

THESIS

DYADIC FLEXIBILITY AND POSITIVE AFFECT IN MOTHER-CHILD INTERACTION
AND CHILD EFFORTFUL CONTROL AS INDEPENDENT AND INTERACTING
PREDICTORS OF CHILD INTERNALIZING BEHAVIORS

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ABSTRACT

DYADIC FLEXIBILITY AND POSITIVE AFFECT IN MOTHER-CHILD INTERACTION AND CHILD EFFORTFUL CONTROL AS INDEPENDENT AND INTERACTING PREDICTORS OF CHILD INTERNALIZING BEHAVIORS

The current study examined both the structure (i.e., in terms of dynamic systems based indicators of flexibility) and the affective content of mother-child interaction, as these relate to children's internalizing behaviors. Child effortful control (EC) was also examined. Together, child EC, dyadic flexibility and dyadic positive affect were tested as independent and interactive predictors of children's internalizing behaviors. In a sample of 100 mother-child dyads when children were approximately 3 years of age, dyads participated in a free play interaction task, and children's EC was observed in a gift delay, snack, and tower task at T1. At T2, mothers and partners reported on children's internalizing behaviors. Child EC significantly predicted internalizing behaviors at T2; there were significant within-time relations between dynamic measures of mother-child interaction and internalizing, and the relation between dynamic measures of mother-child affect at T1 showed a trend towards significantly predicting internalizing at T2. This short-term longitudinal assessment of mother-child interaction and child EC illustrates the complex processes involved in the prediction of children's internalizing behaviors.

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Chapter I

INTRODUCTION

The development of self-regulation, or the physiological, behavioral, attentional, and emotional processes employed in an effort to monitor responses to situational demands (Calkins, 2007), is seen as a cornerstone of later adaptation and adjustment (Calkins, 2007; Eisenberg, Smith, Sadovsky, & Spinrad, 2004; Eisenberg, Spinrad, & Eggum, 2010; Shonkoff & Phillips, 2000). As such, self-regulation has been a central topic of discussion in the developmental psychopathology literature, as individual differences in self-regulation capacities relate to socioemotional competence and maladjustment (e.g., Calkins & Fox, 2002; Posner & Rothbart, 2000). Important influences on this developmental process include the environment, in terms of parents, caregivers, and siblings, as well as the child's constitutionally-based temperament (Fox & Calkins, 2003).

Temperament has been described as the individual differences that exist in emotional, motor, and attentional reactivity, as well as in the capacity to monitor this reactivity (i.e., self-regulation; Rothbart, 2007). A major form of temperamental self-regulation is effortful control (Rothbart & Rueda, 2005). Effortful control (EC) is defined as, "the efficiency of executive attention-including the ability to inhibit a dominant response and/or to activate subdominant response, to plan, and to detect errors" (Rothbart & Bates, 2006, p.129). Rothbart (2007) describes several components subsumed under the broader construct of EC, including attentional control, inhibitory control, and perceptual sensitivity. Attentional control involves the ability to flexibly redirect and focus one's attention, according to the demands of the situation. Inhibitory control refers to the ability to suppress responses and to plan, and perceptual sensitivity is the

detection of minimal levels of external stimulation. Eisenberg and colleagues (2007) also have suggested an additional subcomponent of activational control, the ability to activate a behavior according to the demands of the situation. Thus, inhibitory, attentional, activational, and perceptual sensitivity all are considered to be part of the larger construct of EC.

Developing EC capabilities come online during the first few years of life, and continue developing through the early school years (Posner & Rothbart, 2000; Rothbart, 2007). Given this sensitive period for burgeoning self-regulation abilities, early relationships with caregivers provide an important basis for children learning the strategies involved in regulation (Calkins, 1994; Thompson, 1994). As such, it is important to consider the proximal processes that occur between a parent and child, as these dynamic, reciprocal interactions shape and constrain future developmental outcomes (Bronfenbrenner & Morris, 2006; Sameroff, 1975; Sameroff & Mackenzie, 2003). Accordingly, researchers have called for studies that address the complex interactions among child characteristics, such as temperament (i.e., EC), related self-regulation, and parenting, that lead to adaptation or psychopathology (Posner & Rothbart, 2000; Valiente & Eisenberg, 2006). Consideration of these real-time transactions between the parent and child may provide insight into possible pathways between child self-regulation and the development of adaptation or psychopathology (Olson & Lunkenheimer, 2009). Thus, the current study examined child EC and the affective content and structure of mother-child interaction, with a particular focus on how each independently and interactively contributes to child adjustment.

CHAPTER II

LITERATURE REVIEW

EC and adjustment

Effortful control and its related subcomponents (i.e., attentional control, inhibitory control) have been linked to measures of child competence and dysfunction. Specifically, higher levels of EC are associated with less negative emotionality, higher levels of committed compliance, higher levels of conscience and prosocial responding, higher academic success, and lower levels of problem behaviors (Eisenberg et al., 2004). For example, higher levels of observed child EC between 22-45 months were related to lower levels of parent-reported externalizing behaviors (i.e., underregulated and antisocial behaviors, such as behavioral aggression and emotional irritability) at 73 months (Kochanska & Knaack, 2003). Teacher and parents reports of preschoolers' and kindergartners' of effortful attention (i.e., the shifting and focusing of attention) predicted children's social functioning and prosocial behavior longitudinally, up to 6 years later (Eisenberg et al., 1995; 1997). In addition, children's higher levels of observed inhibitory control from preschool to early school age have demonstrated positive relations to the development of children's moral self and moral cognitions through internalization (Kochanska et al., 1996; Kochanska, Murray, & Coy, 1997). Difficulties with self-regulation in the form of compromised effortful control have negative implications for children's success in school and social competence (see Eisenberg, Hofer, & Vaughn, 2007, for a review). Thus, EC and its subcomponents set the tone for future behaviors (extending beyond childhood), by providing the foundation for positive and effective strategies involved in self-regulation and adjustment.

