as having fewer total behavior problems, $R^2_{Adj} = .23$, $F(5, 45) = 4.00$, $p < .01$ (*Beta* = -.34, $p < .05$, $r^2 = .11$). In addition,

older children were rated as having more total behavior problems (*Beta* = .46, $p < .01$, r^2 = .19).

(b) Shared expressions. During the game-playing task, the regressions examining the amount of time dyads displayed positive expressions were associated with better relationship quality. Specifically, dyads that displayed positive expressions for longer periods of time included mothers who demonstrated more sensitivity, R^2_{Adj} = .14, $F(5, 45) = 2.47$, $p < .05$ (*Beta* = .44, $p < .01$, r^2 = .17), and children who involved their mothers more during the interaction, R^2_{Adj} = .19, $F(5, 45) = 3.21$, $p < .05$ (*Beta* = .49, $p < .001$, r^2 = .21). Furthermore, dyads who displayed more neutral expressions included children who involved their mothers less, R^2_{Adj} = .18, $F(5, 45) = 2.96$, $p < .05$ (*Beta* = -.45, $p < .01$, r^2 = .19). With respect to child behavior problems, mothers with higher levels of childhood histories of aggression *and* withdrawal rated their children as having more total behavior problems when dyads' positive and neutral expressions were entered in Step 5 in their respective regressions (Step 4; *Beta* = .39, $p < .05$, r^2 = .11 in both regressions; Gradient of simple slopes for positive expressions = -5.64, $t(49) = -2.13$, $p < .05$; Gradient of simple slopes for neutral expressions = -5.40, $t(49) = -2.05$, $p < .05$).

During the conflict task, the regression examining dyads' neutral expressions were associated with better relationship quality in that dyads that spent more time displaying neutral expressions tended to include mothers who displayed more sensitivity, R^2_{Adj} = .10, $F(5, 45) = 2.06$, $p < .10$ (*Beta* = .42, $p < .01$, r^2 = .15). Dyads' negative expressions were significantly associated with mothers' sensitivity (Step 5; *Beta* = -.35, $p < .05$, r^2 = .11). This finding suggests that dyads that displayed negative expressions for longer periods of time included mothers who displayed less sensitivity. Furthermore,

regressions examining shared neutral expressions were associated with mothers' ratings of their children's total behavior problems, $R^2_{Adj} = .20$, $F(5, 45) = 3.43$, $p < .01$ (*Beta* = -.29, $p < .05$, $r^2 = .08$). Dyads that spent less time displaying neutral expressions included children with more total behavior problems. Finally, older children were rated as having more total behavior problems (*Beta* = .46, $p < .01$, $r^2 = .19$).

Discussion

In accordance with the overarching goal of the present study, the main contributions were twofold. First, the present findings helped to expand our understanding of the moment-to-moment processes at the individual and dyadic levels that may underlie the expression of emotion during mother-child interactions in a high-risk community sample. Second, the study addressed some of the shortcomings in the research regarding our knowledge of *individual* emotional flexibility during dyadic interactions during middle childhood, the role of shared neutral expressions, and how the structure *and* the content of the interactions can vary according to contextual demands.

Maternal Childhood Histories: Relation to the Underlying Processes of the Interaction

The hypotheses associated with the high-risk status of the sample (i.e., mothers' childhood histories of aggression or aggression *and* social withdrawal) and their relation to the process variables, were partially supported. Mothers' emotional flexibility was predicted by their childhood risk status, while children's emotional flexibility was not. Mothers with higher levels of aggression and aggression and withdrawal combined tended to display less emotional flexibility across contexts (i.e., game-playing and conflict tasks). With respect to the second objective, dyads including mothers with higher

levels of childhood aggression tended to spend less time sharing positive expressions during the game-playing task. These findings, although trends and therefore requiring cautious interpretation, are in line with current research suggesting that positive affect and flexibility tend to occur together in adaptive interactions (Lukenheimer et al., 2011) by showing that *less* positive affect and flexibility (i.e., more rigidity) may have been more common in dyads with histories of maladaptive interaction patterns. Furthermore, the results are consistent with the existing literature suggesting that maladaptive behaviors in childhood and later parenting are one mechanism for the transfer of risk in high-risk families (Serbin & Karp, 2004; Stack et al., 2010). In particular, research from the Concordia Project has shown that childhood histories of aggression and aggression and withdrawal affect subsequent parenting, increasing the probability of negative interactions between mothers and their children (e.g., Grunzeweig, Stack, Serbin, Ledingham, & Schwartzman, 2009; Martin et al., 2012; Serbin et al., 2011; Stack et al., 2012; Stack et al., 2005).

Results from the present study provide additional evidence for the relation between mothers' childhood risk status and problematic parenting behaviors: mothers with higher levels of childhood aggression displayed more hostility (and less sensitivity) during the game-playing task. While some of the findings only tended toward significance, the association between mothers' childhood histories of aggression and problematic parenting practices (i.e., increased hostility) is consistent with and may provide further evidence for the stability of aggression over time (Serbin et al., 2011), and has been found to influence how children and parents interact over time (e.g., Patterson, 2002). Furthermore, mothers with higher levels of childhood aggression and

withdrawal rated their children as having more total behavior problems. These findings, while somewhat tentative, are suggestive of the link between mothers' maladaptive behavior patterns in childhood and the perceived emergence of behavior problems in their offspring (e.g., Serbin et al., 2011; Stack et al., 2005). In addition, adverse mother-child interaction patterns have been related to the emergence and maintenance of problem behavior in children in past studies (e.g., Calzada, Eyberg, Rich, & Querido, 2004; Stack et al., 2012). In other research using state space grids, there is some evidence to suggest that the development of negative cycles of interaction, as well as children's behavior problems, are related to rigid (i.e., inflexible) moment-to-moment interaction patterns (e.g., Granic et al., 2007; Lukenheimer et al., 2011). Consistent with these results, our findings suggested that children with less emotional flexibility were rated as having more behavior problems by their mothers.

Individual Emotional Flexibility

Given that the individual structure of the interactions (i.e., mother and child individual emotional flexibility) was uniquely related to mothers' childhood histories of aggression and children's current behavior problems, results from the present study support the notion that examining emotional flexibility separately (instead of at the dyadic level) for high-risk mothers and children is a venue worthy of continued exploration. This was further evidenced through the examination of individual emotional flexibility and the duration of shared (i.e., dyadic) expressions. Children who displayed more flexibility were included in dyads that spent *less* time displaying shared neutral expressions during the game-playing task, and tended to spend more time displaying shared positive expressions during the conflict task. Mothers who demonstrated greater

emotional flexibility during the game-playing task were also in dyads that spent *less* time displaying shared neutral expressions and *more* time displaying positive expressions. Examining the relationships between individual and dyadic measures with dynamic systems measures provides a clearer picture of the processes underlying the stability and the changes that occur over time during mother-child interactions. In addition, understanding how the structure and the content of the interaction relate to each other enhanced our knowledge of the interplay between these process variables and mother and child outcome variables.

Duration of Shared Expressions and Relationship Quality

Interestingly, duration of shared positive expressions had a much stronger link with the overall quality of the relationship (maternal sensitivity and hostility; child involvement) than mother or child emotional flexibility. In fact, only child emotional flexibility was associated with relationship quality: children with greater flexibility tended to involve their mothers more during the game-playing task and had mothers who displayed less hostility during the conflict task. This suggests that while mothers' emotional flexibility was being influenced by their personal histories as children, their offspring's emotional flexibility appeared to have a somewhat stronger association to the dyad's "here-and-now" relationship quality.

With respect to duration of shared expressions and relationship quality, more time spent sharing positive expressions and *less* time sharing neutral expressions during the game-playing task was associated with more maternal sensitivity and children being more involving of their mothers. During the conflict task, dyads that spent *more* time displaying shared positive *and* neutral expressions and less time displaying shared

negative expressions were associated with more maternal sensitivity. The results regarding shared positive and negative expressions were in accordance with the hypotheses and the current literature examining shared expressions (Denham et al., 2002; Harrist & Waugh, 2002; Lindsey et al., 2008). However, the link between shared neutral expressions and relationship quality appeared to be dictated by the context. As noted previously, mothers and children with greater emotional flexibility spent less time displaying shared neutral expressions during the game-playing task. Furthermore, dyads that spent less time sharing neutral expressions had better relationship quality, suggesting that during a playful, positive context, sharing neutral expressions for an extended period of time is related to maladaptive interpersonal interactions. Interestingly, shared neutral expressions played a different role in the conflict task: longer duration of shared neutral expressions, similar to longer durations of shared positive expressions, was associated with an adaptive interpersonal exchange. The apparently more adaptive relationship between shared neutral expressions and the conflict task context was further corroborated when examining children's behavior problems.

Process Variables and Child Behavior Problems

The hypotheses regarding the associations between the process variables and child behavior problems were partially supported. As anticipated, children with greater emotional flexibility were rated by their mothers as having fewer behavior problems. With respect to the duration of shared expression variables, dyads that spent more time sharing neutral expressions during the conflict task included children with fewer total behavior problems. Results from the present study thus corroborate the association between these process variables (flexibility and shared expressions) and their importance

to healthy child development (e.g., Granic & Hollenstein, 2003). Of note, there was no association between shared neutral expressions measured during the game-playing task and child behavior problems; these distinct findings across tasks again highlight the importance of context when examining the structure and content of nonverbal emotion communication.

Neutral Expressions during Mother-Child Interactions

Across the objectives and results of the present study, context was an important factor in the interpretation of shared neutral expressions, its relation to emotional flexibility, and its association to relationship quality and child behavior problems. Indeed, the findings suggest that in middle childhood, context is an important indicator of how one expresses oneself during the course of an interaction. There is some support for this contention in the literature, where school-age children, unlike preschoolers, have been shown to use the context to interpret emotional expressions (e.g., Nelson & Russell, 2011) and have developed expectations for the self and other regarding the display rules for a given situation (Collins & Madsen, 2003). Neutral expressions may be perceived as dullness, withdrawal, or aloofness (DePaulo, 1991), all of which do not promote positive exchanges. It appears that sharing neutral expressions for an extended period of time during a playful activity (i.e., playing a game) may be a violation of the expectations (i.e., display rules) children and mothers have of each other during such a context (Steinberg & Silk, 2002).

Game-Playing versus Conflict Tasks

It was somewhat surprising that across objectives and results, the game-playing task, a relatively short (four minute), positive and playful activity, generated many

findings. Studies tend to use conflictual or problem-solving type discussions when examining process variables (e.g., emotional expression) and their relation to child outcomes (e.g., Branje, 2008; Granic, Hollenstein, Dishion, & Patterson, 2003; Granic & Lamey, 2002), as it is assumed that there will be a larger range of emotion behavior (Hollenstein et al., 2004). However, the game-playing task generally provided more information with respect to nonverbal emotion communication. Perhaps engagement in a primarily *nonverbal* activity where discussion tended to focus around the game helped prevent the masking or suppressing of emotional expressions throughout the exchange. As research suggests that it is more difficult to suppress the expression of nonverbal than verbal communication (e.g., Burgoon & Bacue, 2003; Planalp, 1999), perhaps the lack of pressure to interact verbally allowed the dyads to interact more naturally while playing the game of Jenga. Another possibility is that the game-playing task, a nonverbal activity, just fit better with the key cues: nonverbal facial expressions. More research is needed with dyads engaged in positive activities, as it will help augment our understanding of *how* the nature of the context may influence the interaction.

Control Variables

Beyond the structure, content, and outcome variables, child age provided some additional findings. The results suggest that older children were typically involved in more negative patterns of interaction with their mothers. Mothers were found to display more hostility when interacting with older children, and older children were rated by their mothers as having more total behavior problems than younger children. It may have been that the older children (11- to 13-years of age) have begun the transition into adolescence. Research has shown a decrease in positive affect and positive interactions between

parents and their pre-adolescent children (Steinberg & Silk, 2002). Thus, what could be considered negative interaction patterns may be reflecting changes in the mother-child relationship as children transition into early adolescence.

Conclusions: Limitations, Contributions, and Future Directions

Taken together, results support and extend research examining emotional flexibility and its role in mother-child relationships during middle childhood. Despite the significance and importance of these findings, some limitations must be noted, including a relatively small sample size, time-limited tasks, the non-causal nature of the analyses, and the caution required in interpreting some of the findings that only tended toward significance. However, the contributions of the findings outweigh the limitations. For example, the integration of multiple contexts and multiple measures (semi-naturalistic observations and questionnaires) allowed for a more comprehensive examination of both the structure and content of nonverbal emotion communication. This study was the first to examine mother and child emotional flexibility as separate measures, highlighting the importance of each person's individual histories to the mother-child relationship and child outcomes. These findings provide some evidence for the unique role that mothers and children, while interacting as a dyad, are individually bringing to the interaction. The examination of sources linked with individual differences in parent-child interaction, such as social and economic factors (e.g., SES, social support, parenting stress, child gender and age, etc.; Serbin & Karp, 2004; Serbin et al., 2011; Steinberg & Silk, 2002) and the unique contributions of such factors to mothers', children's, and the dyads' emotional flexibility is an avenue worthy of future research. The role that shared neutral affect played during the interactions and how it changed across contexts was also

noteworthy, suggesting that neutral expressions provide important information during social exchanges. Further examination of neutral expressions in tandem with positive and negative expressions of emotion is needed to increase our understanding of this understudied state (e.g., compare the duration to the frequency of shared expressions). Finally, the use of a game-playing task contributes to research regarding positive contexts, particularly when investigating process variables. Results suggest that positive contexts should not be discounted as a venue for fruitful information about mother-child exchanges.

In summary, our study began to address some gaps in the literature by extending our understanding of the context-dependent role of shared neutral expressions, and provided evidence for the information that can be gained when examining a positive context. Furthermore, this is the first study to examine the process variables of *individual* emotional flexibility and the duration of shared positive, negative, *and* neutral expressions (content) across two contexts in high-risk mother-child dyads when children were in middle childhood -- an important developmental period of expanding social networks (Denham et al., 2002). Given the intricate links between social and emotional competencies more generally (e.g., Saarni, 2008) and emotional expressiveness and social interactions more specifically (e.g., Planalp, 1999), understanding the processes underlying the emotion exchanges between mothers and their school-age children promotes and expands our conceptualization of how and when relationship quality and child behavior problems unfold during this developmental period.

Table 1

Means, Standard Deviations, and Ranges of Maternal Childhood Histories of Aggression and Withdrawal, Demographic Information, EA Scales, and CBCL Mother Ratings

	Mean (*n*)	**Standard Deviation**	**Range**
Mothers' aggression (z-score)	0.30 (51)	1.13	-1.59-2.96
Mothers' withdrawal (z-score)	0.54 (51)	1.04	-0.74-2.69
Mothers' current age (years)	37.52 (51)	2.40	32.72-42.49
Mothers' age at first child (years)	24.75 (51)	2.80	17.42-29.73
Mothers' education (years)	12.61 (51)	2.54	7.00-17.00
Occupational prestige[a]	38.51 (51)	12.01	19.00-62.00
Children's age at testing	10.92 (51)	1.00	9.49-13.29
Maternal sensitivity	6.95 (47)	1.46	1.00-9.00
Maternal structuring	4.16 (47)	0.99	1.00-5.00
Maternal hostility	1.43 (47)	0.93	1.00-4.50
Child responsiveness	5.68 (47)	1.12	2.50-7.00
Child involvement	5.52 (47)	1.29	1.00-7.00
Total child behavior problems	54.13 (51)	11.48	26.00-76.00

Note. The Standard International Occupational Prestige Scale was used to rate the occupational prestige (SIOPS; Treiman, 1977). [a]Mean occupational prestige ratings correspond to the following occupations: technician, sales worker, and clerical worker.

Table 2

Emotion Behavior Coding Scheme (EBCS; Enns & Stack, 2007): Operational Definitions for Child and Mother Facial Expressions

CATEGORY	DEFINITIONS
SMILING	Facial expressions that may show amusement, satisfaction, affection, and that are characterized by a lateral and upward movement of the lips and cheeks. Lips are either together, parted, mouth is open, and/or teeth are showing. A slight smile is also to be coded as under this behavior.
NEUTRAL	Facial expressions which show a lack of emotion (i.e., do not qualify as any of the abovementioned expressions), which are characterized by straight but relaxed mouth, relaxed eyebrows, and a smooth forehead.
UNFELT SMILING	Facial expressions that may show dissatisfaction, annoyance, lack of affection, exasperation, or anxiousness, and that are characterized by a lateral and upward movement of the lips and cheeks. Mouth may be open or closed, and teeth may or may not be showing.
FROWN/LOOK UPSET	Facial expressions that may show dissatisfaction, concentration, annoyance or exasperation, and that are characterized by brows sharply down and together, wrinkled forehead, narrowed eyes, and/or lips that are either pressed together tightly and/or mouth is drawn downward.
LOOK SAD/DISTRESSED	Facial expressions that may show unhappiness, misery, or sorrow and that are characterized by inner brows drawn together, squinted eyes and/or eyes cast downward, downward-turned mouth, and/or a pout. This facial expression may also include signs of anxiety,

	nervousness, or distress, and are characterized by eyelids raised (shows more white than usual, straight brows slightly drawn or eyebrows raised, and/or mouth corners tight or retracted.
NO CODE	Facial expressions that may not be coded due to either the mother or the child's mouth being difficult to view for 1 second or more. This may occur because the head is turned away from the camera, the mother or the child covers his/her mouth/face with hands or arms, or the mother or child leaves the area that the camera is filming. If it is clear from mouth, eyes, and/or eyebrows that one is smiling, upset, sad, etc., then code as such. As soon as it is difficult to tell, code as No Code.