Accordingly, several studies have established a relationship between lower levels of EC and the development of problem behaviors across childhood, focusing on the relations between EC and children's internalizing and externalizing behaviors (see Eisenberg, Spinrad, & Eggum, 2010; Eisenberg et al., 2007; 2004). Eisenberg and colleagues (2002; 2007) have described internalizing and externalizing behaviors as forms of overcontrol and undercontrol, respectively. In particular, children demonstrating internalizing are behaviorally inhibited in novel situations and overcontrolled in their expression of emotions, and will demonstrate some difficulties with different components of EC (but not all), including attentional control. On the other hand, Eisenberg and colleagues have suggested that undercontrolled behaviors are related to low levels of all types of EC (attentional, inhibitory, activational control). According to Campbell (1995), parents, teachers, and caregivers in early childhood commonly report concern with child behaviors in the externalizing and internalizing domains (although detecting internalizing is admittedly more difficult in young children). Commonly reported externalizing behaviors include overactivity, poor impulse control, noncompliance, aggression, and tantrums; internalizing behaviors include anxiety, sadness, social withdrawal, and fearfulness (Campbell, 1995).

Both types of undercontrolled (externalizing) and overcontrolled (internalizing) problem behaviors have been linked to young children's EC. In a sample of 3-year-old children, lower levels of effortful control have been linked to higher levels of externalizing behaviors, including deficits in attention, impulsivity, and aggression, as reported by both teachers and parents (Olson, Sameroff, Kerr, Lopez, & Wellman, 2005). A longitudinal study that followed toddlers through early preschool demonstrated that lower levels of EC were related to higher levels of mother-reported externalizing problem behaviors (Murray & Kochanska, 2002). In a longitudinal

study of children approximately 6 years of age, lower levels of attentional and inhibitory EC predicted later increased externalizing and internalizing problems (Eisenberg et al., 2009). More importantly, the association between low EC and externalizing demonstrated a stronger relation with age. The results of these studies and others (e.g., Eisenberg, Cumberland, et al., 2001; Eisenberg, Spinrad, et al., 2004) suggest that lower levels of EC in early childhood may be a risk factor for future psychopathology.

Despite strong empirical support for the negative association between EC and externalizing behaviors in early childhood, there have been some inconsistencies in the links reported between EC and internalizing behaviors in young children (Eisenberg et al., 2004, Eisenberg, Spinrad, & Eggum, 2010). Some work suggests that different subcomponents of EC (e.g., inhibitory control) may be differentially related to internalizing (Eisenberg, Spinrad, & Eggum, 2010). For example, in a study of 55 to 97 month old children's externalizing and internalizing behaviors, children manifesting internalizing behaviors also demonstrated lower adult-rated attentional control, but not inhibitory control, as compared to the control group (Eisenberg et al., 2001). In a follow-up assessment two years later, internalizing children were not lower than the control group in either attentional control or inhibitory control (Eisenberg, Sandovsky, et al., 2005). In addition, children in the normative group were rated as more impulsive than children classified as internalizing. These findings support the idea that child internalizing may relate to different components of EC in different ways (i.e., child internalizing may reflect poor attentional but high inhibitory control; Eisenberg et al., 2007).

Murray and Kochanska (2002) found a nonlinear, quadratic relationship between young children's EC and problem behaviors. Higher observed EC related to higher levels of mother-reported internalizing behaviors, and lower observed EC significantly related to higher levels of

externalizing behaviors. In a high-risk sample of young children, Dennis, Brotman, Huang, and Kiely Gouley (2007) found that lower EC was significantly associated with more parent-reports of internalizing behaviors for 4-year-olds, but not for 5 or 6 year olds. Spinrad et al., (2007) found negative associations among toddler's EC and an index of internalizing behaviors, separation distress, when children were 18 and 30 months of age, but the longitudinal association become nonsignificant when controlling for stability in separation distress. To account for potential overlap in measurements assessing child temperament and young children's behavior problems, Lemery, Essex, and Smider (2002) used expert raters and a factor analysis to develop a purified assessment of temperament and related behavior problems. Even with overlapping items removed, parent's reports of lower levels of child EC were predictive of more internalizing behaviors. Taken together, results from studies of EC and internalizing behaviors in early childhood point to a complex pattern of findings, indicating that the relationship between EC and internalizing in young children is still not understood. Consequently, a focus of the current study is to explore how young children's EC relates to internalizing behaviors in a normative sample of three-year-old children. Furthermore, examination of this relationship in the context of mother-child interaction may provide additional insight into the relation between children's EC and internalizing behaviors in early childhood.

EC and the caregiver-child relationship

The transition to preschool, around 3 years of age, is a volatile time when differences in EC capacities are particularly salient (Kochanska et al., 1997, Kopp, 1982), as it may be more challenging for children with less ability to self-regulate (i.e., lower levels of EC) to monitor themselves across contexts that call for different regulatory behaviors. If they are not provided with the necessary support or opportunities to practice effective self-regulation strategies at

home, then they will face challenges adapting to the demands of a classroom setting, where attention regulation and the ability to inhibit undesirable behaviors is required. Therefore, early caregiver-child relationships provide an important context for understanding the development of competencies involved in self-regulation, including EC (Olson & Lunkenheimer, 2009).

For example, observed maternal behaviors during interaction such as higher levels of responsiveness, emotional availability and supportiveness have been shown to predict higher levels of children's EC, at both 22 and 33 months of age (Kochanska, Murray, & Harlan, 2000). Additionally, there were within-time relations between observed maternal power assertion and lower observed levels of child EC. Spinrad and colleagues (2007) found a consistent link between maternal supportiveness (i.e., observed sensitivity and warmth, supportive response to children's negative emotions) and toddler's EC over time, controlling for stability in both constructs. Other researchers have emphasized the importance of a secure attachment relationship, characterized by contingent and adequate maternal responsiveness to child needs, which may lay the groundwork for learning positive self-regulation strategies (Calkins, 2004). Thus, the mother-child relationship plays a key role in the development of EC, a major form of self-regulation (Rothbart & Rueda, 2005).

Dynamic structure and affect in parent-child interaction

A burgeoning area of research involves investigating both the content and dynamic patterns of parent-child interaction. The dynamic patterning of behaviors and affect allows researchers to explore not just *what* about parent-child interaction contributes to child adjustment, but *how* these transactions contribute to adjustment. A central goal of developmental psychopathology is to identify mechanisms that distinguish competence from dysfunction

(Sameroff & Mackenzie, 2003); thus, exploration of parent-child interactive patterns provides a promising basis for answering these questions. There is evidence to suggest that mother-child dyads demonstrate distinct behavioral and affective patterns in their interactions when children demonstrate behavior problems. In a study of dyads with preschool children classified by their teachers as competent, average, anxious, and aggressive, mothers of anxious children demonstrated significantly more negative behaviors when interacting with their child during a challenging task (Dumas & LaFreniere, 1993). Specifically, the mothers of children deemed anxious were more critical, hostile, and intrusive in the context of interaction with their children. In a different study comparing observed control exchanges in mother-child dyads involving children once again considered by teachers to be socially competent, aggressive, and anxious, anxious children and mothers demonstrated less positive affect, and these mothers demonstrated more coercive patterns of control (Dumas, LaFreniere, & Seretich, 1995). Dumas, Lemay, & Dauwalder (2001) used a synergistic approach to demonstrate dyadic differences in interaction patterns, which considers in a pre-determined time frame how behaviors of one person influence the subsequent behaviors of the other. Comparing a set of dyads where the children were either deemed average or aggressive, dyads where the child displayed aggression were marked by recursive patterns of child noncompliance to maternal control attempts. Interestingly, these distinctions were most evident in the context of predominantly positive (as opposed to conflicted) interactions. This suggests that examination of interaction patterns in both positive and negative contexts can provide meaningful information about the caregiver-child relationship and corresponding child adjustment. Indeed, this proposition has been suggested by other researchers, advocating that both maladaptive and adaptive processes in parent-child interactions can provide important information about the development of child behavioral adjustment (e.g.,

Lunkenheimer & Dishion, 2009). Collectively, the work of Dumas and colleagues (1993, 1995, 2001) illustrates that understanding of child developmental psychopathology may be enhanced by exploring the patterning of transactions in the context of mother-child interaction.

In recent years, dynamic systems theory and related methodologies (Granic & Hollenstein, 2003) have received increased attention in developmental research, because they provide methods that capture some of the complexities inherent in the transactional processes that constitute development, such as parent-child interactions. These novel methods provide a basis for examining variability in micro-level processes that link to macro-level developmental outcomes (Lewis, 2000; Lunkenheimer & Dishion, 2009), such as the momentary affective exchanges between a mother and child as they relate to the development of child's regulatory strategies (Olson & Lunkenheimer, 2009). Furthermore, certain methods associated with this approach (e.g., state space grids; Lewis, Lamey, & Douglas, 1999) provide the opportunity to examine the dynamic structure of parent-child interactions.

Granic, O'Hara, Pepler, and Lewis (2007) used state space grids to assess intervention effects in a sample of families with aggressive children. Prior to the intervention and at post-test, mother-child interaction was observed as a basis for investigating effects of the intervention related to flexibility. For the children who demonstrated improvements in externalizing behavior, their interactions were marked by parent-child flexibility during discussion of an unresolved problem. This increased flexibility was operationalized as increases in movements between emotional states (as plotted on the state space grid), with less time spent in one particular area of the grid (see Measures for further description of operationalization of flexibility). Thus, reductions in externalizing behaviors associated with participation in the intervention corresponded with mother-child interactions where dyads were able to effectively navigate

through negative affective states together. These findings reveal the value of state space grids for assessing the organization of behavior and dynamic structure of parent-child interaction.

Recent work using state space grids has also demonstrated that the affective structure of mother-child interactions meaningfully relates to children's behavior problems. For the purposes of this research study, structure refers to the flexibility (or rigidity) of movement between behavioral and affective states in interpersonal interaction that occur in response to the demands of the situation (Hollenstein, Granic, Stoolmiller, & Snyder, 2004). Specifically, rigidity signifies a diminished behavioral repertoire, or a tendency to become fixated in a certain pattern or sequence of behavioral exchanges, with less movement between affective states. In a study that examined the structure of parent-child interactions of high-risk children in kindergarten (Hollenstein et al., 2004), teacher ratings on internalizing and externalizing behaviors were related to greater rigidity (i.e., low flexibility) in parent-child interactions. This rigidity was significantly related to children's internalizing behaviors at the end of kindergarten, and was characteristic of dyads with children especially high in internalizing behaviors. Conceptualizing internalizing behaviors in terms of overregulation, it makes sense that a diminished behavioral repertoire in interaction, with a tendency to remain in certain affective states, would serve to reinforce the development of children's internalizing behaviors.

Other researchers have documented the relation between flexibility (as opposed to rigidity) and affect in parent-child interactions. Hollenstein and Lewis (2006) used a state space grid analysis of mothers and their pre-adolescent daughters during interactions surrounding positive and negative topics. Increases in negative affect were related to decreased flexibility, and increases in positive affect coincided with increases in flexibility. This demonstrates an important interaction between flexibility and affect, where negative affect is associated with a

reduction of behavioral and affective states (i.e., rigidity). The interactions between dyadic positive affect and dyadic flexibility in parent-child interaction have also been investigated in a sample of young children, in relation to the development of children's externalizing behaviors (Lunkenheimer, Olson, Hollenstein, Sameroff, & Winter, 2011). State space grids were used to assess the interaction of dyadic positive affect and flexibility, represented by range, dispersion, and transitions on the state space grid (see Measures for further description). Dyadic positive affect was operationalized as the proportion of time either the child or the parent was in a grid cell representing positive affect. Controlling for child effortful control, T1 externalizing, child gender, negative affect, and task time, the interaction of dyadic positive affect and flexibility when children were 3 years old predicted lower levels of teacher-reported externalizing behaviors when children were 5.5 years of age.