Table 3

Emotional Flexibility and Expression Variables for Children, Mothers, and Dyads: Means, Standard Deviations (SD), and Ranges (Proportions)

	Mean	**SD**	**Range**
GAME-PLAYING TASK			
Child Emotional Flexibility			
Transitions	30.14	8.80	8.40-45.00
Dispersion	0.54	0.12	0.06-0.69
Average Mean Duration	8.57	3.59	5.22-25.49
Emotional Flexibility Index	0.00	1.00	-4.27-1.34
Mother Emotional Flexibility			
Transitions	20.44	9.46	1.00-44.00
Dispersion	0.48	0.15	0.12-0.69
Average Mean Duration (N = 50)	13.48	6.85	5.33-34.29
Emotional Flexibility Index (N = 50)	0.00	1.00	-2.58-1.89
Duration of Shared Expressions			
Positive Expressions	46.23	38.71	0.00-138.00
Neutral Expressions	83.34	43.08	17.00-181.00
CONFLICT TASK			
Child Emotional Flexibility			
Transitions	43.05	19.17	9.00-90.00
Dispersion	0.65	0.18	0.23-1.00
Average Mean Duration	11.41	7.41	3.96-40.00
Emotional Flexibility Index	0.00	1.00	-2.77-1.62
Mother Emotional Flexibility			
Transitions	30.29	15.86	0.00-77.00
Dispersion	0.51	0.19	0.00-1.00

Average Mean Duration (N = 50)	16.13	10.95	4.62-60.00
Emotional Flexibility Index (N = 50)	0.00	1.00	-3.00-2.03
Duration of Shared Expressions			
Positive Expressions	29.90	37.11	0.00-192.00
Neutral Expressions	88.66	63.64	0.00-294.00
Negative Expressions	46.61	61.48	0.00-242.67

Table 4

Intercorrelations between Child and Mother Emotional Flexibility Variables, Shared Expressions, and Predictor Variables during the Game-playing Task (Zero-Order)

	1.	2.	3.	4.	5.	6.	7.	8.	9.	10.	11.
1. Aggression	--										
2. Aggression x Withdrawal	.52***	--									
3. Maternal Education	-.16	-.04	--								
4. Child Age	.10	.11	-.26^{t}	--							
5. Mother Emotional Flexibility	-.22	-.32*	-.12	.23	--						
6. Child Emotional Flexibility	.06	-.03	.09	-.16	.30*	--					
7. Dyad Positive Duration	-.25^{t}	-.18	-.05	-.19	.37**	.06	--				
8. Dyad Neutral Duration	.14	.21	.04	.05	-.36*	-.32*	-.73***	--			
9. Mother Sensitivity	-.23	-.19	.06	-.10	-.03	-.09	.46***	-.22	--		
10. Mother Structuring	.00	-.10	.22	-.04	-.15	-.01	.38**	-.27^{t}	.75***	--	
11. Mother Hostility	.26^{t}	.32*	-.19	.11	-.07	.04	-.24	.09	-.59***	-.53***	--
12. Child Responsiveness	-.14	-.18	.11	-.19	-.03	.15	.44**	-.34*	.67***	.55***	-.35*
13. Child Involvement	-.06	-.13	.20	-.18	.14	.30*	.46***	-.45***	.40**	.37*	-.18
14. Total CBCL	.03	.31*	-.11	.24^{t}	-.12	-.16	-.12	.02	-.25^{t}	-.34*	.33*

^{t} <.10, *p < .05, **p < .01, *** p < .001.

(Table 4 continued)	12.	13.	14.
12. Child Responsiveness	--		
13. Child Involvement	.72***	--	
14. Total CBCL	-.13	.03	--

Table 5

Intercorrelations between Child and Mother Emotional Flexibility Variables, Shared Expressions, and Predictor Variables during the Conflict Task (Zero-Order)

	1.	2.	3.	4.	5.	6.	7.	8.	9.	10.	11.
1. Aggression	--										
2. Aggression x Withdrawal	.52***	--									
3. Maternal Education	-.16	-.04	--								
4. Child Age	.10	.11	-.26^{t}	--							
5. Mother Emotional Flexibility	-.31*	-.30*	.05	-.11	--						
6. Child Emotional Flexibility	-.02	.04	.20	-.22	.09	--					
7. Dyad Positive Duration	-.10	-.14	-.08	-.07	.22	.26^{t}	--				
8. Dyad Neutral Duration	-.08	.02	-.22	.25^{t}	.01	-.13	.08	--			
9. Dyad Negative Duration	-.10	-.19	.08	.11	.20	.20	.12	-.43**	--		
10. Mother Sensitivity	.21	.14	-.02	.02	-.10	.03	-.03	.35*	-.35*	--	
11. Mother Structuring	-.02	-.02	.07	-.08	-.11	.17	-.02	.15	-.20	.75***	--
12. Mother Hostility	-.04	.10	.08	.31*	-.08	-.32*	-.18	-.08	.08	-.59***	-.53***
13. Child Responsiveness	.08	.10	-.14	.19	.15	-.01	-.13	.43**	-.23	.67***	.55***
14. Child Involvement	.10	.05	-.21	.27^{t}	.08	.05	-.04	.28^{t}	-.18	.40**	.37*
15. Total CBCL	.04	.09	.06	.41**	-.02	-.38**	-.01	-.18	.08	-.25^{t}	-.34*

$^{t}p < .10$, $*p < .05$, $**p < .01$, $*** p < .001$.

(Table 5 continued)	12.	13.	14.	15.
12. Mother Hostility	--			
13. Child Responsiveness	-.35*	--		
14. Child Involvement	-.18	.72***	--	
15. Total CBCL	.33*	-.13	.03	--

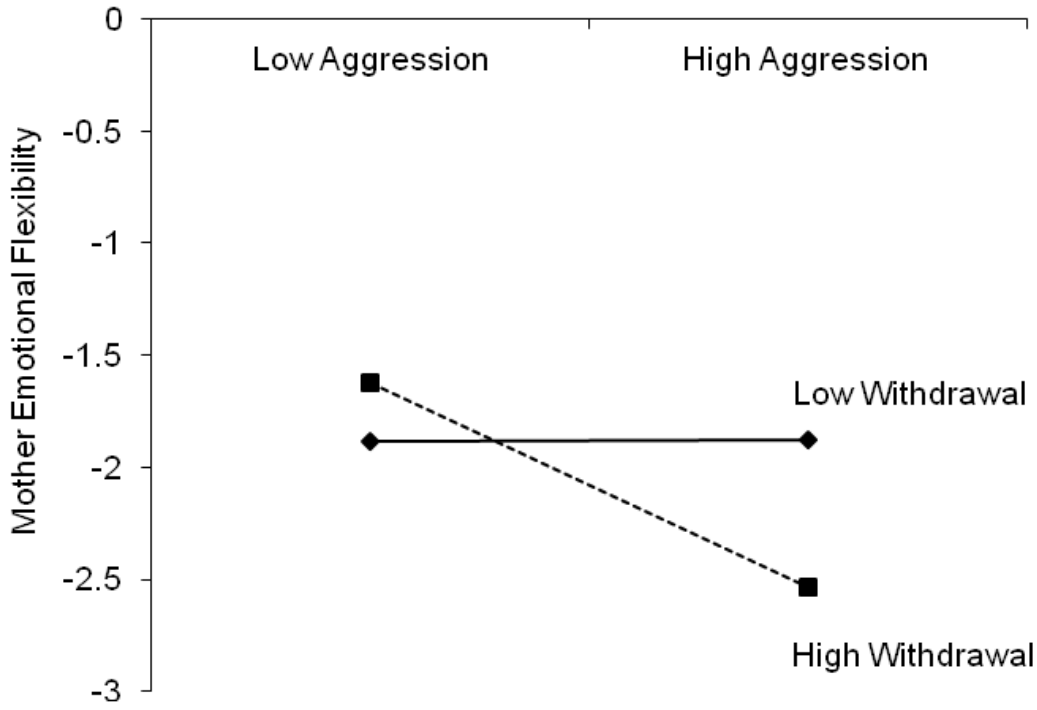

Figure 1. Associations between mothers' emotional flexibility and maternal childhood histories of aggression and withdrawal.

Chapter 3: Transition Statement between Study 1 and Study 2

Results from Study 1 contributed to the current literature by expanding our understanding of the moment-to-moment processes underlying the expression of emotion that were examined at the individual (flexibility) and dyadic (shared expression) levels during mother-child interactions. The associations between the process variables, maternal childhood histories of maladaptive behaviors, the mother-child relationship, and child behavioral functioning provided further evidence of how the patterns of interactions between mothers and their children influence and are influenced by each member individually and the dyad as a whole. Consistent with Study 1, Study 2 was designed to focus on mother and child nonverbal emotion communication behaviors, specifically the process with which emotional flexibility and shared expressions unfold. While much of the emotion behavior literature focuses on facial expressions, recent research suggests that micro-analytic coding of discrete behaviors, while informative, does not reflect the fact that individuals tend to communicate emotion using a number of different nonverbal (and verbal) cues (Coan & Gottman, 2007; Planalp, 1999). It has been suggested that research should attempt to use broader categories of emotion behavior codes to describe emotion communication between individuals. To this end, Study 2 was designed to extend Study 1 through exploring the implications of mothers' and children's nonverbal emotion communication beyond facial expressions by combining a number of discrete, nonverbal behaviors based on categories from the Specific Affect Coding System (SPAFF; Gottman, McCoy, Coan, & Collier, 1995).

Using broader categories or constructs of emotion behaviors, Study 2 was designed to address gaps in the literature by extending our understanding of the interplay

between positive and neutral expressions and their relation to the structure of mother-child interactions during a positive and playful activity. Using innovative methodologies and statistical applications, Study 2 was designed to provide more detail on the potential differences in how dyad, mother, and child flexibility variables relate to process variables (i.e., frequency and duration of shared expressions), as well as additional psychosocial and demographic variables (e.g., measure of current social-emotional support and stress experienced by the dyad; maternal education, child gender, duration of dyad verbal communication).

Findings from Study 1 highlighted important areas that have been neglected in the dynamic systems literature. First, the results strongly support the notion that examining emotional flexibility separately for mothers and children is a line of research worth exploring in addition to the continued measurement of the structure of interactions at the dyadic level. Despite the results being concurrent, examining each member's flexibility and what they are bringing to the interaction embraces the idea that both mother and child are active agents in the creation and ongoing maintenance of social interchange (Granic, 2000; Kuczynski, 2003). Study 2 was designed to address in more detail the potential differences in *how* dyadic, mother, and child flexibility variables related to process variables (i.e., frequency and duration of shared expressions), as well as verbal communication and psychosocial and demographic variables. Second, context appeared to play a noteworthy role in whether or not predictions between mothers' childhood histories of maladaptive behavior, the process variables (flexibility and shared expressions), and the outcome variables would surface. Across objectives and results in Study 1, the game-playing task, a relatively short (4-minute), positive and playful

activity, generated many of the findings. More research is needed with dyads who are engaged in positive activities. In so doing, it may help to improve our understanding and the level of detail as to *how* the nature of a positive, highly nonverbal context influences mother-child interactions during middle-childhood. Study 2 was designed to explore some of these issues in greater depth.

Chapter 4: Dissertation Study 2

Nonverbal Emotion Communication during a Game-Playing Task: The "How" Behind Positive Mother-Child Interactions

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Nonverbal Emotion Communication during a Game-Playing Task: The "How" Behind Positive Mother-Child Interactions

Essential to communication are the abilities to express and regulate emotions. Emotions expressed during dyadic interactions, verbally or nonverbally, convey intimacy and level of support, inform others of our motivations (e.g., concerns, needs, desires, and beliefs) and can influence the behavior of others during interactions (Fischer & Manstead, 2008). It has been argued that nonverbal communication in particular is critical during face-to-face interactions across development, from infancy to old age (Riggio & Riggio, 2012). Despite its importance, researchers tend to focus more on verbal communicative patterns as soon as children learn how to express themselves verbally. Yet, nonverbal communication at any age is highly informative, as it is used, either consciously or unconsciously, as a means to communicate information regarding our internal states, attitudes, and feelings (LaPlante & Ambady, 2003). Research has shown that when a discrepancy between verbal and nonverbal messages arise, individuals are especially likely to believe the nonverbal cues (see Burgoon & Bacue, 2003 for a review). Consequently, displays of emotions, which are by and large nonverbal and intended for others (i.e., nonverbal *emotion* communication), allow people to read changes in emotional states and behaviors throughout social exchanges (Mahady Wilton, Craig, & Pepler, 2000).

Nonverbal Emotion Communication

The ability to accurately send and receive emotionally-expressive messages, nonverbally or verbally, is important in children's relationships and for later emotional and social functioning (Gentzler, Contreras-Grau, Kerns, & Weimer, 2005; Gentzler,

Kerns, & Keener, 2010). It has been well established that displays of nonverbal emotion behavior are a critical mode of communication in infancy and preschool-age children (e.g., Doherty-Sneddon, 2003). However, these displays receive much less attention in middle childhood despite recent evidence of their continued importance during this developmental period (Enns, Barrieau, Stack, Serbin, Ledingham, & Schwartzman, under revision; Enns, Stack, Serbin, Ledingham, & Schwartzman, Chapter 2; Harrist & Waugh, 2002). Thus, nonverbal emotion communication that includes learning the appropriate (for the context) expression, recognition, and regulation of emotion in social situations, is an essential component of developing emotional competence (Saarni, 2008).

Nonverbal emotion communication can be displayed using many nonverbal channels (e.g., facial expressions, eye movements, posture; Planalp, 1999). Individuals tend to exhibit a wide range and combination of nonverbal behaviors during social interactions, providing considerable information about arousal levels, attitudes about a specific situation, and what is being attended to in that context (Gratch & Marsella, 2006; Planalp, 1999; Planalp, DeFrancisco, & Rutherford, 1996). Given the amount of information that needs to be taken into account when examining nonverbal communication, coding schemes using discrete behaviors (i.e., micro-codes) have been expanded to include an examination of the discrete behaviors in the combinations and contexts in which they are presented and describing them with theoretically-contrived constructs (i.e., macro-codes) that represent emotion communication behaviors in their more generalized terms. For example, displays of shared smiling and laughing during a social interaction, instead of being coded as discrete behaviors, would be coded under the construct of *humor.* One such well established measure that codes emotion constructs is

the Specific Affect Coding Scheme (SPAFF; Coan & Gottman, 2007). SPAFF codes were originally created for the examination of verbal *and* nonverbal affective content in the context of conflict between married couples (Gottman, McCoy, Coan, & Collier, 1995) and parent-child interactions (e.g., Hollenstein, Granic, Stoolmiller, & Snyder, 2004; Hollenstein & Lewis, 2006). However, recent research has suggested that verbal and nonverbal communication can be related to different facets of the parent-child relationship, as well as to child outcomes, such as positive social behaviors (Enns, Barrieau et al., under revision), highlighting the importance of examining verbal and nonverbal communication separately, particularly in the context of parent-child interactions. Furthermore, research on emotion development, as a whole, tends to focus on the associations between negative emotions and concurrent or future negative outcomes (e.g., child behavior problems). To assess emotional displays (negative as well as positive), observational measures are often used to code behaviors within the context of conflict and problem-solving tasks (Steinberg & Silk, 2002). However, a recent study has shown that nonverbal emotion communication, while certainly telling and meaningful in conflict tasks, may be particularly relevant to more positive and playful interactions where verbal exchanges are not necessary to complete the goal of the interaction (Enns, Stack, et al., Chapter 2).

Processes of Dynamic and Bi-Directional Interactions

Regardless of how emotion communication is examined, the vast majority of research is concerned with how verbal and/or nonverbal communication are both related to outcomes, thereby overlooking the *processes* through which these outcomes occur (Kuczynski, 2003). Given the bidirectional nature of parent-child interactions, recent

research has emphasized the importance of examining the processes underlying the dynamic transformation of interactions, the shared influence of parents and children as active agents during these interactions, and how the context impacts the developing processes taking place within the interactions (e.g., Saarni, 2008). A dynamic systems perspective embraces bidirectional and transactional processes and emphasizes the stability and variability in both real-time behavior and developmental change. It views the world as operating in systems, both within ourselves (feelings, thoughts, and actions) and between individuals. These systems develop stable patterns of interacting over their many exchanges together (called *attractors*), which can develop functionally or dysfunctionally as they become ingrained in a dyad's relationship history (Fogel, 2011). Many factors contribute to the history of the mother-child relationship and the patterns of their interaction style, such as socio-economic status, mothers' educational attainment, child gender, and the level of perceived parenting stress and social support (e.g., Collin & Madsen, 2003; Harrist & Waugh, 2002; Serbin, Stack, Kingdon, Mantis, & Enns, 2011; Stack, Serbin, Schwartzman, & Ledingham, 2005; Stack et al., 2012; Steinberg & Silk, 2002). In the study of emotional development, examining factors within the dyad, including the content or displayed behaviors during an interaction, and also the underlying structure or orientation, contribute to our understanding of the patterns of relating between mothers and children. A dynamic systems perspective suggests that one way to capture the transactional, process-oriented structure of dyadic interactions using the processes underlying mothers' and children's nonverbal emotion communication is to examine their *emotional flexibility* (e.g., Granic & Lamey, 2002; Hollenstein, 2007).

Emotional flexibility. Emotional flexibility is a dyadic, process-oriented variable that captures the movement from one emotional state to another during parent-child interactions. It can be broken down into components of flexibility, variability, and rigidity, each of which uniquely contributes to emotional flexibility. Hollenstein (2012) has suggested that flexibility can be measured using transitions (movement between behaviors), variability using the measurement of dispersion (the proportion using the number of behaviors displayed and the duration of an interaction), and rigidity using average mean duration (AMD; duration of one behavior; see the Method section for more detail). There is increasing evidence that flexible dyads share the same nonverbal behaviors at the same time, suggesting a mutual understanding of their present context. For example, dyads that demonstrate more emotional flexibility (i.e., more flexibility, more variability, and less rigidity) result in better outcomes for children [e.g., fewer behavior problems (Granic & Lamey, 2002), fewer adjustment problems (Hollenstein et al., 2004), as well as better relationship quality (Branje, 2008)].

To date, emotional flexibility has been considered a dyadic variable. However, solely examining emotional flexibility at the level of the dyad has created a gap in the existing literature as the individual parent and child characteristics inherent in this relationship have been overlooked. Each member of any dyad brings unique characteristics to an interaction (e.g., behavior problems experienced by the parent as a child; age and gender of offspring; current levels of support and stress; e.g., Collin & Madsen, 2003; Enns, Stack et al., Chapter 2; Stack et al., 2012) from their combined as well as individually experienced pasts. These individual characteristics need to be taken into account when examining interactions to understand the processes and to develop

successful interventions (Kelly & Barnard, 2000). For example, Enns, Stack et al. (Chapter 2) found that mothers with childhood histories of aggression and aggression and withdrawal demonstrated less emotional flexibility with their children. In contrast, children's levels of emotional flexibility were unrelated to their mothers' childhood histories, but children who displayed more flexibility were found to have fewer total behavior problems (which were unrelated to mothers' emotional flexibility). Furthermore, emotional flexibility has typically been examined in relation to outcome variables (e.g., child behavior problems; adjustment problems; see Hollenstein, 2007 for a review), while the interaction between the structure and the content *during the process* of parent-child exchanges tends to be understudied. Taken together, an examination of individual emotional flexibility in addition to the dyadic flexibility as outcome variables is warranted in order to better understand the complexities of these processes during mother-child interactions.

Shared expressions. How flexible, variable, and/or rigid a dyad is during an interaction is based in part on the responsiveness of the dyad and the context in which their exchange is taking place (Isen, 2008). An important measure of responsive interaction is affective attunement (DeOliveira, Bailey, Moran, & Pederson, 2004). Affective attunement can be measured by examining the content of the interaction, which is the shared (i.e., synchronized) behaviors displayed during mother-child interactions. Shared expressions play a role in the development of emotion-related competencies and are integral to the socialization of emotion (Harrist & Waugh, 2002), with lower levels of shared expressions found to be related to more negative emotion displays and maladaptive child outcomes more generally (Harrist & Waugh, 2002; Moore et al., 2012).

Notably, much of the research on shared expressions focuses on negative emotions displayed during interactions between mothers and their infants. However, recent studies have made two important contributions to this literature, demonstrating how adaptive positive (Lukenheimer, Olson, Hollenstein, Sameroff, & Winter, 2011), and positive and *neutral* (depending on the context; Enns, Stack et al., Chapter 2) expressions can be when shared between parent(s) and their *school-age* children. Enns, Stack et al. (Chapter 2) demonstrated that shared neutral expressions can be either adaptive or non-adaptive based on the context (i.e., adaptive during a conflict task but non-adaptive during a game-playing task). The present study was designed to examine in more detail interactions involving shared high- and low-intensity positive (e.g., enthusiasm, enjoyment) and neutral (e.g., engagement) nonverbal emotion communication in middle childhood in order to better understand the processes underlying shared affect during these mother-child interactions.