Thus, it is important to extend these findings that suggest both the content and the structure of parent-child interaction are important to consider in delineating maladaptive developmental pathways. Furthermore, state space grids have demonstrated significant utility for simultaneously assessing the affective content and dynamic structure of interaction as they relate to children's adjustment. Accordingly, the goal of the current study was to utilize the state space grid method to examine both the affective content and structure in mother-child interaction in relation to child internalizing behaviors. Using dynamic systems-based methods to assess mother-child interaction can highlight important real-time processes that contribute to young children's development of internalizing behaviors. Moreover, knowledge of these dynamics can point to important areas for change in preventive interventions. In addition, considering the contributions of child EC and the context of mother-child interaction can provide an important

basis for understanding the early development of psychopathology; namely, distinguishing risk markers that may be specific to internalizing behaviors.

EC: Mediator or moderator?

When considering both child EC and the content and structure of mother-child interaction in the prediction of internalizing behaviors, it is important to consider the ways in which mother-child interaction may relate to or interact with child EC. Eisenberg, Cumberland, and Spinrad (1998) have proposed a heuristic model that explains parenting influences child adjustment by way of child emotion-related regulation, including EC. Support for this model has been demonstrated by several studies linking measures of positive, supportive parenting to older children's socioemotional competence and adjustment, mediated by children's EC (Eisenberg, Gershoff, et al., 2001; Eisenberg, Losoya, et al., 2001; Eisenberg, Valiente, et al., 2003; Valiente et al., 2006). There is also support for this model in samples of younger children. Exploring EC as a mediator in a sample of toddlers (at approximately 18 months at T1 and 30 months at T2), maternal supportive parenting (mother's responses to children's negative emotions, observed sensitivity and warmth) was significantly positively related to toddler EC over time (Spinrad, et al., 2007). Within time points (but not across time), EC mediated the link between supportive maternal parenting and child externalizing, separation distress, and social competence. Higher EC was related to lower externalizing behaviors and separation distress (one index of internalizing behaviors), and higher levels of social competence. Kochanska and Knaak (2003) found that toddler EC mediated the relationship between maternal power assertion and child conscience, controlling for children's defiant behaviors that may have contributed to maternal parenting practices. However, in study that sought to replicate a mediational model with a sample of preschool-aged children, a different pattern of findings emerged (Eisenberg, Spinrad,

et al., 2010). Although unsupportive parenting (negative responses to children's negative emotions) was consistently related to lower levels of child EC and internalizing and externalizing behaviors, maternal socialization (observed maternal sensitivity and warmth) at 30 months did not significantly predict child EC and adjustment at 42 months. Thus, in this particular sample of preschool-aged children, child EC was not a significant mediator of the association between parenting and child problem behaviors.

In contrast with child EC as a mediator, others have suggested that EC and temperament, more broadly, moderates the effects of environment on child behavior (Gallagher, 2002; Lengua, Bush, Long, Kovacs, & Trancik, 2008; Morris, Silk, Steinberg, Sessa, Avenevoli, & Essex, 2002; Rothbart & Sheese, 2007; Valiente & Eisenberg, 2006; Valiente et al., 2004). For example, in a sample of first and second graders, low levels of child EC moderated the influence of maternal hostility on teacher-reports of child externalizing behavior, such that children with lower levels of EC demonstrated more externalizing behaviors in the context of experiencing maternal hostility (Morris et al., 2002). In terms of internalizing behaviors, children were apt to demonstrate these behaviors if they were high in irritable distress and experienced maternal psychological control. These findings suggest different aspects of parenting in young children may have different implications for child behavior problems, depending on different aspects of child temperament, including EC and emotional reactivity.

In line with this reasoning, a goal of the current study was to explore the possibility that child EC would serve as a moderator in the relationship between mother-child interaction and child internalizing behaviors. Eisenberg, Spinrad, and colleagues (2010) suggested that EC may be a mediator between parenting and adjustment at some ages and not at others, and thus a potential possibility for EC during the preschool period is that it serves to modify the influence

of parenting on children's behavior. Specifically, it is possible that the affect and related behaviors expressed within the course of parent-child interaction are contingent upon the child's self-regulation capabilities (i.e., EC). In other words, the affective content and flexibility may be salient for children's adjustment when children exhibit lower levels of EC. Valiente and Eisenberg (2006) proposed that children high in EC are able to prevent becoming dysregulated in the context of exposure to intense negative or positive emotion, such as that experienced in interaction with parents and caregivers. Although this hypothesis requires further investigation, if child EC serves as a significant moderator of the influence of parent-child interaction and internalizing behaviors, this could highlight the importance of child EC as a mechanism for change in early interventions.

Current Study

Accordingly, by assessing the independent and interactive contributions of child EC and mother-child positive affect and related flexibility, a goal of the current study was to elucidate the complex pathways between parent-child interaction, child EC, and the development of internalizing behaviors in early childhood. Four separate models were tested. First, mother-child affective flexibility and child EC were examined as independent (Model 1) and interactive (Model 2) predictors of internalizing behaviors at T2, controlling for child age, gender, age, cognitive ability, and stability in internalizing behaviors. Second, mother-child dyadic positive affect and child EC were examined as independent (Model 3) and interactive (Model 4) predictors of internalizing behaviors at T2, controlling for child age, gender, cognitive ability, and stability in internalizing behaviors. Specifically, the following research questions were addressed:

- 1) First, how does preschool-aged children's EC and affective flexibility in mother-child interaction relate to the development of internalizing behaviors?

- 2) Second, how does preschool-aged children's EC and dyadic positive affect in mother-child interaction relate to the development of child internalizing behaviors?
- 3) In the context of EC and dyadic flexibility as predictors of internalizing behaviors, does EC function as a moderator of the relations between dyadic flexibility and child internalizing behaviors?
- 4) In the context of EC and dyadic positive affect as predictors of internalizing behaviors, does EC function as a moderator of the relations between dyadic positive affect and child internalizing behaviors?

First, it was expected that higher levels of child EC at T1 would be related to lower levels of child internalizing at T2, and less mother-child dyadic flexibility at T1 would be related to higher levels of internalizing behaviors at T2. Next, an interaction term between EC and flexibility was included to test the possibility that higher levels of child EC would moderate the relation between lower flexibility and the development of higher internalizing behaviors at T2, such that higher levels of child EC would modify the effects of lower dyadic flexibility on children's higher levels of internalizing symptoms. Third, it was expected that the lower levels of dyadic positive affect would be related to more internalizing behaviors at T2. Again, an interaction term was included to test the hypothesis that higher levels of child EC might moderate the relation between less dyadic positive affect and more internalizing behaviors at T2, such that higher levels of child EC would mitigate the effects of less dyadic positive affect on children's higher levels of internalizing symptoms.

CHAPTER III

METHOD

Participants

In order to establish a normative developmental model of emotional and physiological regulation processes in parent-child interaction, a nonprobability, locally representative sample was recruited from the local day care centers and preschools in a small Western city. A total of $N=100$ families (i.e., mother, partner, and child) participated in the study. All participants were fluent in English, and families were ineligible to participate if the child had any diagnosed emotional disorder or developmental disability. At the time of data collection, children were between age 3 years, 0 months and 3 years, 8 months. Parents were over the age of 21 and could be adoptive or biological, but they had to be the primary caregivers and live in the same home with the child. The racial makeup of participants was 86% White, 8% Biracial, 3% Asian, and 3% “other race” children, and an ethnic makeup of 10% Hispanic or Latino children. Median annual family income was roughly \$65,000 and mothers’ and fathers’ education was high on average (college graduate). Seventy-nine percent of biological parents were married, 7% were cohabiting, 7% were single, 5% were separated or divorced, and 1% were remarried.

Procedure

Laboratory assessment. At T1, mothers and children came into the lab to participate in a variety of videotaped behavioral tasks, including the effortful control task and to participate in parent-child interaction tasks (e.g., clean-up, free play). Some of the tasks were one on one with the experimenter and the child (e.g., effortful control battery), and during this time mothers completed questionnaires regarding their child’s social and emotional behaviors. The mothers’

partners were sent the same questionnaires to be completed prior to the lab observation; mothers brought the partners' completed questionnaires to the lab at T1.

Online assessment. At T2, approximately 4-6 months after the initial laboratory assessment (T1), mothers and partners filled out online questionnaires about the child's emotional and behavioral adjustment. Each family (mother and partner) received a gift card for their participation upon completion of the surveys.

Measures

Mother-child free-play interaction. Mothers and children were observed interacting in the laboratory during a 7 minute free play session. Dyads were given an array of different toys (e.g., dolls, trucks, puzzles) to play with and instructed to act as they normally would during a play session at home. Interactions were videotaped and recorded by Noldus Observer XT 8.0. Interactions were then transported from Noldus into Gridware 1.1 (Lamey, Hollenstein, Lewis, & Granic, 2004).

Affect coding. The Dyadic Interaction Coding system (Lunkenheimer, 2009) was used to code behavioral observations recording using the Noldus Observer XT 8.0 software. Mothers and children were each coded in real time on a second-by-second basis along two dimensions, affect and behavior. Three undergraduate and graduate research assistants coded the data and were tested for reliability on 20% of the dataset in relation to a standard set by the principal investigator and a trained graduate student. Reliability was calculated on an initial set of 10 videotapes, in addition to drift reliability assessed on an additional 10 tapes during the coding period. Reliability analysis was performed in the Noldus Observer XT 8.0 using a standard 3-second window. Average overall interrater agreement on the entire coding system for all observed dyadic tasks was 71 % for the three coders. Actual reliability was likely slightly higher

given that many codes were quick (e.g., 3 seconds long) and recurring, and reliability analysis in the Noldus Observer XT 8.0 could not account for the agreement between the recurrence of a coded behavior by one coder (i.e., a behavior is interrupted briefly and then resumes) while the other coder had coded the behavior as uninterrupted during this same time period.

Four codes reflected verbal and nonverbal affect: negative affect, neutral affect, low positive affect, and medium-high positive affect. Although the same four affect codes were used for both parent and child, the scale of emotional intensity was different for parents versus children, in that child affect codes accounted for the greater affective intensity typical of 3-year-olds as compared to adults. *Negative affect* referred to an expression, however small, of irritation, annoyance, distress, anger, disgust, sadness, discomfort, fear, nervousness, or anxiety. For parents, examples of negative affect included heavy sighs, eye rolling, sharp voice tone, frowning, or narrowed eyes. For children, examples of negative affect included stomping, crying, yelling in anger, frowning, or slumped shoulders. *Neutral affect* reflected the absence of verbal or nonverbal affective expression. Examples of neutral affect included a lack of eye contact, the absence of a particular facial expression (e.g., smile or frown), and/or a relatively flat vocal tone with few fluctuations or lilts. *Low positive affect* referred to the expression of low intensity positive affect. Examples included positive lilts or warmth in vocal tone, a smile, and/or warm eye contact that conveyed interest or engagement. *Medium-high positive affect* referred to the expression of medium or high intensity positive affect. Examples included larger fluctuations in vocal tone, such as the use of a high pitch to express excitement or gain the other's attention, open mouth smiles, laughing, giggling, singing, or hugging. Interrater reliability for the parent negative, neutral, low positive, and medium-high positive affect codes was 96%, 93%, 91%, and 91%, respectively. Interrater agreement for the child negative, neutral,

low positive, and medium-high positive affect codes was 100%, 95%, 85%, and 85%, respectively.

State space grids. Dyadic flexibility and affect at T1 were derived using the coding system established by Lunkenheimer (2009) and were computed using state space grids (Lewis et al., 1999) in Gridware 1.1 (Lamey et al., 2004). Gridware plots a graph of observational data using two ordinal or categorical variables that define the state space for the system; the sequence of dyadic states as it proceeds in real time is portrayed on the state space grid, which represents all possible behavioral combinations of the dyad (see Hollenstein, 2007, for review). In the current study, four affect codes were used to define the state space grid for the system: negative, neutral, low-positive, and medium-high positive. Child affect was plotted on the x-axis and parent affect was plotted on the y-axis. See Figure 1 for an example state space grid depicting one dyad's affective states during the free-play task.