Research is needed to elucidate the important role that shared positive and neutral expressions play during mother-child interactions during middle childhood, an often neglected developmental period particularly when examining nonverbal emotion communication. In the examination of parent-adolescent interactions during problem-solving and conflict tasks, studies suggest that these exchanges include more frequent but shorter durations of affective behavior, and increased negative emotions and a slight decrease in positive emotions (Steinberg & Silk, 2002). While these authors highlight the importance of examining both the frequency and duration of negative and positive emotions, it is more common for observational studies to focus on the frequency *or* duration of *negative* emotions during *conflictual* parent-child interactions. Less is known

about the unique contributions of the frequency *and* duration of positive and neutral nonverbal emotion communication during positive parent-child interactions in middle childhood, despite the importance of nonverbal cues for the development of prosocial skills (e.g., Denham, von Salisch, Olthof, Kockanoff, & Caverly, 2002).

Psychosocial Risk Factors and the Mother-Child Relationship in Middle Childhood

During middle childhood, there are shifts that occur in the parent-child relationship, such as helping to build and maintain positive relationships beyond the family (e.g., peers, school), encouraging and teaching children to take responsibility for the management of their own behavior, as well as changes in processes of control within the relationship (Collins & Madsen, 2003). Despite these adaptations, the mother-child relationship continues to be critical to enhancing and promoting emotion-related competencies (Denham et al., 2002; Saarni, 2008). In more disadvantaged families, lower SES and less social support/more isolation can place a considerable strain on parenting, leading to increased parental stress and less child support and stimulation in the home (e.g., Stack et al., 2012). When families face these types of stressors, the modelling, coaching, and even the discussion of emotions can become disrupted by parents appearing to become indifferent towards their children's emotional growth and thus stunting their developing socio-emotional competence (Steinberg & Silk, 2002). Research from the Concordia Longitudinal Risk Project (Concordia Project), a historically disadvantaged community sample with histories of psychosocial risk and problems with peer relations, has provided ample evidence of the associations between problematic parenting practices, low SES, low maternal education, and mothers' childhood histories of aggression and/or social withdrawal (see Serbin et al., 2011 for a

review). However, the concept of risk is inherently probabilistic and therefore some individuals from moderate to high-risk backgrounds are likely to develop well despite their apparently poor prospects in infancy or early childhood. Hence, within an at-risk population, it is expected that there will likely be a range of adaptation and competence across the lifespan. The Concordia Project provides a unique opportunity to study the intergenerational transfer of psychosocial risk as it plays out in parenthood, as well as help to determine the processes and protective factors that predict positive outcomes for children within an ‘‘at-risk’’ population. Within the context of the Concordia Project sample, the present study was designed to contribute to the literature by examining the underlying processes (i.e., the *how* behind the interaction) of nonverbal positive and neutral emotion communication between mothers and their school-age children, an area of study that has received little, if any, research to date.

Objectives

The present study included a subsample of mothers and school-age children from the Concordia Project. The overarching goal was to investigate in greater detail the interplay between the moment-to-moment processes (emotional flexibility and shared positive and neutral nonverbal emotion communication) during a game-playing task. Based on findings from Enns, Stack et al. (Chapter 2), the dynamic systems (e.g., Lukenheimer et al., 2011), and the emotional development literatures (e.g., Isen, 2008), it was hypothesized that dyads, mothers, and children who demonstrated more emotional flexibility (i.e., more transitions, greater dispersion, and lower AMD values) would also display shared enthusiasm and shared enjoyment (i.e., positive expressions) more frequently and for longer periods of time, and display shared engagement (i.e., neutral

expressions) less often and for shorter periods of time. It was also hypothesized that the relationship between the flexibility variables and the duration and frequency of shared expressions would differ in their strength of associations based on whether the dyads', mothers', or children's flexibility was measured. Dyadic, mother, and child emotional flexibility and their relation to the duration of verbal communication, as well as psychosocial and demographic factors (e.g., maternal education, current social-emotional support and stress levels, child gender) were also investigated as control variables. Based on previous research conducted with the Concordia Project, as well as the emotional development and dynamic systems literatures (e.g., Halberstadt, Dennis, & Hess, 2011; Hollenstein & Lewis, 2006; Martin & Ruble, 2010; Stack et al., 2012), it was hypothesized that dyads, mothers, and children with more flexibility would: (1) spend more time engaged in conversation; (2) include mothers with more education; (3) tend to be girls; and (4) have more current social-emotional support and less stress. To understand dyadic versus individual emotional flexibility in greater detail, comparisons between the hierarchical regression models measuring dyadic and mother, and dyadic and child emotional flexibility were conducted to examine whether they were uniquely associated with the predictor variables (i.e., measuring different things). Given that the comparison analyses were exploratory in nature, no explicit hypotheses were made.

Method

Participants

The current study included a sub-sample of mothers participating in the Concordia Project. Recruitment of the original participants took place in 1976-1978. At this time, 4,109 students (who were in 1st, 4th, or 7th grade) were recruited from inner-city

Francophone schools found in low SES neighborhoods in Montréal, Québec. This is considered an at-risk community-based sample in that the original participants came from communities where levels of economic and social disadvantage were high, and because average family socio-economic status and other demographic characteristics were below the population means. Furthermore, it was also possible to examine with this sample how other potential risk factors (e.g., behavioral, environmental) operate within differing levels of socio-economic risk. Boys *and* girls were rated by their peers on levels of aggression and social withdrawal using the Pupil Evaluation Inventory (PEI: Pekarik, Prinz, Liebert, Weintraub, & Neale, 1976; see Serbin et al., 1998 for more detailed information on this measure; see Appendix A for sample items). Oversampling at the extremes of the sample (i.e., the upper tails of the aggression and withdrawal dimensions) created a final sample of 1,774, allowing for a range of scores, including children from across the continuum on aggression and withdrawal drawn from the same schools and neighborhoods. This sample of children was subsequently followed in smaller representative sub-samples at three to five year intervals, with many of the original participants having since had children themselves. A more detailed description of the Concordia Project sample can be found in Schwartzman, Ledingham, and Serbin (1985), and Serbin et al. (1998). For the present study, the sample was comprised of the original girls who were now mothers, as well as spouses of original boys who were now fathers.

Seventy-five mothers (mean age = 37.32 years, *SD* = 2.73) were drawn from a larger sub-sample of 119 and participated in the present study with their 9- to 13-year-old children (mean age = 10.83 years, *SD* = 0.93; 48% boys). At the time of data collection, mothers had attained an average of 12.73 years of school (*SD* = 2.48), their occupational

prestige ratings corresponded to the following occupations: technician, sales worker, and clerical worker (M = 37.51, SD = 11.86; Ganzeboom & Treiman, 1996), and mothers' average age at birth of first child was 24.82 years (SD = 2.94). Of the 75 mothers who participated, 51 were original female participants (mean age = 37.52 years, SD = 2.40) and 24 were spouses of original male participants (mean age = 36.88 years, SD = 3.34). Of the 44 mothers who did not participate, 17 completed questionnaires but did not participate in the videotaped observations, and 27 of the videotaped observations could not be included due to technical issues [e.g., lighting issues (n = 8), camera set-up in a way that one member was not fully facing the camera (n = 18), father-child dyad (n = 1)].

To assess the representativeness of the current sample to those who did not participate but that are a part of the larger Concordia Project, the 75 original mothers and spouses of original fathers who participated in the present study were compared to two different samples: one sample included 75 original mothers only, and the other sample was one of 119 original mothers and mothers who married original fathers. The samples were compared based on years of education, $F(2, 266) = 0.88$, $p > .10$, occupational prestige, $F(2, 266) = 0.19$, $p > .10$, age at birth of first child, $F(2, 266) = 0.31$, $p > .10$, mother age at time of testing, $F(2, 266) = 0.63$, $p > .10$, and child age at time of testing, $F(2, 266) = 0.57$, $p > .10$. No differences were found across all variables and the present sub-sample was therefore considered to be representative of the larger samples. To ensure representativeness between the 51 original mothers and the 24 mothers who were spouses of original fathers, further comparisons were completed on the same variables. No differences surfaced with respect to years of education, $t(73) = 0.64$, $p > .10$, occupational prestige, $t(73) = 0.68$, $p > .10$, age at birth of first child, $t(73) = 0.31$, $p > .10$, mother age

at time of testing, $t(73) = 0.96$, $p > .10$, and child age at time of testing, $t(73) = 1.22$, $p > .10$.

Procedure

The present study was part of a larger project in which interviews, questionnaires, and semi-naturalistic observations were obtained over one home visit and two school visits. The home visit was conducted by one PhD-level experimenter and one research assistant both trained in the administration of the testing protocol and blind to the mothers' childhood histories. Mothers were provided with a description of the procedure and read and signed informed consent forms (Appendix B). During the home visit, mother and child were videotaped during several tasks and also completed a range of questionnaires to assess socio-demographics and various aspects of relationship quality and child functioning (refer to Stack et al., 2012 for more detail on the procedures included in the present sample).

The current study focused on a game-playing task (Serbin et al., 1998). For the game-playing task, dyads played *Jenga* for four minutes (a game created by Parker Brothers whereby players take turns removing a block from a tower and balancing it on top). This task was used to assess mothers' and children's emotion behaviors when presented with a playful situation (Appendix C).

Questionnaire Measures

Demographic Information Questionnaire (DIQ). The DIQ was employed to collect the participating families' socio-demographic information, including mother's current age, age at birth of first child, marital status, number of years of education, occupational status, etc. This measure has proven effective in collecting participant

demographics, and has been used in past studies of the Concordia Project (e.g., De Genna, Stack, Serbin, Ledingham, & Schwartzman, 2007; Martin, Stack, Serbin, & Schwartzman, 2012).

The Parenting Stress Index (PSI short version; Abidin, 1995). The PSI is a 36-item self-report inventory used to identify sources and levels of parenting stress across three main domains (as a parent, in relation to the child, and total life stress). A French translation was used and items range on a 5-point likert-scale from "strongly agree" to "strongly disagree," with higher scores relating to more perceived stress. For purposes of the present study, the overall index of total life stress was used. The total life stress subscale includes 12 items assessing the extent to which parents find themselves in stressful circumstances that are often beyond their control (e.g., the death of a relative, loss of a job). Sample items include, “I often have the feeling that I cannot handle things very well,” and “There are quite a few things that bother me about my life.” Validity and reliability for this measure have been found to be satisfactory to excellent (Abidin, 1995).

The Parenting Social Support Index (PSSI; Telleen, 1985). The PSSI is a self-report measure consisting of 24 items assessing seven forms of support that parents could be receiving (e.g., relationship with a confidant, material aid) was used to evaluate the level of parenting social support. A French translation was used, where parents rate their need for each type of support on a 5-point likert-scale, ranging from “very dissatisfied” to “very satisfied” (e.g., How satisfied were you with the talks you had with others about your personal and private feelings during the past month?). Three total scores are then generated (total perceived need for support, total network size, and total support satisfaction). The higher the scores, the more satisfied the parent is with the type of

support received. Only total support satisfaction was used in the present set of analyses. The PSSI has been found to have good reliability and validity (Telleen, 1985).

Home Observation for Measurement of the Environment (HOME; Caldwell & Bradley, 1984). The HOME Inventory is a standardized observational screening tool used to measure the quality and quantity of stimulation and support available to a child in his or her home environment. A French translation of the measure used for the present study is composed of 59 items clustered into 8 subscales (Emotional and Verbal Responsibility, Encouragement of Maturity, Emotional Climate, Growth Fostering Materials and Experiences, Provision for Active Stimulation, Family Participation in Developmentally Stimulating Experiences, Aspects of the Physical Environment). Items are scored with a "plus" if present or a "minus" if absent (e.g., parent encourages child to contribute to the conversation during visit; parent responds to child's questions during interview). Only the total HOME score (where a higher score reflects a more stimulating and supportive home environment) was included. The HOME's psychometric properties are adequate, with ratings of reliability and validity ranging between satisfactory to excellent (Caldwell & Bradley, 1984).

Means, standard deviations, and ranges for all measures are included in Table 1.

Behavioral Measures and Coding

Emotion Behavior Coding Scheme (EBCS). The EBCS (Enns & Stack, 2007) is a 2-part observational measure of mother and child emotion behaviors during the game-playing task, and was developed based in part on existing literature (e.g., Batum & Yagmurlu, 2007; Hubbard, 2001; Perez & Riggio, 2003; Planalp, 1999; Posner & Rothbart, 2000). The objective of this coding system was to capture the frequency and

duration of emotion behaviors displayed during mother-child interactions. Part 1 of the EBCS identifies a number of emotion behaviors of both mothers and their children, including individual facial expressions, eye movements, physical contact, body language, gestures, and vocalizations. Codes for Part 1 were assigned second-by-second. Part 2 of the EBCS attempted to identify additional child emotion behaviors displayed during the interaction. Categories that were coded include posture and activity level [i.e., fidgetiness of body and hands; playing with or clutching items (e.g., pencil, blocks, etc.)]. In addition, this component of the EBCS coded for the duration of mother and child speech (i.e., verbal communication) during the task. Codes were assigned during 5-second intervals, and only if the behavior occurred for the majority of the interval. Following filming of the game-playing task, videotaped records of the mother-child interactions were coded using the EBCS. Videotapes were viewed three times; children's behaviors were coded on the first and third pass and mothers' facial expressions were coded on the second pass. For purposes of the present study, only selected behaviors were included for further analyses (see Table 2 for detailed operational definitions of these codes).

Twenty-six per cent of mother and child behaviors were coded by a BA level undergraduate student (blind to hypotheses and maternal risk status) to assess reliability. Cohen's kappa coefficients (r_k; Cohen, 1960; Kaplan & Saccuzzo, 2001) were calculated to assess per category agreement between the two coders. Reliability was at a satisfactory to highly satisfactory level for all mother and child emotion behaviors (r_k = .71 - .95; Fleiss, 1981).

Nonverbal Emotion Communication Coding Scheme (NECCS). The NECCS (Enns & Stack, 2011) is an observational measure designed to study mother and child

nonverbal emotion communication in the context of a game-playing task. The discrete behaviors coded using the EBCS (Enns & Stack, 2007; see previous section) were combined to create the nonverbal emotion communication constructs and were based in part on the Specific Affect Coding System (SPAFF; Coan & Gottman, 2007). Constructs fall under the categories of Positive, Neutral, Mixed, and Negative Affect (and No Code). Each NECCS construct code is defined by its function (i.e., purpose) during nonverbal communication, nonverbal cues (all discrete behaviors that occurred simultaneously), code level (primary or secondary), and counter-indicators (behaviors that are incompatible with the construct and therefore cannot be coded). Following the coding of the game-playing task with the EBCS, the behaviors were examined in combination and assigned a NECCS code. For purposes of the present study, Enthusiasm, Anticipation, Enjoyment, and Engagement were used in further analyses (see Table 3 for detailed operational definitions of these codes). Given the relatively small sample sizes and the number of analyses that were planned, Anticipation was subsumed under the code of Enthusiasm.

Dynamic Systems Methods: State Space Grids. State space grids (Hollenstein, 2007) enable the analysis of the structure or patterns of nonverbal emotion communication during interactions within specific contexts, as well as the specific emotions used (i.e., the content of emotion displayed using facial expressions and other nonverbal cues). State space grid analyses are ideal for quantifying observational data. Through this methodology, it is possible to represent graphically both individual and dyadic behaviors as they change from moment-to-moment (i.e., emotional flexibility). According to a dynamic systems approach, emotional flexibility is studied and quantified

using state space grids in three ways: (1) the number of transitions between emotion behavior states, which is quantified by the trajectory lines on the grid (transitions); (2) a proportion using the range or number of different states and total duration, by creating an index based on proportional duration and number of behaviors occupied across each grid (dispersion; Granic et al., 2007); and (3) the tendency to perseverate or get "stuck" in a small number of states, by averaging all individual cell mean durations (average mean duration, or AMD). In the present study, the flexibility (transitions), variability (dispersion), and rigidity (AMD) of the NECCS codes were examined using state space grids.

Results

Prior to conducting statistical analyses, descriptive statistics were used to assess the normality of the distribution, skewness for each variable, and to identify outliers. In cases where there was non-normality, significant outliers were systematically brought in by converting them into a value that was one, two, or three standard deviation(s) above the mean, eliminating the majority of the skewness. There was one mother's AMD value that was such an extreme outlier; it was considered an anomaly and therefore removed. Analyses involving mothers' AMD variable were conducted with the remaining 74 participants.

Given the relatively small sample sizes and the number of analyses that were planned, it was deemed necessary to reduce the number of variables to be included in the study. Previous research conducted with subsamples of the Concordia Project created a current support and stress index factor score by combining variables indicating maternal social support, parenting stress, and the stimulation and support provided to the child in

the home environment by the parents (Stack et al., 2012). Given the informative role this factor score played in understanding the current risk status of the mother-child relationship with respect to their psychosocial support and stress, this factor was re-created for the present study. The principal components factor analysis retained one factor (eigenvalue of 1.72), and explained 57.31% of the variance. The means, standard deviations, and ranges for all variables are reported in Table 1.

Analyses were conducted using: Gridware (Version 1.1; Lewis, Lamey, & Douglas, 1999), a statistical application used to create state space grids based on dynamic systems principles; PASW Statistics 18.0 (formerly known as SPSS Statistics 18); and FZT computator, a program for comparing dependent correlations using the methods advanced by Steiger (1980; see Wuensch, 2013 for a description and its application). For the first set of analyses, hierarchical regressions using PASW Statistics 18.0 were conducted. The analyses were designed to examine how dyadic, mother, and child emotional flexibility variables (transitions, dispersion, AMD) were associated with: (1) the duration and frequency of shared expressions (enthusiasm, enjoyment, and engagement); and (2) the duration of dyad verbal communication and psychosocial/ demographic factors (maternal education, current social-emotional support and stress, and child gender). For the second set of analyses, dependent correlation comparisons were conducted using the FZT computator. The analyses were designed to examine each hierarchical regression model for dyadic, mother, and child emotional flexibility variables and whether they differed in their relationship to the predictor variables. In each regression, maternal education was entered in Step 1, child gender in Step 2, the current social-emotional support and stress index in Step 3, shared enjoyment in Step 4, shared

enthusiasm in Step 5, shared engagement in Step 6, and the duration of verbal communication in Step 7. The duration and frequency of shared expressions were entered in separate regressions. Comparisons were also conducted between the duration and frequency of shared expressions to determine which was more strongly associated with dyadic, mother, and child emotional flexibility variables. The emotional flexibility variables, shared expressions, and dyadic verbal communication variable were created using Gridware. Inter-correlations among all variables included in the regressions are provided in Table 4. A summary of the regressions can be found in Tables 5 and 6.