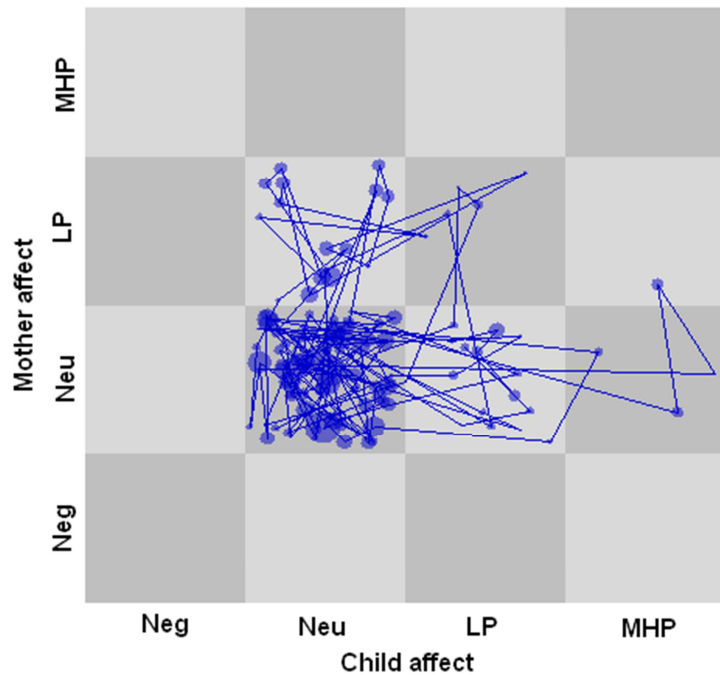


Figure 1

Sample State Space Grid of Dyadic Interaction during the Free-Play Task. Note: Neg = Negative, Neu=Neutral, LP= Low Positive, and MHP= Medium-High Positive Affect.

Dyadic positive affect. Dyadic positive affect was calculated as the proportion of time spent in the 8 cell region of the grid that indicated positive affect on the part of the mother, the child, or both, out of the total duration of the interaction (i.e., time spent in any of the 16 cells that made up the grid). For the 8 cell region of the grid, potential affective combinations included: when mom was neutral and the child was in low positive, when mom was neutral and the child was in medium high positive, when mom was low positive and the child was neutral, when mom was low positive and the child was low positive, when mom was low positive and the child was medium high positive, when mom was medium high positive and the child was in neutral, when mom was in medium high positive and the child was in low positive, and when

mom was medium high positive and the child was also in medium high positive. Measuring the construct of dyadic positive affect in this way was done in accordance with prior work that has calculated dyadic positive affect as the duration of time the dyad spent in which parent and child displayed low or high positive affect as represented on the state space grid (Lunkenheimer et al., 2011). Figure 2 depicts a state space grid representing the durational proportion of time spent in each dyadic affective state during the free-play interaction for the whole sample; the highlighted cells indicate the 8 cell region of the grid from which dyadic positive states were derived.

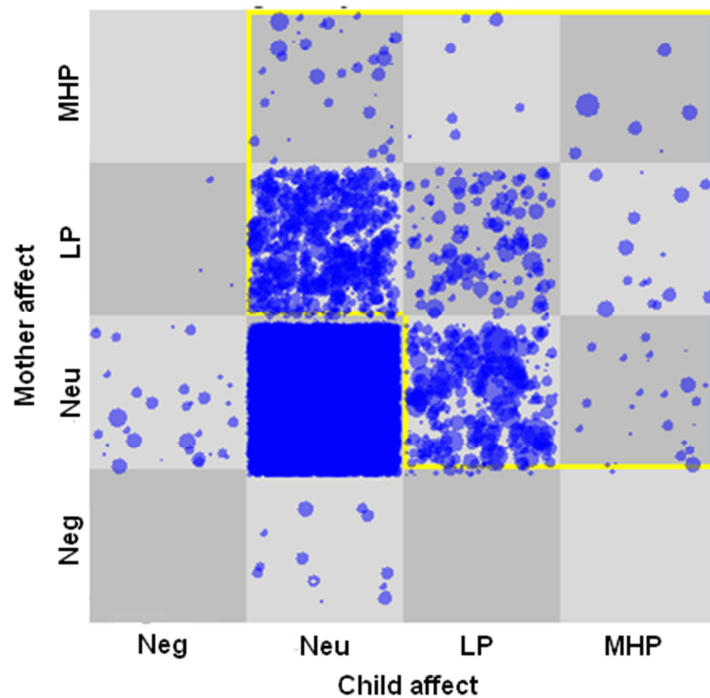


Figure 2

State Space Grid Demonstrating Dyadic Affect for the Sample During the Free-Play Task. Note: Neg = Negative, Neu=Neutral, LP= Low Positive, and MHP= Medium-High Positive Affect.

Dyadic flexibility. Three dynamic-systems based indices of dyadic interaction patterns were used to represent the variation in affective intensity and valence (i.e., dyadic flexibility). These indices were derived from the cells of the state space grid, including all levels and types of affect. The first index, *Range*, is measured as a count of the number of unique cells visited on the grid. A higher number of unique cells visits represent a greater range of affective states, and thus, a greater level of dyadic flexibility. The second index, *Dispersion*, represents the distribution of behavior across cells; this is calculated as the sum of squared proportional durations across all cells, adjusted for the total number of cells in the grid matrix and inverted so that cell values range from zero (no dispersion; all behavior in one cell) to one (maximum dispersion; behavior equally distributed across the grid). The corresponding formula is $[\{n \sum (d_i/D)^2\} - 1] / (n-1)$; D represents the total duration, d is the duration in cell i , and n is the total number of possible cells in the state space grid. A more even distribution (cell range closer to one) represents a more flexible dyad. The third index, *Transitions*, is represented by the number of movements the dyad makes between cells of the grid during their interaction. More frequent movements between affective states represent higher dyadic flexibility. Figure 3 depicts two state space grids demonstrating one dyad higher in affective flexibility, and one lower in flexibility.