Duration and Frequency of Shared Expressions in Relation to Dyadic, Mother, and Child Emotional Flexibility

The duration and frequency of shared expressions and their relationship to dyadic, mother, and child emotional flexibility variables were examined using separate hierarchical regressions. Pertaining to the duration of shared expressions, results across regressions indicated that longer durations of shared enjoyment and enthusiasm and shorter durations of shared engagement were associated with greater dyadic, mother, and child emotional flexibility (i.e., more transitions and dispersion, lower AMD values). One exception was mothers' AMD values, which was not related to shared engagement. Interestingly, shared enjoyment became non-significant when shared engagement was entered in Step 6.

With respect to the frequency of shared expressions, results across regressions indicated that more frequently shared enjoyment, enthusiasm, *and* engagement were related to more dyadic, mother, and child transitions during the game-playing task (i.e., more flexibility). More frequently shared enjoyment, enthusiasm, and engagement were

associated with lower dyadic and child AMD values (i.e., more flexibility). More frequently shared enjoyment and enthusiasm were also associated with lower AMD values for mothers. Dyadic, mother, and child dispersion were not related to shared engagement; however, greater dispersion was associated with more frequently shared enjoyment and enthusiasm.

Dyadic Verbal Communication and Psychosocial/Demographic Factors in Relation to Dyadic, Mother, and Child Emotional Flexibility

All findings were consistent across regressions unless otherwise indicated (see Tables 5 and 6). Results from the regressions including the duration of shared expressions showed that dyads, mothers, and children who displayed more transitions (i.e., more emotional flexibility) also spent more time engaged in conversation throughout the task. In addition, dyads and children with higher AMD values (i.e., less emotional flexibility) spent less time engaged in conversation during the interaction. There were no significant findings from the regressions that included the frequency of shared expression variables.

With respect to maternal education, mothers with more education displayed less dispersion and tended to have higher AMD values (i.e., less flexibility). Moreover, maternal education became a trend when the current support and stress index was entered in the regression predicting mothers' transitions: mothers with more education tended to display fewer transitions. Maternal education also became a trend when shared enjoyment was entered in the regression examining the frequency of shared expressions: dyads with less dispersion tended to include mothers with more education.

Pertaining to child gender, girls displayed more dispersion, had mothers who displayed more dispersion, and were members of dyads who displayed more dispersion

(i.e., more flexibility). In addition, girls tended to have mothers who displayed lower AMD values.

In the examination of current social-emotional support and stress, results suggest that dyads with higher scores on the current support and stress index [more social support for mothers, more support and stimulation for children provided in the home (i.e., better quality of home environment), and less parental stress], displayed more transitions and had lower AMD values (i.e., more flexibility). Higher scores on the current support and stress index were also associated with more mother transitions, as well as lower mother AMD values (trend). Finally, higher scores on the current support and stress index tended to be associated with more dyad and child transitions and lower dyad and child AMD values.

Comparison of Duration with the Frequency of Shared Expressions and the Strength of their Associations to Emotional Flexibility

To understand the potentially unique contributions of the frequency and duration of positive and neutral nonverbal emotion communication during positive parent-child interactions in middle childhood, correlations of the frequency and duration of shared expressions were compared to dyadic, mother, and child emotional flexibility variables (see Table 7 for correlations and *z*-scores). By comparing the absolute-value of correlations using Steiger's *z*-test (Steiger, 1980), one is able to discern which predictor (i.e., the frequency or the duration of a shared expression) accounted for more variance in relation to the emotional flexibility variables.

When predicting transitions, the frequency of shared enjoyment and shared enthusiasm were found to be more strongly and positively related to dyadic, mother, and

child transitions than their duration. In contrast, the duration of shared engagement was more strongly and negatively associated with dyadic, mother, and child transitions than its frequency. However, the frequency of shared engagement was not significantly related to dyadic, mother, or child transitions.

When predicting dispersion, the frequency of shared enjoyment was more strongly and positively related to dyadic and mother dispersion than its duration; there was no difference for child dispersion. With respect to shared enthusiasm, there were no differences in the predictive value of frequency and duration for dyadic, mother, or child dispersion. Pertaining to shared engagement, the duration was more strongly and negatively associated with dyadic and child dispersion than its frequency. In contrast, the frequency of shared engagement was more strongly and negatively related to mother dispersion than its duration. However, the frequency of shared engagement was not significantly related to dyadic or mother dispersion.

When predicting AMD, the frequency of shared enjoyment was more strongly and negatively related to dyadic, mother, and child AMD values than its duration. With respect to shared enthusiasm, frequency was more strongly and positively associated with dyadic and mother AMD values than its duration; there was no difference for child AMD values. Pertaining to shared engagement, the duration was more strongly and positively related to dyadic, mother, and child AMD values, but unrelated to its frequency.

Taken together, these findings address a gap in the literature by displaying the different pattern of results that occur when examining the duration versus the frequency of shared positive and neutral nonverbal emotion communication and the structure of the interaction (as well as whose structure – dyad, mother, or child).

Comparison of Dyadic, Mother, and Child Emotional Flexibility and their Association to the Predictor Variables

To examine whether dyadic, mother, and child emotional flexibility variables were uniquely associated to the same predictor variables (i.e., whether the way each member or dyad organizes the interaction represents the same pattern of relating), dyad and mother and dyad and child final regression models were compared using a cross validation technique and Steiger's *z*-tests (Cohen, Cohen, West, & Aiken, 2003; Hittner, May, & Silver, 2003; Steiger, 1980). Comparing dependent variables across regressions using the same independent variables informs us whether there is merit in measuring emotional flexibility variables independently as well as dyadically. To conduct these analyses, a comparison of the structure of the models for dyadic and mother and dyadic and child emotional flexibility variables was made by applying either mothers' or children's models to the dyadic models and comparing the resulting "crossed" R^2 (i.e., mother or child) with the "direct" R^2 (i.e., dyad) emotional flexibility variables. The direct and crossed R^2 variables were created by summing the product of each predictor variable included in the final step of the regression and its unstandardized beta weights. Following that step, correlations between dyads' emotional flexibility variables (the original values), the dyad's weighted values, referred to as dyads' "direct" emotional flexibility variables, and mother or child "crossed" emotional flexibility variables were examined and compared using Steiger's *z*-test (see Table 8 for R^2-values and *z*-scores).

In the regressions including the duration of shared expression predictor variables (Table 5), there were no differences between dyad and mother and dyad and child transitions, or between dyad and child dispersion (i.e., they were measuring the same

thing). However, mother AMD and dispersion values were significantly different from dyad AMD and dispersion values. This suggests that mother AMD and dispersion values, when analyzed individually, were associated with the predictor variables in ways that were uniquely different than when analyzing dyad AMD and dispersion values. In addition, child AMD values tended to differ from dyad AMD values, again suggesting that outcomes can differ based on whether dyad or individual emotional flexibility variables are analyzed. In the regressions including the frequency of shared expression predictor variables (Table 6), both mother and child transitions tended to differ from dyad transitions. This suggests that mother and child transitions, when analyzed individually, tended to be associated with the predictor variables in a different way than when analyzing dyad transitions. In addition, mother AMD values were significantly different from dyad AMD values, while child AMD values tended to differ from dyad AMD values. Finally, there was no difference between dyad and mother and dyad and child dispersion.

Discussion

In accordance with the overarching goal of the present study, findings contributed to our understanding of the interplay between the dyadic *and* individual moment-to-moment processes of underlying mother-child positive and neutral nonverbal emotion communication during a game-playing task. First, results changed depending on how the process variables were analyzed (e.g., transitions versus dispersion versus AMD with respect to flexibility; dyad versus mother or child emotional flexibility; duration or frequency of shared expressions). Second, findings also underscored the role of other micro- (duration of verbal communication) as well as macro- (psychosocial and

demographic factors) processes that both influence and are influenced by dyads', mothers', and children's organization and display of positive and neutral nonverbal emotion communication behaviors. Together, the present research addressed an important gap in the literature by furthering our understanding of how positive and neutral nonverbal emotion communication develops during middle childhood in a historically at-risk sample.

Positive Nonverbal Emotion Communication

Findings that pertain to positive nonverbal emotion communication (enjoyment and enthusiasm) were in line with the hypotheses and the current literature (e.g., Lukenheimer et al., 2011): in general, more frequent and longer displays of shared enjoyment and enthusiasm were associated with greater dyad, mother, and child emotional flexibility (i.e., more transitions, greater dispersion, and lower AMD values; however, the findings for mothers' dispersion and AMD values were trends). The comparison analyses conducted following the regressions suggest a more complicated association between flexibility and positive affect than one might have considered based on the initial results. In general, results showed that regardless of the duration of shared positive expressions, the *frequency* with which they were shared (i.e., greater affective attunement; DeOliveira et al., 2004) had a stronger positive relationship with dyad and individual flexibility. Findings contribute to the emotional development literature by clarifying that frequently shared positive expressions in particular are important beyond infancy and preschool-age, extending into the mother-child relationship during middle childhood. Denham and colleagues (Denham, Bassett, & Wyatt, 2007) found that positive expressiveness in families promotes emotion understanding because, based on the

broaden-and-build theory of positive emotions (e.g., Fredrickson, 2001), the experience and expression of positive feelings allow children to be more open to learning and problem-solving. Given that positive communication skills, whether verbal or nonverbal, facilitate appropriate levels of interpersonal cohesion and adaptability to change (Olson, 2000), results from the present study also expand on the dynamic systems literature: emotional flexibility not only helps to teach children to regulate and repair the experience and expression of negative emotions (Granic & Hollenstein, 2003; Granic & Lamey, 2002), it also helps in teaching children to be more open, cohesive, and adaptive during playful mother-child interactions.

It was interesting that dyadic, mother, and child dispersion values (i.e., the variability demonstrated during the interaction) were equally related to the frequency and duration of shared enthusiasm (i.e., there was no difference in the strength of the association), despite the trends found in the associations for mothers' dispersion values. This would suggest that sharing enthusiastic behaviors during a game-playing task is related to more variability (i.e., an "optimally" structured or organized interaction; e.g., Hollenstein, 2012) regardless of how long or frequently the enthusiasm is shared. Furthermore, there was no difference in the strength of the relationship between the frequency and duration of shared enjoyment with respect to child dispersion, nor was there a difference for shared enthusiasm and child AMD values. Perhaps children who structure their role during a game-playing task with more variability and less rigidity are prone to enthusiastic sharing of a game with their mothers, both with respect to its frequency and duration. These findings provide additional information regarding the bi-directionality of socialization (Granic, 2000; Kuczynski, 2003), informing us of how

children are organizing themselves in the interaction and how this organization relates to the nonverbal emotion communication behaviors of the dyad as a whole. The follow-up comparison analyses contributed to our understanding of how shared positive nonverbal emotion communication relates to dyad and individual emotional flexibility by beginning to unpack the processes underlying positive mother-child exchanges in middle childhood.

Neutral Nonverbal Emotion Communication

The associations between shared engagement and emotional flexibility variables were also complex. The first hypothesis was partially supported: dyads, mothers, and children who displayed shared engagement for longer periods of time demonstrated less emotional flexibility (fewer transitions and lower dispersion values; the only exceptions were mothers' AMD values, which were unrelated to the duration of shared engagement, and mothers' transitions, which was a trend). Generally speaking, these findings suggest that during a game-playing task, dyads and their individual members who have more difficulty organizing themselves in a flexible, variable, and less rigid manner will also spend more time sharing neutral behaviors (i.e., more time sharing engagement). The results regarding positive expressions in the present study along with previous research (Branje, 2008; Enns, Stack et al., Chapter 2) suggest that spending too much time sharing engagement displays may indicate dysfunction in the mother-child relationship. Furthermore, comparison analyses suggest that when examining the relationship between shared neutral expressions and flexibility variables, child flexibility is more strongly related to shared engagement and may be carrying the dyad's flexibility (i.e., making the dyad appear more flexible than it actually is). Including the generally overlooked variables of individual flexibility and shared neutral affect further unpacks the processes

underlying mother-child interactions and extends our understanding of the nuances of nonverbal emotion communication. These findings corroborate the notion that mothers and school-age children separately bring their own experiences to dyadic exchanges, emphasizing the dynamic and bi-directional nature of their interactions in the creation of their own environment and social relations (Granic, 2000).

Contrary to the first hypothesis, more frequent displays of shared engagement were related to more dyadic, mother, and child transitions and lower dyadic and child AMD values (i.e., more flexibility). This suggests that while displays of shared neutral expressions for longer periods of time during a game-playing task may indicate dysfunction within the mother-child relationship, more *frequently* shared neutral expressions help to improve the organization within the interaction. Intuitively one would expect greater movement between emotion behaviors to be related to more emotional flexibility, which would include movement to and from neutral expressions (e.g., Hollenstein, 2007). It was therefore surprising to find that dyadic, mother, and child dispersion values were *not* associated with the frequency of shared engagement. In addition, results suggest that mothers' AMD values were not related to shared engagement while child and dyad AMD values were. Interestingly, the contradictory nature of these findings resulted in full support of the second hypothesis, which proposed that the relationship between the flexibility variables and the duration and frequency of shared expressions would vary (i.e., differ in their strengths of association) based on whether the dyads', mothers', or children's flexibility was measured. Results suggest that child and/or dyadic AMD values had a stronger relationship with shared engagement, thus guiding these components of the process underlying nonverbal emotion

communication during a game-playing task more readily than for mothers alone. More research is needed to continue unpacking the interplay between the processes underlying mother-child interactions and how they may be related to emotion socialization practices.

Additional Micro- and Macro-Processes

In addition to the complex relationship between the content and structure of nonverbal emotion communication, the duration of dyad verbal communication, maternal education, child gender, and current stress and social support were included as additional micro- and macro-process variables.

Verbal communication. With respect to verbal communication findings, dyads, mothers, and children with greater emotional flexibility spent more time engaged in conversation. While the content, not the duration, of verbal interaction tends to be studied, inferences about the relationship between nonverbal and verbal communication may still be drawn from the present study. Previous research has found that open communication is related to displays of affection, emotional support, and a sense of humor, as well as promoting positive social interactions and an open exchange of ideas (Caughlin, 2003). Given that positive parent-child interactions are associated with more flexibility (e.g., Lukenheimer et al., 2011), these findings were not surprising and highlight the need to study both types of communication separately as well as simultaneously (e.g., Burgoon & Bacue, 2003). The findings also suggest that while a game-playing activity such as *Jenga* can be a relatively nonverbal task, engaging in both nonverbal *and* verbal exchanges may enhance the pleasurable experience of the interaction. Future research is needed to continue to tease apart the unique interplay of

the organization and content involving verbal and nonverbal emotion communication between mothers and children during a playful activity.

Child gender and maternal education. With respect to child gender, findings suggested that being a girl tended to be related to greater flexibility; in this case, larger dyadic, mother, and child dispersion values and lower mother AMD values. In contrast, maternal education results were somewhat puzzling: they were contrary to the hypothesis and only related to mothers' emotional flexibility variables. More specifically, mothers with *less* education tended to display greater dispersion values and lower AMD values. Previous research including participants from the Concordia Project has found maternal education to be a protective factor (e.g., Serbin et al., 2011). In the context of the present findings, we could hypothesize that mothers may be preparing for the transition from middle childhood to pre-adolescence, consequently demonstrating adaptive emotion socialization techniques by adjusting how they structure or organize their own behaviors during interactions with their children to allow for changes in autonomy. Examples of such adjustments to mother-child interactions have been evidenced in Fogel and colleagues' work examining mother-infant exchanges (e.g., Hsu & Fogel, 2003) and may therefore be protective in at-risk families. Given the limited nature of these findings, more research is needed to better understand the role of maternal education in emotional flexibility.

Current support and stress index. Contrary to the maternal education findings, there were a number of trending associations between the current support and stress index and the flexibility variables. As anticipated, dyads, mothers, and children with more transitions and lower AMD values (i.e., greater flexibility and less rigidity) tended to be

associated with more perceived social support by mothers, better support and stimulation for children (better quality of the home environment), and less parental stress. Despite the fact that many of these findings only tended toward significance, they were in line with previous studies examining the current psychosocial risk status of a subsample of mothers and children from the Concordia Project (Stack et al., 2012); social support, quality of the home environment, and levels of parenting stress as protective contextual factors and related to better mother-child relationship quality. In contrast, families with less support, stimulation, and more stress would be considered more at risk (e.g., Diamond & Josephson, 2005), and therefore may have more difficulty organizing themselves and the dyad to behave in contextually appropriate ways during a playful activity (i.e., showing enjoyment and/or enthusiasm). Importantly, it appears that parent behaviors may not be the only factor affecting children's emotional development and the socialization of emotional competence (e.g., socio-demographic risks; chaotic or more rigid family conditions). Children as well as the dyad, by themselves and in combination with other risk factors, each have influence on and are influenced by the moment-to-moment processes within the exchange of nonverbal emotion communication. By using an at-risk community sample, the variability in risk outcomes allowed for the examination of a range of behaviors, highlighting both the processes underlying successful mother-child interactions as well as dysfunctional exchanges.

Interestingly, the relationship between dyad's emotional flexibility variables and the current support and stress index appeared to be stronger than either mother or child alone. This finding suggests that dyadic emotional flexibility as a whole has a different association with the level of support and stress than either mother or child emotional

flexibility. As predicted, dyad and individual emotional flexibility variables were associated with the duration and frequency of shared nonverbal emotion communication behaviors in different ways; however, the differences were dependent on the type of emotional flexibility variable and whether the frequency or duration of the content were examined. Dyadic transitions and AMD values (but not dispersion) related differently to mother and child transitions and AMD values when examining the *frequency* of shared expressions. In contrast, dyadic and individual emotional flexibility variables had fewer differences in the results (i.e., tended to measure the same thing) when predictor variables included the *duration* of shared expressions.

Applied Implications

These and other findings (e.g., Enns, Stack et al., Chapter 2) have implications for understanding the measurement of emotional flexibility, and suggest that in order to have accurate, in-depth assessment of mother-child nonverbal emotion communication, the interplay between the underlying processes during a playful activity need to be unpacked. For example, our results suggest that to be able to identify whether the dyad's emotional flexibility is providing the whole story of the interaction or whether mother and child are bringing their own unique histories to the "here-and-now" exchange may depend on the type of flexibility variable analyzed. Identifying the mechanisms underlying patterns of mother-child interactions by unpacking the interplay between process variables can then be used to guide intervention efforts that target parent-child relationships (e.g., Triple P-Positive Parenting Program; Sanders, Markie-Dadds, Tully, & Bor, 2000). Knowing where (i.e., context), what, and how to measure the processes help to pinpoint what successful interactions look like, where the dysfunction in difficult mother-child

relationships may lie, and how to intervene to improve these interactions. In particular, awareness of *how* the process variables play out in moment-to-moment interaction allows us to more accurately target behaviors that we wish to change in intervention efforts created to improve the mother-child relationship (e.g., parent training techniques; Nowak & Heinrichs, 2008). In turn, improving the processes in mother-child relationships may then play out in other domains, improving outcomes as children develop (e.g., school, peer relations, prosocial skills, etc.; Denham, Wyatt, Bassett, Echeverria, & Knox, 2009; Nowak & Heinrichs, 2008).