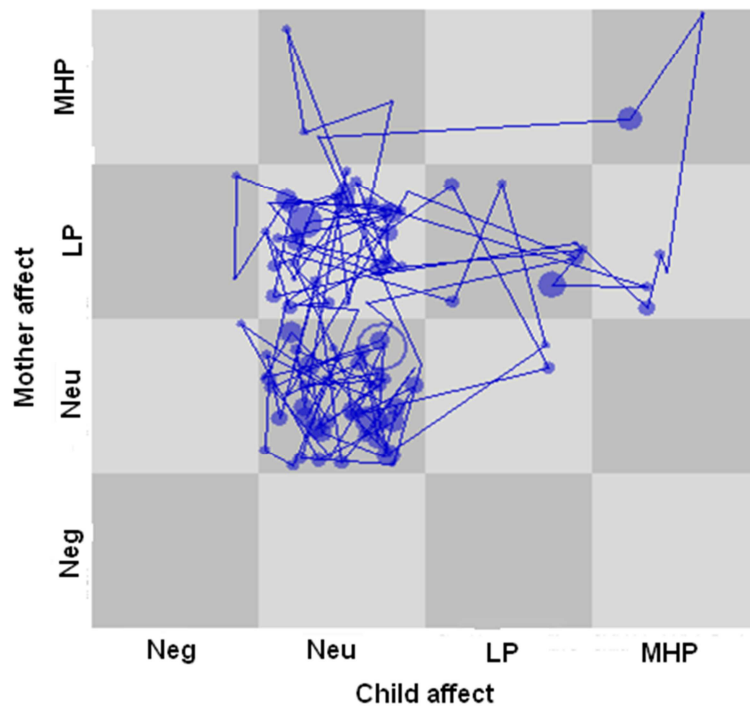


Figure 3a

State Space Grid Demonstrating a Dyad Higher in Affective Flexibility. Note: Neg = Negative, Neu=Neutral, LP= Low Positive, and MHP= Medium-High Positive Affect.

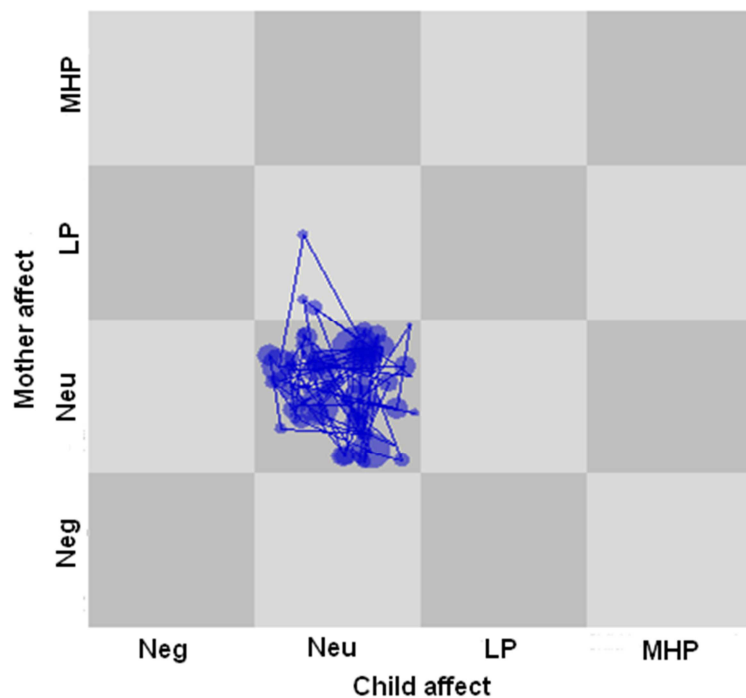


Figure 3b

State Space Grid Demonstrating a Dyad Lower in Affective Flexibility. Note: Neg = Negative, Neu=Neutral, LP= Low Positive, and MHP= Medium-High Positive Affect.

Internalizing behaviors. The Child Behavior Checklist (CBCL/1^{1/2}-5; Achenbach & Rescorla, 2000) was used to assess children’s internalizing behaviors. Mothers’ ratings of child internalizing behaviors at T1 were used as a baseline measure of child internalizing, and mothers’ and partners’ ratings of child internalizing behaviors were used as the dependent variable at T2. The CBCL is a 99-item self-report scale that measure children’s behavioral, emotional, and social functioning. For the purposes of the current study, only the internalizing subscale was used. Internalizing raw scores were computed by summing the raw scores on the emotionally reactive, anxious/depressed, somatic complaints, and withdrawn behaviors

subscales. Cronbach's alpha was .72 for mothers at T1, and .77 for mothers and .77 for partners at T2.

Effortful control. At T1, EC was observed using three tasks from Kochanska and colleagues' (1996, 1997) EC behavioral battery. Each task (described in detail below) is designed to assess Rothbart's construct of EC, the ability to suppress a dominant response and initiate a subdominant response, according to the demands of the task. All tasks were introduced as "games", and children were reminded of the rules halfway through the task. Each task was observed and coded from videotapes. As recommended in prior work (e.g., Kochanska, 1996; Olson et al., 2005), scores for each task were averaged across several trials, and then standardized and summed to compute a total observed EC score at T1. Reliability for the total EC score was .58.

Tower task. The tower task is designed to assess the child's ability to suppress and initiate behaviors in the context of a social turn-taking situation. Each child was instructed to take turns with the experimenter placing blocks one at a time to build a block tower. A total of two trials were completed with the child and experimenter taking turns to build the tower. Scores were calculated by the number of blocks placed by the child in relation to the total number of blocks. Reliability for this task was .78.

Snack delay. The snack delay is designed to assess the child's ability to delay gratification, and suppress and initiate impulses concerning food. In this task, the experimenter placed a skittle under a clear plastic cup on the table and instructed the child that he or she could pick up the cup and have the candy, but only after the experimenter rang the bell. About halfway through the wait, the experimenter would purposefully lift the bell but not ring it. There were 4 trials with different delay times of 10, 15, 20, and 30 seconds, respectively. Scores were

computed on a scale of 0 to 4, where 0 indicated the child ate the candy before the experimenter lifted (but did not ring) the bell, 1 indicated the child ate the candy after the bell was lifted (but did not ring), 2 indicated the child touched the bell or cup *before* the bell was lifted (but did not ring), 3 indicated the child touched the bell or cup *after* the bell was lifted (but did not ring), and 4 indicated the child waited until the experimenter rang the bell. Scores were averaged across the four trials. Reliability for this task was .77.