Conclusions: Limitations, Contributions, and Future Directions

Taken together, results from the present study addressed several gaps in the emotional development and dynamic systems literatures: the patterns of interaction that develop are complicated by *how* the structure or organization (flexibility, variability, or rigidity) and content (frequency or duration) of the interaction are examined, *who* is examined (dyad or mother and child individually), as well as *the type of* context being examined (positive versus negative). By examining both intra- and inter-individual differences in real-time across contexts, we can continue to expand our understanding of the processes of change within relationships and ultimately, explain how moment-to-moment change occurs in emotional processes. Despite some limitations (e.g., no contextual comparison, the brevity of the task, exclusion of the examination of negative expressions, the correlational nature of the data, and a fairly small sample size), the contributions outweigh the drawbacks. The use of a playful activity as the context in which to examine positive and neutral nonverbal emotional communication in middle childhood is novel and perhaps better suited than a conflict or problem-solving task: it

may allow the dyads to relax into the task, displaying a more natural interactional pattern (and perhaps allowing them to feel comfortable enough to engage in more verbal discourse). Furthermore, few studies have included a thorough examination of the influence that neutral nonverbal emotion communication can have during mother-child interactions in a positive context. The present findings along with recent research (e.g., Enns, Stack et al., Chapter 2) provide some evidence that neutral behaviors are not as benign to an interaction as previously assumed and may be very context specific in the way that they operate during mother-child exchanges. Finally, the measures or variables selected to study and how they are defined can change our understanding of the underlying processes of an interaction (e.g., frequency versus duration of nonverbal displays; dyad versus individual measures of behavior). These important yet often overlooked methodological implications suggest a need for future research to continue to disentangle the complicated interplay of the process variables that are alive and at work in every exchange.

Table 1

Means, Standard Deviations (SD), and Ranges of Demographic Information, Maternal Financial Score Variables, and Current Support and Stress Variables

	Mean (*n*)	SD	Range
Mothers' education (years)	12.65 (75)	2.50	7.00 – 18.00
Occupational prestige	37.51 (75)	11.86	13.00 – 62.00
Children's age at testing	10.83 (75)	0.93	9.32 – 13.29
HOME total score	48.32 (72)	6.12	29.00 – 59.00
Index of total parental stress	67.14 (75)	19.71	42.00 – 131.00
Total social support	4.81 (75)	1.59	1.00 – 6.61
Dyad Transitions	63.91 (75)	21.70	28.00 – 127.00
Dyad Dispersion	0.74 (75)	0.13	0.39 – 0.90
Dyad AMD	4.05 (75)	1.37	1.86 – 8.17
Mothers' Transitions	30.40 (75)	14.37	1.00 – 72.00
Mothers' Dispersion	0.44 (75)	0.16	0.03 – 0.66
Mothers' AMD	9.30 (74)	5.17	3.26 – 34.29
Children's Transitions	42.19 (75)	15.69	14.00 – 83.00
Children's Dispersion	0.58 (75)	0.15	0.11 – 0.78
Children's AMD	6.35 (75)	2.60	2.86 – 15.00
Duration of Shared Enjoyment	23.91 (75)	24.80	0.00 – 103.00
Duration of Shared Enthusiasm	29.00 (75)	6.59	0.00 – 29.00
Duration of Shared Engagement	74.87 (75)	49.71	0.00 – 178.00
Frequency of Shared Enjoyment	7.63 (75)	6.56	0.00 – 31.00
Frequency of Shared Enthusiasm	2.48 (75)	3.10	0.00 – 14.00
Frequency of Shared Engagement	10.36 (75)	5.01	0.00 – 23.00
Duration of Dyads Talking	56.40 (75)	33.84	0.00 – 135.00

Note. Mean occupational prestige ratings correspond to the following occupations: technician, sales worker, and clerical worker.

Table 2

Emotion Behavior Coding Scheme (EBCS; Enns & Stack, 2007): Operational Definitions for Child and Mother Discrete Emotion Behaviors

CATEGORY	DEFINITIONS
FACIAL EXPRESSIONS	
SMILING	Facial expressions that may show amusement, satisfaction, enjoyment and/or affection, and that are characterized by a lateral and upward movement of the lips and cheeks. Lips are either together, parted, mouth is open, and/or teeth are showing. Include coding of "slight" smiles where the corners of the mouth or one corner of the mouth is raised.
NEUTRAL	Facial expressions that show a lack of emotion (i.e., do not qualify as any of the abovementioned expressions), which are characterized by a straight but relaxed mouth, relaxed eyebrows, and a smooth forehead.
LOOK SAD/DISTRESSED	Facial expressions that may show unhappiness, misery, or sorrow and that are characterized by inner brows drawn together, squinted eyes and/or eyes cast downward, downward-turned mouth, and/or a pout. This facial expression may also include signs of anxiety, nervousness, or distress, and are characterized by eyelids raised (shows more white than usual, straight brows slightly drawn or eyebrows raised, and/or mouth corners tight or retracted.
NO CODE	Facial expressions that may not be coded due to either the mother or the child's mouth being difficult to view for 1 second or more. This may occur because the head is turned away from the camera, the mother or the child covers his/her

	mouth/face with hands or arms, or the mother or child leaves the area where the camera is filming. If it is clear from mouth, eyes, and/or eyebrows that one is smiling, upset, sad, etc., then coded as such. As soon as it is difficult to tell, code as No Code.
EYE MOVEMENTS	
JOINT ATTENTION	Mother and child's eyes are fixed on the same object, person, or are looking off in the same direction for 1 second or more (e.g., Jenga tower).
BODY MOVEMENTS	
SMALL GESTURE	Gestures using hands and/or arms. Hands must stay below the shoulders, or close together. Also includes shrugging of the shoulders. Coded at any duration.
LARGE GESTURE	Gestures using hands and/or arms. Hands must be at the level of the shoulders or above, arms may be extended, and may appear dramatic in nature. Coded at any duration.
HEAD MOVEMENTS	Clearly nods, shakes, and/or moves head in a dramatic and intense fashion. If it is clear head movement as described above, code at any duration. Not coded if Head Movement is very slight and short in duration.
VOCALIZATIONS	
QUIET POSITIVE	Includes making "oooo-ing" sounds under his/her breath, or other unintelligible sounds combined with smiling or warm neutral interaction. Code a Quiet Positive if vocalization is at the participant's normal talking volume or quieter. Coded at any duration.
LOUD POSITIVE	Includes squealing, loud "ooo-ing" sounds, or other unintelligible sounds combined with smiling or warm neutral

	interaction. Code a Loud Positive if vocalization is louder than the talking voice the participant normally uses. Coded at any duration.
LAUGHING	An open or closed mouth snicker, giggle, chuckle, or laugh. Coded at any duration.
<u>POSTURE</u>	
RELAXED	Child looks relaxed, shoulders not hunched, slight curve in spine, may be leaning on hands or leaning back in the chair; looks comfortable and at ease with the interaction.
TENSE	Child looks tense, shoulders may be hunched; looks uncomfortable and ill-at ease with the interaction.
<u>ACTIVITY LEVEL</u>	
PLAYING WITH ITEMS	Child plays with nearby objects and/or objects on his/her own person with his/her hand(s). This could include a pencil, paper, blocks, necklace, bracelet, etc. The object must be moving in the child's hand(s) to receive this code.
FIDGETY HANDS	Any behavior where the child is using either one or both hands in a fidgety manner, without the use of an object. This includes drumming fingers or hands on the table, running hands/fingers over the chair(s), playing with his/her own hands or his/her mother's hands, and/or wringing hands.
SHIFTING/WIGGLING	Movement that depict either a child who shifts his/her body positioning, arms, legs, and/or torso frequently during a 5-second interval, and/or appears unable to sit still. Examples include rocking or jiggling while sitting in the chair, or changing body position for more than half of a 5-second interval (e.g., crossed arms to uncrossed arms to leaning on hand to sitting back, etc.).

OUT OF CHAIR	Child is no longer seated on his/her buttocks or knees in his/her chair and is standing or leaning on the table.
PACING	Child has not left the interaction, but has left his/her chair and is moving around during the interaction.
VERBAL COMMUNICATION	
MOTHER TALKING	Coded when the mother speaks to her child for the majority (i.e., over half) of a 5-second interval. Includes a normal volume of speech, quiet talking, and whispering.
CHILD TALKING	Coded when the child speaks to his/her mother for the majority (i.e., over half) of a 5-second interval. Includes a normal volume of speech, quiet talking, and whispering.

Table 3

Nonverbal Emotion Communication Coding Scheme (NECCS; Enns & Stack, 2011): Operational Definitions for Child and Mother Clustered Emotion Behaviors

POSITIVE AFFECT

Enthusiasm

Function:

- Expresses a passionate interest in a person or activity, as well as a positive valence associated with that interest.
- Is infectious and often sudden, loud, boisterous, and energetic.
- Can lead to behavior reflecting anticipation and/or excitement (e.g., jumping up and down; yelling; shrieking).

<u>Excitement/Surprise</u>

Nonverbal Cues:

- A facial expression of Smiling, Neutral, Looking Sad/Distressed, or No Code combined with a Loud Positive Vocalization.
- A facial expression of Smiling and a Large Gesture.
- A facial expression of Smiling and both Small Gesture and Quiet or Loud Positive Vocalizations.
- A facial expression of Smiling, Looking at Other, Small or Large Gesture, and Quiet or Loud Positive Vocalization or Talking.

Code Level: Primary

Counterindicators:

- When choosing between “Anticipation” and “Excitement”, code for “Excitement”, as it is a higher intensity code.

<u>Humor</u>

Nonverbal Cues:

- A facial expression of Smiling and Laughing.

Code Level: Primary

Counterindicators:

- None.

Anticipation

Function:

- Hopeful, future-oriented, and child-like (e.g., fidgeting in chair; having difficulty waiting turn).
- An increase in activity level indicating difficulty restraining intent to act. For example, with respect to the Game-playing task, appearing to be having difficulty waiting for one's turn.

Nonverbal Cues:

- A facial expression of Smiling, Neutral, and No Code (facial expression) and Shifting/Wiggling (Child code only).
- A facial expression of Smiling or Neutral or No Code (facial expression) and Out of Chair code (Child code only) and/or Pacing.
- A facial expression of Smiling or Neutral or No Code (facial expression), Joint Attention, and Playing with Items.
- A facial expression of Smiling, Neutral, Looking Sad/Distressed, or No Code and a Quiet Positive Vocalization (indicates a low intensity level).
- A facial expression of Smiling or Neutral with both Head Movements and Fidgety Hands codes or Fidgety Hands alone.
- A facial expression of Smiling and a Tense posture (Child code only).
- When a No Code expression is surrounded by Smiling expressions along with additional nonverbal cues (other than Out of Chair) and occurs within 5 seconds or less, code as "Anticipation."

Code Level: Primary

Counterindicators:

- Humour code

- When a No Code expression is surrounded by a Smiling expression along with additional nonverbal cues, (other than Out of chair) but the gap between expressions is greater than 5 seconds, then code as “Fidgety”.
- When choosing between “Anticipation” and “Excitement”, code for “Excitement”, as “Anticipation” is a lower intensity code.

Enjoyment

Function:

- The pleasure felt when having a good time.

Nonverbal Cues:

- A facial expression of Smiling and any other nonverbal behavior that is not already indicated in another construct (e.g., Smiling along with a Relaxed Posture).

Code Level: Secondary

Counterindicators:

- A Smiling code accompanied with laughter is coded as “Humour”.
- A Smiling code accompanied with Activity Level codes is coded as “Anticipation”.
- A Smiling code accompanied with Vocalization codes is coded as “Excitement”.

NEUTRAL AFFECT

Engagement

Function:

- Indicates involvement with and commitment to the task, but without indication of enjoyment.

Nonverbal Cues:

- A facial expression of Neutral or No Code (facial expressions), Joint Attention, Looking at Other, or Mutual Eye Contact, and no other codes.
- A facial expression of Neutral or No Code (facial expressions) and Joint Attention, Mother Talking and/or Child Talking, and no other codes.

- A facial expression of Neutral and Large or Small Gestures and Mother Talking and/or Child Talking.

Code Level: Secondary

Counterindicators:

- A facial expression of Smiling and Joint Attention is coded as “Enjoyment”.
- A Tense posture combined with a “Fidgety” nonverbal cue and a Neutral facial expression should be coded as “Anticipation.”

Table 4

Intercorrelations between Structure, Content, and Control Variables (Zero-Order)

	1.	2.	3.	4.	5.	6.	7.	8.	9.	10.	11.	12.
1. Maternal Education	--											
2. Current Support and Stress Index	.27*	--										
3. Child Gender	.10	.05	--									
4. Dyad Transitions	-.07	.25*	.10	--								
5. Dyad Dispersion	-.08	.14	.26*	.73***	--							
6. Dyad AMD	.05	-.35**	-.08	-.93***	-.75***	--						
7. Mother Transitions	-.17	.18	.08	.85***	.61***	-.78***	--					
8. Mother Dispersion	-.30**	-.03	.24*	.55***	.74***	-.55***	.73***	--				
9. Mother AMD	.21^{t}	-.13	-.15	-.65***	-.56***	.72***	-.81***	-.73***	--			
10. Child Transitions	.01	.23^{t}	.13	.91***	.67***	-.84***	.58***	.32**	-.40***	--		
11. Child Dispersion	.08	.13	.25*	.64***	.87***	-.65***	.36**	.36**	-.26*	.74***	--	
12. Child AMD	-.15	-.23^{t}	-.17	-.79***	-.67***	.80***	-.43***	-.22^{t}	.28*	-.92***	-.82***	--
13. Duration of Shared Enjoyment	.01	.00	.02	.35**	.41***	-.30**	.34**	.38***	-.32**	.30**	.30**	-.28*
14. Frequency of Shared Enjoyment	.01	.02	.06	.63***	.52***	-.55***	.61***	.52***	-.48***	.54***	.38***	-.46***
15. Duration of Shared Enthusiasm	-.09	.11	.08	.55***	.43***	-.49***	.51***	.42***	-.35**	.52***	.39***	-.44***
16. Frequency of Shared Enthusiasm	-.08	.19	.09	.73***	.50***	-.62***	.70***	.45***	-.47***	.64***	.43***	-.52***
17. Duration of Shared Engagement	.03	-.21^{t}	-.10	-.52***	-.66***	.55***	-.43***	-.50***	.40***	-.47***	-.49***	.42***
18. Frequency of Shared Engagement	.04	.10	-.09	.02	-.18	-.05	-.08	-.30**	.08	.09	.01	-.13
19. Duration of Dyad Talking	.11	.10	.13	.28*	.03	-.28*	.21^{t}	-.04	-.09	.28*	.12	-.28*

$^{t}p < .10$, *$p < .05$, **$p < .01$, *** $p < .001$.

Table 4 – continued

	13.	14.	15.	16.	17.	18.	19.
13. Duration of Shared Enjoyment	--						
14. Frequency of Shared Enjoyment	.89***	--					
15. Duration of Shared Enthusiasm	.25*	.39***	--				
16. Frequency of Shared Enthusiasm	.32**	.50***	.88***	--			
17. Duration of Shared Engagement	-.51***	-.49***	-.32**	-.43***	--		
18. Frequency of Shared Engagement	-.51***	-.35**	-.15	-.19	.65***	--	
19. Duration of Dyad Talking	-.03	.13	.11	.21^{t}	.15	.33**	--

$^{t}p < .10$, *$p < .05$, **$p < .01$, *** $p < .001$.

Table 5

Summary of Results for Regression Models Predicting Dyadic, Mother, and Child Transitions, Dispersion, AMD, from Maternal Education, Current Child Gender, Current Support and Stress, Duration of Shared Expressions, and Verbal Communication (N = 72)

Outcome measures	Significant predictors in the final model[a]	Betas	Explained variance	Statistics for the final equation
<u>Dyad</u>				
Transitions	3) Current Support and Stress	0.28*	7.0%	R^2_{Adj} = .51, F = 11.41***
	4) Enjoyment Duration	0.34**	11.0%	
	5) Enthusiasm Duration	0.46***	19.0%	
	6) Engagement Duration	-0.34**	7.0%	
	7) Dyad Talking	0.31***	9.0%	
Dispersion	2) Child Gender	0.34**	12.0%	R^2_{Adj} = .64, F = 19.05***
	4) Enjoyment Duration	0.38***	15.0%	
	5) Enthusiasm Duration	0.30**	8.0%	
	6) Engagement Duration	-0.69***	30.0%	
AMD	3) Current Support and Stress	-0.38**	14.0%	R^2_{Adj} = .53, F = 12.54***
	4) Enjoyment Duration	-0.29**	9.0%	
	5) Enthusiasm Duration	-0.39***	14.0%	
	6) Engagement Duration	0.41***	10.0%	
	7) Dyad Talking	-0.33***	10.0%	

Mother				
Transitions	3) Current Support and Stress	0.24*	5.0%	R^2_{Adj} = .37, F = 6.88***
	Maternal Education	-0.24[t]	5.0%	
	4) Enjoyment Duration	0.33**	11.0%	
	5) Enthusiasm Duration	0.41***	15.0%	
	6) Engagement Duration	-0.21[t]	3.0%	
	7) Dyad Talking	0.22*	4.0%	
Dispersion	1) Maternal Education	-0.30**	9.0%	R^2_{Adj} = .43, F = 8.62***
	2) Child Gender	0.33**	11.0%	
	4) Enjoyment Duration	0.36***	13.0%	
	5) Enthusiasm Duration	0.29**	8.0%	
	6) Engagement Duration	-0.37**	9.0%	
AMD[b]	1) Maternal Education	0.20[t]	4.0%	R^2_{Adj} = .23, F = 3.99***
	2) Child Gender	-0.21[t]	4.0%	
	3) Current Support and Stress	-0.21[t]	4.0%	
	4) Enjoyment Duration	-0.31**	10.0%	
	5) Enthusiasm Duration	-0.23*	5.0%	
Child				
Transitions	3) Current Support and Stress	0.24[t]	5.0%	R^2_{Adj} = .43, F = 8.49***
	4) Enjoyment Duration	0.29*	8.0%	

	5) Enthusiasm Duration	0.44***	18.0%	
	6) Engagement Duration	-0.33**	7.0%	
	7) Dyad Talking	0.29**	8.0%	
Dispersion	2) Child Gender	0.30*	9.0%	R^2_{Adj} = .40, F = 7.64***
	4) Enjoyment Duration	0.27*	8.0%	
	5) Enthusiasm Duration	0.31**	9.0%	
	6) Engagement Duration	-0.52***	17.0%	
AMD	3) Current Support and Stress	-0.20[t]	4.0%	R^2_{Adj} = .36, F = 6.63***
	4) Enjoyment Duration	-0.26*	7.0%	
	5) Enthusiasm Duration	-0.39***	14.0%	
	6) Engagement Duration	0.30*	6.0%	
	7) Dyad Talking	-0.28**	7.0%	

[a]Bracketed numbers indicate the step at which the predictor was entered. [b]N = 71.

[t]$p < .10$, *$p < .05$, **$p < .01$, *** $p < .001$.

Table 6

Summary of Results for Regression Models Predicting Dyadic, Mother, and Child Transitions, Dispersion, AMD from Maternal Education, Child Gender, Current Support and Stress, Frequency of Shared Expressions, and Verbal Communication (N = 72)

Outcome measures	Significant predictors in the final model[a]	Betas	Explained variance	Statistics for the final equation
<u>Dyad</u>				
Transitions	3) Current Support and Stress	0.28*	7.0%	R^2_{Adj} = .69, F = 23.94***
	4) Enjoyment Frequency	0.62***	38.0%	
	5) Enthusiasm Frequency	0.51***	18.0%	
	6) Engagement Frequency	0.29***	7.0%	
Dispersion	2) Child Gender	0.34**	12.0%	R^2_{Adj} = .37, F = 7.01***
	4) Enjoyment Frequency	0.48***	23.0%	
	5) Enthusiasm Frequency	0.26*	5.0%	
AMD	3) Current Support and Stress	-0.38**	14.0%	R^2_{Adj} = .55, F = 13.57***
	4) Enjoyment Frequency	-0.53***	28.0%	
	Maternal Education	0.16[t]	2.0%	
	5) Enthusiasm Frequency	-0.38***	10.0%	
	6) Engagement Frequency	-0.26**	6.0%	
<u>Mother</u>				
Transitions	3) Current Support and Stress	0.24*	5.0%	R^2_{Adj} = .59, F = 15.69***

	Maternal Education	-0.24[t]	5.0%	
	4) Enjoyment Frequency	0.59***	35.0%	
	5) Enthusiasm Frequency	0.48***	16.0%	
	6) Engagement Frequency	0.18*	3.0%	
Dispersion	1) Maternal Education	-0.30*	9.0%	R^2_{Adj} = .42, F = 8.30***
	2) Child Gender	0.33**	11.0%	
	4) Enjoyment Frequency	0.48***	23.0%	
	5) Enthusiasm Frequency	0.19[t]	2.0%	
AMD[b]	1) Maternal Education	0.20[t]	4.0%	R^2_{Adj} = .32, F = 5.70***
	2) Child Gender	-0.21[t]	4.0%	
	3) Current Support and Stress	-0.21[t]	4.0%	
	4) Enjoyment Frequency	-0.47***	22.0%	
	5) Enthusiasm Frequency	-0.23[t]	4.0%	
<u>Child</u>				
Transitions	3) Current Support and Stress	0.24[t]	5.0%	R^2_{Adj} = .54, F = 13.00***
	4) Enjoyment Frequency	0.52***	27.0%	
	5) Enthusiasm Frequency	0.47***	15.0%	
	6) Engagement Frequency	0.32***	9.0%	
Dispersion	2) Child Gender	0.30*	9.0%	R^2_{Adj} = .22, F = 3.88***
	4) Enjoyment Frequency	0.34**	11.0%	

	5) Enthusiasm Frequency	0.30*	6.0%	
AMD	3) Current Support and Stress	-0.20[t]	4.0%	R^2_{Adj} = .41, F = 8.04***
	4) Enjoyment Frequency	-0.44***	19.0%	
	5) Enthusiasm Frequency	-0.37**	10.0%	
	6) Engagement Frequency	-0.33***	9.0%	

[a]Bracketed numbers indicate the step at which the predictor was entered. [b]N = 71.

[t]p < .10, *p < .05, **p < .01, *** p < .001.

Table 7

Comparing the Duration and Frequency of Shared Expressions in relation to Dyad, Mother, and Child Emotional Flexibility Variables: r-values and z-scores

	ENJOYMENT			ENTHUSIASM			ENGAGEMENT		
	Frequency (*r*)	Duration (*r*)	z-score	Frequency (*r*)	Duration (*r*)	z-score	Frequency (*r*)	Duration (*r*)	z-score
Transitions									
Dyad	.63**	.35**	5.81**	.73**	.55**	4.17**	.02	-.52**	-5.35**
Mother	.61**	.34**	5.41**	.70**	.51**	4.19**	-.08	-.43**	-3.77**
Child	.54**	.30**	4.78**	.64**	.52**	2.70**	.09	-.47**	-4.06**
Dispersion									
Dyad	.52**	.41**	2.20*	.50**	.43**	1.30	.18	-.66**	-5.65**
Mother	.52**	.38**	2.76**	.45**	.42**	0.52	-.30**	-.50**	-2.17*
Child	.38**	.30**	1.51	.43**	.39**	0.76	.01	-.49**	-5.05**
AMD									
Dyad	-.55**	-.30**	4.86**	-.62**	-.49**	2.62**	-.05	.55**	-5.38**
Mother	-.48**	-.32**	3.14**	-.47**	-.35**	3.14**	.08	.40**	-3.29**
Child	-.46**	-.28*	3.54**	-.52**	-.44**	1.46	-.13	.42**	-3.18**

Note. p-values based on two-tailed z-critical values.

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

Table 8

Comparing the Regression Models across Dyad and Mother and Dyad and Child Emotional Flexibility Variables: r^2-values and z-scores

	DYAD AND MOTHER			DYAD AND CHILD		
	Dyad (r^2)	Mother (r^2)	z-score	Dyad (r^2)	Child (r^2)	z-score
Frequency of Shared Expression Regression Models						
Transitions	.72**	.67**	1.88^t	.72**	.67**	1.88^t
Dispersion	.44**	.37**	1.40	.44**	.36**	1.51
AMD	.36**	.25**	2.00*	.36**	.26**	1.89^t
Duration of Shared Expression Regression Models						
Transitions	.56**	.53**	1.00	.56**	.55**	0.59
Dispersion	.67**	.55**	2.55*	.67**	.62**	1.54
AMD	.58**	.45**	2.25*	.58**	.50**	1.77^t

Note. p-values based on two-tailed z-critical values.

$^t p < .10$,*$p < .05$, **$p < .01$.

Chapter 5: General Discussion

Processes guiding nonverbal emotion communication between mothers and their school-age children are not well understood, nor have they been sufficiently studied. The overriding goal of the present dissertation was to provide a more comprehensive understanding of the processes underlying nonverbal emotion communication in middle childhood by addressing some of the gaps in the emotion development literature, including: nonverbal emotion communication between mothers and children during middle childhood; examination of mother-child interactions during a positive, game-playing context; moving beyond the dyad to explore the role of individual emotional flexibility in the structure (i.e., organization) of mother-child interactions; the study of shared expressions, particularly neutral expressions; and the methodological implications of how constructs are measured (e.g., frequency or duration of expressions; individual behaviors or dyadic behaviors). In accordance with the goal(s) of the present dissertation, the main contributions were twofold: First, the findings with regard to the methodology and the ensuing results helped to expand our understanding of the moment-to-moment processes examined at the individual and dyadic levels that may underlie the expression of emotion during mother-child interactions in an at-risk community sample. Second, the present series of two studies addressed some of the shortcomings in the research regarding our knowledge of *individual* emotional flexibility during dyadic interactions, the role of shared neutral expressions, and how the structure *and* the content of the interactions can vary according to contextual demands. The dissertation studies began to unpack the less well-known mechanisms of mother-child positive interactions during middle childhood. Using innovative statistical and methodological procedures, it was

possible to capture some of the positive and not so positive processes underlying nonverbal emotion communication between mothers and their school-age children during a conflict task (Study 1) and game-playing task (Studies 1 and 2). Detailed examination of mother-child interactions are needed as part of comprehensive assessments identifying the interplay between the structure (i.e., flexibility) and content (i.e., expressed emotions) to inform our understanding of how functional and dysfunctional relationships develop, evolve, and are maintained across development.

Nonverbal Emotion Communication in Middle Childhood

Nonverbal emotion communication focuses on the ability to express, recognize, and regulate nonverbal displays of emotion in a contextually-appropriate manner and is taught and modeled in parent-child relationships (Saarni, 2008). However, there are several gaps in the present literature that impede our understanding of how nonverbal emotion communication develops and/or is maintained in mother-child relationships during middle childhood. Such gaps include a focus on outcome variables resulting from the mother-child relationship rather than process variables underlying the make-up of mother-child interactions, and a paucity of research examining nonverbal communication in middle childhood related in part to the focus on verbal communication. Regardless of age, how emotion is expressed and its consequences (i.e., the reactions that follow) continuously help children to regulate the behavior and emotions of self and to react to the emotion of others (Denham, von Salisch, Olthof, Kochanoff, & Caverly, 2002; Saarni, 2008). A sole focus on the content of verbal communication can cause researchers to overlook the influence of context on behavior. Nonverbal emotion behaviors convey both *how* and *how much* an event impacts the individuals involved in an interchange, as

well as the dyad as a whole (Dougherty, 2003). Results from the present dissertation highlight the interplay between emotional flexibility and positive, neutral and negative nonverbal emotion communication. In addition, they also provided a simple demonstration of the complex relationship between nonverbal and verbal communication. For example, results indicated that the relationship between emotional flexibility variables and duration of conversation was only significant when the duration of nonverbal emotion communication behaviors was examined. These findings corroborated previous research, which has found that the frequency of emotional expressions do not change for early versus late language development (Bloom, 1990). Future research is needed to continue to tease apart the unique interplay that verbal and nonverbal emotion communication have with respect to the structure (i.e., organization) of mother-child interactions.

Overall, results across Studies 1 and 2 exemplified just how critical nonverbal emotion communication is for adaptive development. Results underscored the importance of context in understanding the interplay between the process variables in addition to outcome or control variables. In particular, results from the present dissertation demonstrated the significance of examining a positive context when exploring the encoding and decoding of nonverbal emotion communication between mothers and their school-age children.

Inclusion of a Positive Context

Studies that examine mother-child interactions using observational measures tend to use conflictual or problem-solving type discussions when examining process variables (e.g., emotion expressions/displays) and their relation to child outcomes (e.g., Branje,

2008; Granic, Hollenstein, Dishion, & Patterson, 2003; Granic & Lamey, 2002), as it is assumed that there will be a larger range of emotion behaviors (Hollenstein et al., 2004). It was therefore unexpected that the game-playing task, a relatively short (4-minute) positive and playful activity, would contribute as many results as it did and become a larger focus of the present dissertation. Perhaps involvement in a primarily *nonverbal* activity where discussion tended to focus around the game helped prevent the masking or suppressing of emotional expressions and thus opened the door for nonverbal emotion communication to be more central. Research suggests that it is more difficult to suppress the expression of nonverbal than verbal communication (e.g., Burgoon & Bacue, 2003; Planalp, 1999); perhaps the lack of pressure to interact verbally allowed the dyads to interact more naturally while playing the game of Jenga. Another possibility is that the game-playing task, a nonverbal activity, was a better fit with the study of nonverbal emotion communication, as it required less verbal communication to successfully complete the task.

The processes underlying nonverbal emotion communication were illuminated during the positive context, which aligns well with the emotional development literature in general, as well as studies on the importance of play and play therapy (e.g., Brown, 2006a; Lester & Russell, 2008). According to this literature, play: (1) gives rise to feelings of positive affect, developing flexibility, optimism and resilience; (2) allows for the expression and experience of strong emotions within a safe outlet; and (3) provides children a place to assess the risk others may pose as well as the risk within their present surroundings. As play experiences also support the development of emotional

competence (Lindsey & Colwell, 2003), further research examining how both mothers and their school-age children communicate emotions during their playtime is warranted.

Individual versus Dyadic Emotional Flexibility

Using a dynamic systems perspective, (e.g., Fogel et al., 1992; Granic, O'Hara, Pepler, & Lewis, 2007; Hollenstein, Granic, Stoolmiller, & Synder, 2004; Lewis, Zimmerman, Hollenstein, & Lamey, 2004) the processes of stability and change were examined in real time (i.e., moment-to-moment interaction), allowing for the investigation into the nature or processes underlying emotional development. By examining both the structure (i.e., emotional flexibility) and the content (i.e., shared expressions), the present dissertation provided additional fine-grained information regarding the transactional patterns of interaction between the members of a dyad and the influence of their context (Sameroff, 2009). The emphasis on relational, dynamic, and transactional processes in a dynamic systems perspective fits well under the umbrella of the meta-theoretical transactional model (Sameroff, 2009). Transactional models take into consideration the past and present contexts in which changes occur when examined across time and development. They suggest going beyond the differences in emotional responding in the mother-child relationship based on age and developmental level of the child and also consider the past and present history of the mother-child relationship, as well as the mothers' own childhood histories, and the children's histories outside of this subsystem (Fogel, 2009; Sameroff & Mackenzie, 2003).

To the best of our knowledge, the study of emotional flexibility during mother-child interactions was solely at the dyadic level prior to the present dissertation. Given the transactional and bi-directional nature of socialization (i.e., mothers *and* children as

active agents during their interactions; e.g., Granic, 2000; Kuczynski, 2003; Sameroff, 2009), as well as the partially unique history and role that each member brings to an interaction, examining the relative influence of *each* member's flexibility across the interaction was not only warranted but necessary to push our understanding of the structure of social interactions forward. Across the two studies in the present dissertation, the relationships between individual and dyadic variables were examined using dynamic systems measures, providing a clearer and more comprehensive picture of the processes underlying the stability and change that occurred over time during mother-child interactions. In addition, understanding how the individual and dyadic structure and dyadic content of the interaction related to each other enhanced our knowledge of the interplay between these process variables across contexts, as well as mother and child outcome variables. More specifically, results from the present dissertation suggested that while mothers' emotional flexibility was influenced by their personal histories as children, their offspring's emotional flexibility appeared to have a stronger association to the dyad's "here-and-now" relationship quality. In-depth analyses comparing individual and dyadic emotional flexibility variables displayed intricacies in the processes underlying mother-child interactions that would have been lost had only dyad emotional flexibility been examined. These findings provide additional information regarding the bi-directionality of socialization by demonstrating that children as well as their parents are actively engaged in the process (Granic, 2000; Kuczynski, 2003). The bi-directionality of socialization practices appears to become more and more evident as children transition from preschool-age to middle childhood and on to adolescence. The follow-up analyses comparing individual and dyadic flexibility with shared expressions

contributed to our understanding of how nonverbal emotion communication related to dyad and individual emotional flexibility by teasing apart the unique influence of each individual's emotional flexibility. This unpacking of the emotional flexibility variables allowed for a better understanding of the mechanisms underlying stability and change between mothers and their school-age children. In addition, studying mother and child emotional flexibility separately provided additional evidence of *how* patterns of emotion behaviors in mother-child interactions are associated with their relationship across contexts and on a more global level (i.e., emotional availability variables; child behavioral outcomes; Serbin et al., 2011; Stack et al., 2012). Each member of any dyad brings unique characteristics to an interaction (e.g., behavior problems experienced by the parent as a child; age and gender of offspring; current levels of support and stress; e.g., Collin & Madsen, 2003; Stack et al., 2012) from their combined as well as individually experienced pasts. Findings from the present dissertation provided evidence that these individual characteristics need to be taken into account when examining the structure (i.e., organization) of mother-child interactions in order to apply such processes to the development of successful interventions (Kelly & Barnard, 2000). Put another way, keeping in mind the bi-directional nature of the socialization process as children grow may be a key component to developing successful interventions in middle childhood (Granic, 2000). In addition to the importance of unpacking the structure of the interaction, understanding the mechanisms underlying the content or shared expressions used during mother-child interactions is needed to comprehend both sides of nonverbal emotion communication during middle childhood.

Shared Expressions in Mother-Child Interactions in Middle Childhood

Across the two studies, the content of nonverbal emotion communication was examined through shared expressions, using the discrete behaviors of facial expressions in Study 1 and established latent psychological constructs (a combination of facial expressions, eye movements, vocalizations, postures, and activity level; Coan & Gottman, 2007; Planalp, 1999) in Study 2. Regardless of the nonverbal mode(s) used, the level of shared expressions (i.e., affective matching; matched affect; affective synchrony) was measured, which is the degree to which parents and children simultaneously display the same affective expression (Harrist & Waugh, 2002). Research has shown that lower levels of shared expressions between parents and infants are related to poorer physical outcomes for the infants (greater physiological arousal and atypical vagal tone reactivity to their mothers; Moore & Calkins, 2004). In other research, it has been found that mother-child dyads who display fewer shared positive expressions and more shared negative affect have been associated with maternal depression, suggesting the importance of assessing valence when examining the quality of dyadic interaction (see Moore et al., 2012 for a brief review). When examining shared expressions between mothers and children, the research has generally been focused on infants and young children; however, the present studies provided evidence to support speculations that affective matching still plays an important, yet different role, in middle childhood (Harrist & Waugh, 2002), and in the context in which shared expressions are displayed (Saarni, 2008). For example, from an attachment framework, the notion of shared expressions aligns well with the concepts of attunement (a reflection of how sensitive and responsive a mother is to her child's cues) and mutual regulation (a child's responsiveness to

mother's efforts; Colle & Del Giudice, 2011). Across the present series of two studies, findings suggest that attachment is a dynamic, changing process that may require fine-tuning and adjustments as the child matures and the relationship between mother and child changes (Colle & Del Giudice, 2011; Collins & Madsen, 2003). Furthermore, results from the present dissertation expand the current literature pertaining to the importance of shared expressions, particularly positive and neutral expressions, between mothers and children during middle childhood.

Fredrickson's (2001) broaden-and-build theory of positive emotions suggests that the experience and expression of positive feelings allow children to be more open to learning and problem-solving (Isen, 2008). Denham and colleagues (Denham, Bassett, & Wyatt, 2007) provided corroborating evidence for this theory by showing that positive expressiveness in families promotes emotion understanding. Results from the present dissertation expand current theories on positive emotions as well as the dynamic systems literature, demonstrating that while emotional flexibility may help teach children to regulate and repair the experience and expression of negative emotions (Granic & Hollenstein, 2003; Granic & Lamey, 2002), flexibility may also help to teach children to be more open, cohesive, and adaptive during positive mother-child interactions. For example, results from the present series of two studies suggest that mothers, children, and dyads who were more flexible shared positive expressions more frequently and for longer durations. These more flexible, positive characteristics of families were also associated with lower levels of maternal childhood histories of aggression and aggression and withdrawal, less parenting stress and more social support in both the mothers' and children's current environments, as well as better quality in the concurrent relationship

and fewer child behavior problems. As positive nonverbal (as well as verbal) communication skills facilitate appropriate levels of interpersonal cohesion and adaptability to change (Olson, 2000), results from the present dissertation underscore the interplay between emotional flexibility and negative, positive, *and even* neutral emotional experiences.

Results from the present dissertation contributed to our understanding of shared positive and negative affect, which are commonly studied affective states, and also neutral expressions, whose impact during mother-child interactions has been far less explored. The context-dependent nature of neutral expressions was particularly striking: while longer durations of shared neutral expressions appeared beneficial during a conflict task, the results suggested that it was non-adaptive during the game-playing task. More specifically, findings across the present series of two studies suggested that sharing longer durations of neutral or engagement expressions during the game-playing task were associated with less flexibility for children and mothers, a negative interaction pattern (e.g., Granic & Lamey, 2002; Hollenstein et al., 2004). The present dissertation was able to unpack the role of neutral expressions during a positive context even further by displaying *how* the nature of the context may influence the interaction. For example, a more complex understanding of the role of shared neutral expressions during a game-playing context was achieved across studies, wherein frequent displays of engagement were positively related to a flexible (i.e., organized) interaction while long durations of neutral expressions were not. Future research on neutral expressions across different contexts (e.g., problem-solving), ages (e.g., preschool-age, older adolescence), and within

different relationships (e.g., father-child, siblings, peers) would be beneficial in helping to understand their role during social interactions.

Taken together, results from the current dissertation demonstrated that examining the interplay between the structure (i.e., organization), content (i.e., expressions), and context is important when considering attunement in mother-child relationships during middle childhood. The attachment literature suggests that children who feel safe and secure in their relationship are able to move more freely (i.e., display more flexibility) in their relationship with their mothers (e.g., Colle & Del Giudice, 2011). Mothers with histories of risk, who have been found to have difficulty establishing secure connections with their children (e.g., Kim & Cicchetti, 2010; Stack et al., 2005, 2012) may carry this into their own rigid patterns of interacting. The results from the present dissertation may also imply that the connection created between mothers and children needs to be maintained beyond the end of early childhood, and can be continuously cultivated during every interaction. However, the continuous reinforcement of the relationship between mother and child may evolve as children age and bi-directional socialization practices become more explicit. Results from the present dissertation suggest that the overall relationship between individual flexibility and the duration and frequency of shared expression lends support to bi-directional socialization and transactional models of interaction within the mother-child relationship during middle childhood (e.g., Granic, 2000; Kuczynski, 2003; Sameroff, 2009).

Bi-Directional Socialization of Nonverbal Emotion Communication

Mothers, who are often the primary caregivers, appear to be entrusted with the role of socializing their children's understanding of the expression and regulation of

emotions as it develops in everyday interactions (Eisenberg, Cumberland, & Spinrad, 1998). There is substantial evidence that children's expressions of emotion are unintentionally socialized every day through modelling (how to express them, and when), coaching, contingent responding, and through others' reactions (e.g., Denham et al., 2007). There is strong support that children of caregivers who encourage emotional expression come to understand emotions better (Denham et al., 2002). In turn, these children display more optimal social competence and academic achievement, as well as fewer behavior problems then children of mothers who discourage such expressions (Denham et al., 2007; Eisenberg et al., 1998; Isley et al., 1999). Results from the present dissertation contributed to our understanding of mothers' socializing role in terms of how they organize themselves within the interaction. For example, the results suggested that mothers' emotional flexibility was partly influenced or associated with their own past histories of behavior problems as well as present living situation (e.g., parenting stress, perceived social support; ability to support and stimulate one's child). The emotional flexibility of mothers also appeared to differ at times from how children organized themselves during the exchange, as well as the dyad as a whole. However, the differences that were observed appeared to be dependent on the type of flexibility measured (transitions, dispersion, or AMD values; see the section on individual versus dyadic flexibility for more detail). Future research examining mothers' flexibility across different contexts (e.g., problem-solving; positive discussions), as well as examining adjustments in how mothers' flexibility changes as the child becomes an adolescent, will help inform the trajectory of these developments over time. Understanding the trajectory may enlighten us about the mechanisms underlying maternal emotion socialization

practices and how mothers adapt to the change in developmental periods, in addition to how dysfunctional patterns may emerge in relationships where mothers do not adapt.

However, children are not passive recipients of their mothers' socializing strategies, but actively engage in the creation of their own environments and social interactions (Granic, 2000; Kucynzski, 2003). Children are in fact players in their own emotion socialization and development. From infancy to adolescence, research has shown that different temperamental characteristics play an important role in children's expression of emotion, influencing their social behavior (Denham et al., 2007). Research conducted by Patterson and colleagues (e.g., Chamberlain & Patterson, 1995; Patterson, 2002) addressing the coercive interaction patterns between children and parents has demonstrated the role children play in maintaining these negative cycles (e.g., children with more negative emotionality and difficulties regulating angry outbursts elicit negative responses from their parents). At the other end of the spectrum, children whose ability to understand emotional exchanges is well-developed have been shown to be more effective communicators of their own feelings and goals during social interactions (Denham et al., 2007), promoting positive interchanges in their relationships (e.g., eliciting positive responses from their mothers). Results from the present dissertation provide evidence for the association between children's emotional flexibility and the quality of their relationship with their mothers (while mother's emotional flexibility was not associated), as well as their own behavior problems. Furthermore, in-depth analyses examining the duration versus frequency of shared expressions and the structure of nonverbal emotion communication addressed gaps in the literature by demonstrating that different results and strength of relationship emerge depending on the unit (individual or dyad) being

examined. For example, children's rigidity (i.e., AMD values) was related to the duration of shared engagement, but not its frequency. This was just one of several findings unique to children's emotional flexibility, suggesting that future research is warranted to gain an even deeper understanding of how flexibility variables interact with shared displays of emotion, depending on the member(s) involved in the exchange. The results from the present series of two studies also demonstrated the importance of understanding the underlying processes when examining moment-to-moment interactions between mothers and their school-age children, particularly during a positive context.

Taken together, the results from the present dissertation allow for inferences to be made regarding the involvement of both mothers *and* children in the process of emotion socialization, which slowly takes place over the everyday interactions in relationships over time and across contexts. However, this process does not occur in a vacuum: mother-child emotional exchanges, current and future, are molded not only by their previous interactions, but also by other experiences of the child and mother, including mothers' childhood experiences.

Past and Present Risk Factors

Mother and child interactions, including the content they share and how they structure their exchanges, are affected by risk factors both past and present. A mother's ability to socialize emotion and adaptive development in her offspring is greatly influenced by her own experiences as a child and an adult. For example, research with participants from the Concordia Project has shown that childhood histories of behavior problems, such as aggression and/or social withdrawal, influence subsequent parenting style and increase the probability of a host of developmental and psychosocial difficulties

in offspring, thus perpetuating a cycle of risk over time and across generations (e.g., Stack, Serbin, Schwartzman, & Ledingham, 2005; Serbin et al., 2002). During parenthood, environmental stressors such as lower SES and lack of social support can prevent parents from providing adequate stimulation and support to their children, further interrupting the socialization process and increasing the probability of detrimental outcomes in their offspring (e.g., lower cognitive ability, academic outcomes, more behavior problems; Serbin et al., 2011). The Concordia Project provided a unique opportunity to study the intergenerational transfer of parenting and environmental stress during childhood, and to determine the processes and protective factors underlying the mother-child relationship that predict negative as well as positive outcomes for children within an at-risk population. Results from the present dissertation contribute to the growing list of factors that are influenced by mothers' childhood histories of aggression and aggression and withdrawal: mothers with higher levels of aggression or aggression and withdrawal in childhood displayed less flexibility during the game-playing and conflict tasks. Interestingly, this relationship was only true for mothers' emotional flexibility, highlighting once again the importance of examining emotional flexibility of individual members in addition to the dyad. Continuity of risk factors over time was also examined by exploring current risk (and protective) factors, measured by the current social support and stress index. This index has been found to be a good measure of the current level of mothers' parenting stress and whether adequate support is perceived as being provided to the mother, and from the mother to the child (Stack et al., 2012). As anticipated from the dynamic systems literature, results from the present dissertation underscored that dyads, mothers, and children with less emotional flexibility (measured

by transitions and AMD values) were also found to have lower levels of support and more stress.

As the concept of risk is inherently probabilistic, it follows that some individuals from moderate to high-risk backgrounds are likely to develop well, despite their apparently poor prospects in infancy or early childhood. Hence, within an at-risk population, it is expected that there will likely be a range of outcomes in terms of adaptation and competence across the lifespan. By using an at-risk community sample, the present dissertation was able to allude to the indices of risk and resilience indicated by the developmental psychopathology framework (Cicchetti & Toth, 2009; Kim & Cicchetti, 2010). This framework emphasizes the need to comprehend the mechanisms behind both dysfunctional as well as functional behavior in order to fully understand the pathways to adaptive and maladaptive outcomes throughout development. Results from the present dissertation reinforce several tenets of this framework. First, the results did not only focus on risk factors, but also a number of protective factors that may have been adaptive for some of these high-risk families (e.g., demonstrating more emotional flexibility; sharing positive expressions more frequently and for longer durations during a positive context; sharing longer durations of neutral expressions during a conflict task but not a game-playing task). Second, the interactive intra- and inter-individual processes of (dys)functional behavior and how it may be maintained within the mother-child relationship during middle childhood was a focus, extending beyond the study of indicators to outcomes. In addition, and also central to the development psychopathology framework, the present dissertation used multiple levels of analyses in order to better inform prevention and intervention practices for those at highest risk for developing later

disorders, as well as those who "beat the odds" and are able to protect themselves from transferring the cycle of risk across generations. Finally, the methodological considerations emphasized throughout the present dissertation addressed some important gaps in the current literature.

Methodological Considerations

Addressing several methodological short-comings of the current emotional development literature became a central piece of the present dissertation. Gaps that were addressed included: the examination of nonverbal emotion communication between mothers and their school-age children across two contexts (game-playing and conflict tasks) with a focus on a positive game-playing task; the measurement of individual emotional flexibility variables as well as dyadic flexibility; the examination of neutral expressions in addition to positive and negative expressions; measurement of the frequency and duration of expressions. Results informed our understanding of the mechanisms underlying mother-child nonverbal emotion communication on several levels. For example, by measuring the relationship between each content and emotional flexibility variable and then comparing the strength of the relationships, the present dissertation began to unpack the processes that create the moment-to-moment patterns of interaction between mothers and children during middle-childhood. In other words, results suggest that the interplay between content and structure changed depending on how the process variables were analyzed (e.g., transitions versus dispersion versus AMD with respect to flexibility; dyad versus mother or child emotional flexibility; duration or frequency of shared expressions). In addition, the use of multiple measures (semi-naturalistic observations in the home and questionnaires), as well as varied statistical

approaches, particularly with respect to understanding the detailed coding of the observations, allowed for a more comprehensive examination of behavior across several different informants.

The use of innovative statistical applications such as state space grids allowed for explicit observation and quantification of the processes behind the interactions *as they occurred.* This in itself is quite remarkable, given that much of our recent research and theories in the area of child development promote the importance of understanding the structure (i.e., organization) and content (i.e., behavior) displayed during interactions (e.g., Kuczynski, 2003). Quantifying moment-to-moment processes underlying mother-child interactions will hopefully continue in the future, as the quest to unpack the mechanisms behind adaptive and maladaptive exchanges and their impact on later outcomes (both children *and* mothers) has only just begun. In the present dissertation for example, the results suggest that individual emotional flexibility was uniquely associated to outcome variables (e.g., maternal childhood histories of risk; relationship quality; child behavior problems) and other process variables (e.g., frequency and duration of shared expressions). However, the differences appeared to be dependent on the type of emotional flexibility variable examined (i.e., transitions or dispersion or AMD values). More specifically, dyadic transitions and AMD values (but not dispersion) had different associations to mother and child transitions and AMD values when predictor variables included the frequency of shared expressions. In contrast, dyad and individual emotional flexibility variables had fewer differences in their findings (i.e., were measuring the same thing) when predictor variables included the duration of shared expressions. These findings have important implications for understanding the measurement of emotional

flexibility and perhaps even how to use this knowledge when developing assessment tools and/or intervention programs that address family dynamics.

In order to have accurate, in-depth assessment of mother-child nonverbal emotion communication, results from the present dissertation demonstrated the need to disentangle the underlying processes, with respect to: (1) the emotional flexibility variables examined, and (2) whether the dyad's structure is providing the whole story of the interaction, or whether mother and child are bringing their own unique histories to the "here-and-now" exchange. The results revealed a relationship between variability (i.e., flexibility) and contextually-appropriate displays of shared positive and neutral expressions (i.e., content) using facial expressions alone, as well as broader emotional constructs. The importance of spending time displaying positive emotions (interspersed with shorter but frequent displays of neutral expressions) during a playful activity was evident. Such methodological considerations should be addressed in future research that examines the interplay between processes variables, moving research forward in the understanding of the "how" of interactions, particularly with respect to mother-child exchanges during a *positive* context.

Summary. Overall, findings from the present dissertation highlight the importance of examining the dyad *and* the individual in the moment-to-moment interactions in continued efforts to unpack the processes underlying functional and dysfunctional mother-child exchanges during middle childhood. In addition, state space grids are one way to open the door to begin to understand and work with the processes that are potentially *modifiable factors* within moment-to-moment interactions. Pinpointing factors that are modifiable within mother-child interactions is a critical

component to any intervention. Researchers do not want to change or cannot change factors such as child temperament, age, and gender, and it can be incredibly difficult to change factors such as criminality, ones' neighbourhood, socio-economic status, etc., especially in the relatively short amount of time and limited amount of finances available for treatment programs. Therefore, focusing in on the modifiable factor of the moment-to-moment exchange within interactions may be one approach to making change over time at the micro-level (i.e., parent-child relationship). The present dissertation was able to contribute to unpacking the structure and content underlying mother-child interactions in an at-risk community sample. Broadening the understanding of the processes behind functional and dysfunctional patterns of interactions using an at-risk sample can help inform interventions targeting maladaptive family dynamics.

Applied Implications

Interventions that nurture responsive mother-child relationships and assist in successful emotion socialization not only increase the likelihood that children demonstrate adaptive levels of emotional competence, but may also interrupt the cycle of risk, thus minimizing harmful repercussions on subsequent generations. For example, the importance of regulating emotional expressions has been highlighted in research with children who have been maltreated, providing evidence of the difficulties parents can have in socializing regulatory displays of emotion in historically at-risk families (e.g., providing support and modelling how to handle negative emotions when children are upset; Kim & Cicchetti, 2010). As highlighted throughout the present dissertation, so much was said without saying anything at all - the exchange of nonverbal emotion communication appeared to speak as loud (if not louder) than words. The results of the

present series of two studies suggest that the indirect socialization of emotion occurs during nearly every moment of parent-child interaction. It therefore appears that there are many moments in the parent-child relationship that can be tapped for intervention programs. Promoting positive relationships and interactions through parent training programs, for example, tends to be the crux of these programs, much more so than reducing maladaptive outcomes by eliminating problematic behavior (e.g., Craig & Pepler, 2008; Nowak & Heinrichs, 2008). For example, researchers using a dynamic systems perspective have provided evidence of how the structure of mother-child interactions (i.e., emotional flexibility) can be adjusted to increase successful mother-child exchanges through parent training and behavior modification programs for aggressive school-age children (Granic, O'Hara, Pepler, & Lewis, 2007). Using a pre-post treatment design, Granic et al. found that children who were rated as less aggressive by their mothers following treatment increased their (dyadic) emotional flexibility during interactions compared to those children who were rated as similarly aggressive pre- and post-treatment.

Building on these exciting findings, results from the present dissertation corroborate the importance of emotional flexibility regardless of the context (playful or conflictual). In addition, results provided ideas for *where* (game-playing activities as well as conflict tasks) and *how* to adjust the flexibility of the dyad *and* the individual. More specifically, the importance of emotional flexibility in game-playing activities was underscored throughout the dissertation. Perhaps a positive context such as playing a game would be an optimal place to start working with mothers and children "stuck" in more maladaptive patterns of relating; a more relaxed atmosphere with less expectation

for verbal communication may allow for more focus on nonverbal communication and its context-appropriate regulation. For example, results from the present dissertation suggest that increasing the frequency and duration of shared positive affect while decreasing the duration of neutral expressions during game-playing activities may increase emotional flexibility. For example, helping parents tune in to the importance of sharing positive emotions with their children at context-appropriate times (e.g., playing games), through psycho-education and potentially behavior monitoring may be a simple and effective way to increase dyadic flexibility. In turn, increasing emotional flexibility may promote change in the dynamic of the mother-child relationship and perhaps extend to the larger family unit (e.g., Lukenheimer, Olson, Hollenstein, Sameroff, & Winter, 2011).

Continued exploration of play between mothers and children in middle childhood and the influence of the structure and content expressed during play may help mental health professionals pinpoint areas to focus on during play therapy (i.e., the relationship between therapist and child), or when coaching mothers and children in treatment (e.g., parent training and behavior modification programs; Nowak & Heinrichs, 2008). Furthermore, the opportunities provided by helping to unpack the processes underlying dysfunctional relational patterns within a non-threatening, positive and playful context may be beneficial in moving interventions forward. Future research examining shifts in flexibility during playful activities within a clinical population could be valuable to furthering our understanding of such interventions within a positive clinical psychology framework (e.g., Wood & Tarrier, 2010). As the present dissertation's results are correlational in nature, the causality in the abovementioned string of events is

hypothetical. Research that addresses the causality or sequence of changes in interactional patterns is sorely needed to better inform family intervention programs.

Utilizing the processes of emotional flexibility and shared expressions also has promise for interventions using a family systems framework as well. Family flexibility is a core trait that prevents family dysfunction (Doherty, 1993). In structural family therapy (e.g., Nichols & Schwartz, 1998), there is a focus on boundaries, hierarchies, and proximity in families. Families need to be stable enough to ensure continuity, but also flexible enough to accommodate to changing circumstances. In particular, disengaged families are found to have rigid boundaries and extreme emotional distance. The results of the present dissertation regarding neutral expressions and its relation to rigidity in both mothers', children's, and dyads' organization during mother-child exchanges may suggest that these families were showing some level of disengagement. Although highly speculative, the findings may also speak to the importance of applying flexibility to subsystems in families, as disengagement (as well as enmeshment) between subsystems tend to be reciprocal (i.e., shared/synchronous expressions). Furthermore, knowing the appropriate emotions to express during which context, a seemingly understudied relationship may provide an additional area to help families balance their level of involvement and flexibility. As research suggests that low matching or matching on negative emotions can be harmful to the mother-child relationship (see Moore et al., 2012 for a brief review), so may the overuse (in terms of duration) of neutral expressions during playful activities. As the dynamic systems literature expands to include the examination of the emotional flexibility of families during positive and negative affective displays (e.g., mother, father, and child; Lukenheimer et al., 2011), results from the

present dissertation provide evidence to include a place for the examination of neutral expressions as well and their use within different family contexts.

Conclusions and Future Directions

Through a series of two studies, the present dissertation addressed some of the gaps in the literature by extending our understanding of the context-dependent role of shared neutral expressions, as well as providing evidence for the information that can be gained when examining mother-child interactions during a positive context. This is the first set of studies to examine the process variables of *individual* as well as dyadic emotional flexibility and the duration of shared positive, negative, *and* neutral expressions (content) across two contexts in at-risk mother-child dyads during middle childhood -- an important developmental period of expanding social networks (Denham et al., 2002). The results from the present dissertation suggest that the type of patterns that develop is complicated by *how* the structure or organization (flexibility, variability, or rigidity) and content (frequency or duration) of the interaction are examined, *who* is examined (dyad or mother and child individually), and *which* context is examined (positive versus conflictual). By examining both intra- and inter-individual differences in real- (and developmental) time and across contexts, researchers can continue to expand our understanding of the processes of change within relationships and therefore, explain how change in real-time occurs in emotional processes. Given the intricate links between social and emotional competencies more generally (e.g., Saarni, 2008) and emotional expressiveness and social interactions more specifically (e.g., Planalp, 1999), understanding the processes underlying the nonverbal emotion communication exchanges between mothers and their school-age children advances our conceptualization of

relationship quality demonstrated during this developmental period. Results from the present series of studies also add to the growing dynamic systems literature, which suggests that patterns of interactions develop in relationships, influencing behavior and development over time.

Despite some limitations (e.g., the brevity of the tasks, the correlational nature of the data, and a fairly small sample size), the contributions of the present dissertation outweigh the drawbacks. The focus on a positive, playful activity is novel to research examining mother-child interactions in middle childhood and arguably, more suitable for examining nonverbal emotion communication (at least positive and neutral). Furthermore, the methodological implications of the present dissertation and how choice of variable can change our understanding of the underlying processes of an interaction suggest a need for future research to continue to disentangle the complicated interplay of the process variables that are alive and at work in every exchange. And as previously noted the importance of accurate in-depth assessment of socio-emotional functioning during development cannot be understated.

As discussed throughout this chapter specifically, and the dissertation more generally, future research should continue to explicitly examine shared positive and neutral expressions during mother-child interactions during middle childhood, an often neglected developmental period. Prior to the present dissertation, little was known about the unique contributions of the frequency *and* duration of positive (e.g., enthusiasm, enjoyment) and neutral (e.g., engagement) nonverbal emotion communication during positive parent-child interactions in middle childhood. And there is still an abundance to learn. For example, future research is needed to continue to tease apart the unique

interplay that verbal and nonverbal emotion communication have with respect to the organization or structure of mother-child interactions during a positive and playful activity. Exploring how the structure changes when more or different family members are included (e.g., father, sibling), when peers are involved, and at different development periods (e.g., preschool versus adolescence), would all be important and timely areas to explore using different types of positive and playful activities that could rely more heavily on nonverbal than verbal communication. Furthermore, results from the present dissertation highlight how the process and/or outcomes may change depending on the variable(s) included in the research design (e.g., duration versus frequency of behavior; dyad versus individual members). Such methodological considerations should be considered in future research that examines the interplay of process variables during moment-to-moment interactions. For example, shared neutral affect could be a risk factor or a protective factor in high-risk dyads, depending on the context in which it is shared. Further examination of neutral expressions in tandem with positive and negative expressions of emotion (e.g., its impact on different contexts with different dyad or triad pairings, such as father and child, father, mother, and child, siblings, or peers) is needed to increase our understanding of this understudied expression. Furthermore, examining additional sources linked with individual differences in parent-child interaction, such as social and economic factors (e.g., teenage motherhood; maternal and/or child psychopathology) and the unique contributions of risk and protective factors to mothers', children's, and the dyads' emotional flexibility are avenues worthy of future research.

Overall, the present dissertation began to unpack the less well-known aspects of mother-child interactions with the help of innovative methodological and statistical

procedures that capture the positive and not so positive processes underlying mother-child nonverbal emotion communication during middle childhood. Good communication is a key factor in building successful relationships. Accurately identifying and using nonverbal communication skills help children to express their true feelings, establish healthy relationships, and connect with others across development.

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Appendix A

Sample Items from the Pupil Evaluation Inventory

Aggression Items

3. Those who can't sit still.

4. Those who try to get other people into trouble.

8. Those who play the clown and get others to laugh.

9. Those who start a fight over nothing.

20. Those who bother people when they're trying to work.

23. Those who are rude to the teacher.

24. Those who are mean and cruel to other children.

Withdrawal Items

5. Those who are too shy to make friends easily.

10. Those who never seem to be having a good time.

11. Those who are upset when called on to answer questions in class.

13. Those who are usually chosen last to join in group activities.

17. Those who have very few friends.

28. Those who often don't want to play.

32. Those who aren't noticed much.

Appendix B

Informed Consent Form

«**L'INDIVIDU DANS SON MILIEU: Les parents et leurs enfants**»

Directeurs du projet: -Lisa A. Serbin, Ph.D.
-Dale M. Stack, Ph.D.

Numéro d'identification:

Formulaire de consentement

Je, soussigné(e), autorise les chercheurs du projet «*L'individu dans son milieu*» de l'université Concordia à rencontrer mon enfant _____à l'école, en deux sessions, durant la période de classe. Je comprends que mon enfant remplira des tests de fonctionnement intellectuel et académique ainsi que des questionnaires sur son comportement et son tempérament. J'autorise également les chercheurs à recueillir des informations sur la vie scolaire de mon enfant de la part de son professeur et à avoir une copie du dernier bulletin de l'année en cours. Finalement, lors d'une troisième visite, je consens à rencontrer les chercheurs de l'université Concordia à la maison avec mon enfant afin de remplir des questionnaires additionnels portant sur notre vie familiale et de recueillir des échantillons de salive sur moi-même, lors de la rencontre, et sur mon enfant, lors de la rencontre et pendant deux jours de la semaine. J'accepte aussi d'être filmé(e) avec mon enfant lors d'une session incluant un jeu et des discussions portant sur des résolutions de problèmes.

Je comprends que toute l'information recueillie demeurera confidentielle et qu'elle ne servira qu'à des fins de recherche. Cependant, si après évaluation des examens votre enfant requérait une attention spéciale, les chercheurs de l'université Concordia s'engagent à faire le suivi de la rencontre afin de référer les services nécessaires.

Dans l'éventualité où j'aurais des questions concernant cette recherche, je pourrai m'adresser soit à Julie Aouad ou bien à Nadine Girouard au (514) 848-2424 extension 2254.

Nom: _____ Date:
EN LETTRES MOULÉES

Signature:
****

Nom de l'enseignant/e:

Année:

Nom du directeur/de la directrice:

Nom de l'école:

Numéro de téléphone: (_____)
code régional

Adresse: _____
rue

_____
ville code postal

Appendix C

Jenga Task Protocol

Home: script visit

Jenga Task: 4 minutes

Voici un jeu que vous aimerez sûrement. Jenga est un jeu coopératif. Chacun votre tour, vous enlèverez un bloc de cette tour de 18 étages et vous placerez sur la tour, perpendiculaire aux blocs de l'étage juste en dessous. Terminer toujours un étage de trois blocs avant de commencer l'étage plus haut.

Vous devez travailler en équipe. Le but est de bâtir une tour aussi haute que possible jusqu'à ce quelle tombe.

Appendix D

Conflict Task Protocol

Conflict Resolution Task

1) Complete Parent-Child Conflict Questionnaires

La mère et l'enfant sont séparés lorsqu'ils complètent le questionnaire sur les conflits.

Mother and child are separated in order to complete the parent-child conflict questionnaire (*Potential Parent-Child Conflict Questionnaire*).

"Voici une liste de thèmes à propos desquels les enfants et leurs parents sont souvent en désaccord. Nous voulons connaître jusqu=à quel point vous (mère et enfant) êtes en désaccord sur ces sujets à la maison. Veuillez indiquer sur une échelle de 0 à 5 chacun des items de la liste. 0 = Je ne suis pas en désaccord et 5 = je suis très en désaccord."

2) Conflict Resolution Task (6 minutes)

L'assistant(e) de recherche doit avoir sélectionne le sujet de discussion a partir des questionnaires remplis par la mère et par l'enfant (*Potential Parent-Child Conflict Questionnaire*). Le sujet de discussion doit être choisi a partir du sujet que la mère et l'enfant auront évalue comme étant problématique sur l'échelle.

Choisi le sujet qui possède le score le plus élevé et ou les scores chez la mère et l'enfant sont très semblables.

"Nous vous avons demandé tout à l'heure de remplir un questionnaire afin d'identifier certains thèmes qui peuvent causer des problèmes dans votre famille. Après avoir regardé chacune de vos réponses, j'ai choisit un sujet qui semble être l'objet d'une mésentente entre vous et qui ferait l'objet d'une discussion intéressante. Le sujet que vous aveux identifié est _____. J'aimerais que vous preniez les six prochaines minutes pour discuter ensemble de ce sujet. Il est important que vous participiez tout(e) les deux. Je vais maintenant vous laisser seul(e) s et je vais revenir dans six minutes. Avez-vous des questions? Vous pouvez commencer."

Appendix E

Descriptive Statistics for Chapter 2

(Table E1)

Table E1

Child and Mother Facial Expressions: Means, Standard Deviations (SD), Ranges, and Kappas (Raw Scores; N = 51)

	Mean	SD	Range	Kappa
GAME-PLAYING TASK				
Child Facial Expressions				
Smile	88.47	49.01	1.00-203.00	0.83
Neutral Face	119.86	44.20	27.00-198.00	0.84
Frown/Look upset	2.55	7.68	0.00-52.00	0.87
Look Sad/Distressed	1.94	5.33	0.00-36.00	0.70
Unfelt Smiles	0.31	1.39	0.00-9.00	0.50
Negative Expressions	4.80	9.37	0.00-52.00	0.83
No Code - Face	25.88	29.35	0.00-132.00	0.85
Mother Facial Expressions				
Smile	82.57	54.94	0.00-184.00	0.85
Neutral Face	136.37	53.40	22.00-225.00	0.85
Frown/Look upset	4.73	13.47	0.00-82.00	0.90
Look Sad/Distressed	3.80	7.59	0.00-42.00	0.76
Unfelt Smiles	0.00	0.00	0.00-0.00	--
Negative Expressions	8.65	16.81	0.00-82.00	0.84
No Code - Face	11.43	12.75	0.00-52.000	0.86
CONFLICT TASK				
Child Facial Expressions				
Smile	56.27	47.21	0.00-169.00	0.86
Neutral Face	117.47	64.26	1.00-294.00	0.88
Frown/Look upset	46.31	42.68	0.00-161.00	0.86
Look Sad/Distressed	50.12	56.60	0.00-316.00	0.86

Unfelt Smiles	23.98	26.45	0.00-112.00	0.76
Negative Expressions	120.33	77.36	0.00-316.00	0.85
No Code - Face	42.12	77.57	0.00-312.00	0.92
Mother Facial Expressions				
Smile	52.14	51.78	0.00-201.00	0.89
Neutral Face	190.39	82.07	36.00-360.00	0.87
Frown/Look upset	72.12	79.29	0.00-271.00	0.90
Look Sad/Distressed	7.69	24.92	0.00-153.00	0.82
Unfelt Smiles	3.92	7.54	0.00-38.00	0.72
Negative Expressions	78.51	81.34	0.00-267.00	0.87
No Code - Face	10.02	28.32	0.00-182.00	0.83

Appendix F

Summary Tables for Regression Analyses Reported in Chapter 2

(Tables F1 through F6)

Table F1

Summary of Results from Maternal Risk Factors Regression Models Predicting Emotional Flexibility

Outcome measures	Significant predictors in the final model[a]	Betas	Explained variance	Statistics for the final equation
GAME-PLAYING TASK				
Child				
Emotional Flexibility Index	N/A	--	--	R^2_{Adj} = -.05, F = 0.46
Mother				
Emotional Flexibility Index	4) Aggression x withdrawal[t]	-0.30	6.0%	R^2_{Adj} = .11, F = 2.48[t]
CONFLICT TASK				
Child				
Emotional Flexibility Index	N/A	--	--	R^2_{Adj} = .00, F = 0.97
Mother				
Emotional Flexibility Index	1) Maternal childhood aggression*	-0.31	10.0%	R^2_{Adj} = .05, F = 1.66

[a]Bracketed numbers indicate the step at which the predictor was entered and/or became significant.
[t]$p < .10$. *$p < .05$. **$p < .01$.

Table F2

Summary of Results from Emotional Flexibility Indices and Maternal Risk Factors Regression Models Predicting Duration of Shared Expressions

Outcome measures	Significant predictors in the final model[a]	Betas	Explained variance	Statistics for the final equation
GAME-PLAYING TASK				
Child Emotional Flexibility				
Dyad Positive Expressions	1) Maternal childhood aggression[t]	-0.25	6.0%	R^2_{Adj} = .11, F = 1.12
Dyad Neutral Expressions	5) Child emotional flexibility*	-0.33	10.0%	R^2_{Adj} = .15, F = 1.62
Mother Emotional Flexibility				
Dyad Positive Expressions	1) Maternal childhood aggression[t]	-0.26	7.0%	R^2_{Adj} = .17, F = 2.94*
	5) Mother emotional flexibility**	0.41	14.0%	
Dyad Neutral Expressions	5) Mother emotional flexibility*	-0.36	11.0%	R^2_{Adj} = .06, F = 1.60
CONFLICT TASK				
Child Emotional Flexibility				
Dyad Positive Expressions	5) Child emotional flexibility[t]	0.29	8.0%	R^2_{Adj} = .01, F = 1.13
Dyad Neutral Expressions	N/A	--	--	R^2_{Adj} = .01, F = 1.12
Dyad Negative Expressions	N/A	--	--	R^2_{Adj} = .02, F = 1.23

Mother Emotional Flexibility				
Dyad Positive Expressions	N/A	--	--	R^2_{Adj} = -.04, F = 0.61
Dyad Neutral Expressions	N/A	--	--	R^2_{Adj} = .01, F = 1.07
Dyad Negative Expressions	N/A	--	--	R^2_{Adj} = .01, F = 1.06

[a]Bracketed numbers indicate the step at which the predictor was entered and/or became significant.
[t]$p < .10$. *$p < .05$. **$p < .01$.

Table F3

Summary of Results from the Emotional Flexibility Index Regression Models Predicting Relationship Quality

Outcome measures	Significant predictors in the final model[a]	Betas	Explained variance	Statistics for the final equation
GAME-PLAYING TASK				
Child Emotional Flexibility				
Maternal sensitivity	N/A	--	--	R^2_{Adj} = -.03, F = 0.70
Maternal hostility	1) Maternal childhood aggression[t]	0.26	7.0%	R^2_{Adj} = .04, F = 1.42
Child involvement	5) Child emotional flexibility[t]	0.26	7.0%	R^2_{Adj} = .03, F = 1.32
Mother Emotional Flexibility				
Maternal sensitivity	1) Maternal childhood aggression*	-0.29	9.0%	R^2_{Adj} = .01, F = 1.06
Maternal hostility	1) Maternal childhood aggression*	0.36	13.0%	R^2_{Adj} = .15, F = 2.54*
Child involvement	N/A	--	--	R^2_{Adj} = -.02, F = 0.82
CONFLICT TASK				
Child Emotional Flexibility				
Maternal sensitivity	N/A	--	--	R^2_{Adj} = -.07, F = 0.41
Maternal hostility	3) Child age*	0.37	12.0%	R^2_{Adj} = .14, F = 2.48*
	5) Child emotional flexibility*	-0.31	9.0%	

Child involvement	N/A	--	--	R^2_{Adj} = .01, F = 1.07
Mother Emotional Flexibility				
Maternal sensitivity	N/A	--	--	R^2_{Adj} = -.06, F = 0.47
Maternal hostility	N/A	--	--	R^2_{Adj} = .03, F = 1.29
Child involvement	N/A	--	--	R^2_{Adj} = -.02, F = 0.82

[a]Bracketed numbers indicate the step at which the predictor was entered and/or became significant.
[t]p < .10. *p < .05. **p < .01.

Table F4

Summary of Results from Duration of Shared Expression Regression Models Predicting Relationship Quality

Outcome measures	Significant predictors in the final model[a]	Betas	Explained variance	Statistics for the final equation
GAME-PLAYING TASK				
Dyad Positive Expressions				
Maternal sensitivity	5) Dyad positive expressions**	0.44	17.0%	R^2_{Adj} = .14, F = 2.47*
Maternal hostility	1) Maternal childhood aggression[t]	0.26	7.0%	R^2_{Adj} = .07, F = 1.65
Child involvement	5) Dyad positive expressions***	0.49	21.0%	R^2_{Adj} = .19, F = 3.21*
Dyad Neutral Expressions				
Maternal sensitivity	N/A	--	--	R^2_{Adj} = -.02, F = 0.85
Maternal hostility	1) Maternal childhood aggression[t]	0.26	7.0%	R^2_{Adj} = .04, F = 1.35
Child involvement	5) Dyad neutral expressions*	-0.45	19.0%	R^2_{Adj} = .18, F = 2.96*
CONFLICT TASK				
Dyad Positive Expressions				
Maternal sensitivity	N/A	--	--	R^2_{Adj} = .00, F = 0.96
Maternal hostility	3) Child age*	0.37	12.0%	R^2_{Adj} = .09, F = 1.89
Child involvement	N/A	--	--	R^2_{Adj} = .03, F = 1.29

Dyad Neutral Expressions				
Maternal sensitivity	5) Dyad neutral expressions**	0.42	15.0%	R^2_{Adj} = .10, F = 2.06[t]
Maternal hostility	3) Child age*	0.37	12.0%	R^2_{Adj} = .07, F = 1.67
Child involvement	N/A	--	--	R^2_{Adj} = .03, F = 1.31
Dyad Negative Expressions				
Maternal sensitivity	5) Dyad negative expressions*	-0.35	11.0%	R^2_{Adj} = .05, F = 1.53
Maternal hostility	3) Child age*	0.37	12.0%	R^2_{Adj} = .04, F = 1.36
Child involvement	N/A	--	--	R^2_{Adj} = .03, F = 1.31

[a]Bracketed numbers indicate the step at which the predictor was entered and/or became significant.
[t]p < .10. *p < .05. **p < .01. ***p < .001.

Table F5

Summary of Results from the Emotional Flexibility Index Regression Models Predicting Child Behavior Problems

Outcome measures	Significant predictors in the final model[a]	Betas	Explained variance	Statistics for the final equation
GAME-PLAYING TASK				
Child Emotional Flexibility				
Total Problems	4) Aggression x withdrawal*	0.39	11.0%	R^2_{Adj} = .09, F = 1.92
Mother Emotional Flexibility				
Total Problems	4) Aggression x withdrawal*	0.37	10.0%	R^2_{Adj} = .10, F = 2.05^t
CONFLICT TASK				
Child Emotional Flexibility				
Total Problems	3) Child age**	0.46	19.0%	R^2_{Adj} = .23, F = 4.00**
	5) Child emotional flexibility*	-0.34	11.0%	
Mother Emotional Flexibility				
Total Problems	3) Child age**	0.45	19.0%	R^2_{Adj} = .11, F = 2.15^t

[a]Bracketed numbers indicate the step at which the predictor was entered.

$^t p < .10$. *$p < .05$. **$p < .01$.

Table F6

Summary of Results from Duration of Shared Expression Regression Models Predicting Child Behavior Problems

Outcome measures	Significant predictors in the final model[a]	Betas	Explained variance	Statistics for the final equation
GAME-PLAYING TASK				
Dyad Positive Expressions				
Total Problems	4) Aggression x withdrawal*	0.39	11.0%	R^2_{Adj} = .08, F = 1.84
Dyad Neutral Expressions				
Total Problems	4) Aggression x withdrawal*	0.39	11.0%	R^2_{Adj} = .08, F = 1.81
CONFLICT TASK				
Dyad Positive Expressions				
Total Problems	4) Child age**	0.46	19.0%	R^2_{Adj} = .11, F = 2.27^t
Dyad Neutral Expressions				
Total Problems	3) Child age**	0.46	19.0%	R^2_{Adj} = .20, F = 3.43**
	5) Dyad neutral expressions*	-0.29	8.0%	
Dyad Negative Expressions				
Total Problems	3) Child age**	0.46	19.0%	R^2_{Adj} = .11, F = 2.26^t

[a]Bracketed numbers indicate the step at which the predictor was entered.
$^t p < .10$. *$p < .05$. **$p < .01$.