Gift delay. The gift delay task is an adaptation of Kochanska et al.'s, (1996) task that is designed to assess the child's ability to delay gratification, and suppress and initiate impulses with respect to a desired object. In this task, the experimenter told the child that she would like to give the child a present for all his or her hard work, but that the present needed to be wrapped first. The child was then instructed to face away from the table, and not to look at the experimenter while she wrapped the "surprise". The experimenter then noisily wrapped the gift for approximately 1 minute, and then placed the wrapped gift near the child and directed the child to wait without touching the gift while the experimenter went to find a bow. The experimenter then left the room for 2 minutes, and then came back with a bow. If the child had not yet opened the gift, the experimenter placed the bow on the gift and gave it to the child to open. Scores were based on an aggregate of the following: the frequency of peeking during the 1-minute noisy wrapping segment and the number of times the child touched the gift. Reliability for this task was .52.

Child Cognitive Ability. Three subtests of the Wechsler Preschool and Primary Scale of Intelligence-Third Edition (WPPSI-III; Wechsler, 2002) were used to assess the child's cognitive ability at T1, including the Block Design, Information, and Receptive Vocabulary tasks. Overall reliability for this task was .70.

Block Design. This task is designed to measure a child's ability to analyze and synthesize abstract visual stimuli (Wechsler, 2002). There are a total of 20 items, divided into two parts, A and B. Part A involves the use of one-color blocks, and Part B involves the use of two-color blocks. It requires the child to view a constructed model or a picture in a Stimulus Book, and use the blocks to re-create the design within a pre-specified amount of time. The task is scored on the basis of whether items were completed within the time limit, and whether the child constructed the design correctly. The total possible raw score out of the 20 items is 40 points, and thus a higher score indicates a higher ability to analyze and synthesize abstract visual stimuli.

Receptive Vocabulary. This task is designed to assess the child's ability to comprehend verbal directives, discriminate auditory and visual stimuli, auditory memory, auditory processing, and the integration of visual perception and auditory input (Wechsler, 2002). Receptive Vocabulary has a total of 38 items, for each item, the child looks at a group of four pictures and points to the one the examiner names aloud. Scores are based on whether the child gave a correct response, with a higher score indicating a higher ability to process visual and auditory stimuli.

Information. The Information task is designed to assess a child's ability to acquire, retain, and retrieve factual knowledge (Wechsler, 2002). This task consists of 34 items, with 6 picture items and 28 verbal items. The child responds to a question for the picture items by choosing a picture from four options. The child answers questions that address a broad range of general knowledge topics for the verbal items. Scores are administered on the basis of correct responses, and thus a higher score indicates a higher ability to acquire, retain, and retrieve factual knowledge.

Plan of Analysis

In order to test the hypothesis that higher levels of EC and lower levels of dyadic flexibility at T1 predict lower levels of internalizing behaviors at T2, a SEM was used to assess the contributions of dyadic flexibility and EC at T1 in the prediction of T2 internalizing behaviors. A measurement model was computed, loading grid transitions, dispersion, and range (derived from the state space grids) onto the latent construct of dyadic flexibility, and the latent construct of internalizing behaviors was modeled by loading partner and mother reported internalizing behaviors at T2. Child gender, age, cognitive ability, and internalizing behaviors at T1 were included as control variables. Thus, the first model consisted of the latent construct of dyadic flexibility, child EC, child cognitive ability, gender, age, and internalizing behaviors at T1 as predictors of the latent construct of child internalizing behaviors at T2. Once the first hypothesized model was tested, an interaction term between dyadic flexibility and EC was computed and added to test the second model with dyadic flexibility, EC, child gender, child cognitive ability, and internalizing behaviors at T1 and then tested as a predictor of internalizing behavior at T2. This allowed for exploration of the dyadic flexibility and EC moderation hypothesis.

Similarly, a SEM was computed to assess whether less dyadic positive affect and higher EC at T1 predicted higher levels of internalizing behaviors at T2. Dyadic positive affect was operationalized as the proportion of time at least one member of the dyad was in a positive affective state, out of the total duration of the interaction. In the third model, dyadic positive affect and child EC at T1 were entered as predictors of child internalizing at T2, including the control variables of child gender, age, cognitive ability, and internalizing behaviors at T1. Then, an interaction term between dyadic positive affect and EC was computed and added to test the

fourth model with dyadic positive affect, EC, child gender, child cognitive ability, and internalizing behaviors at T1, and tested as a predictor of internalizing behavior at T2. This allowed for exploration of the dyadic positive affect and EC moderation hypothesis.

CHAPTER IV

RESULTS

Preliminary Analyses

Preliminary analyses were conducted to explore whether child EC, dyadic flexibility (i.e., range, dispersion, and transitions), and dyadic positive affect differed by sociodemographic variables. These predictors were not significantly associated with maternal education or socioeconomic status. However, age was significantly associated with child EC ($r = .22, p < .05$), demonstrating that with development, older children tend to exhibit higher levels of EC. Therefore, child age was used as a control variable in all the models. Planned control variables included the child's cognitive ability (as measured on the block design, receptive vocabulary, and information subtests of the WPPSI-III; Wechsler, 2002) and child gender. Previous research has suggested that child cognitive abilities lay the groundwork for competencies involved in self-regulation (e.g., children must be able to mentally represent a command in order to comply with caregiver expectations accordingly, Kopp, 1982), and it is well documented that there are gender differences in self-regulation capabilities, including effortful control, as males tend to demonstrate lower EC than females (e.g., Kochanska et al., 2000). Indeed, independent samples t -tests indicated that child EC scores differed significantly by gender, $F = 6.04, p < .05$, for female children ($N = 53$), $M = .30, SD = 1.52$; for male children ($N = 45$), $M = -.38, SD = 2.42$. In addition, scores on the WPPSI Block Design, Information, and Receptive Vocabulary subtests were significantly associated with the predictors at $p < .05$. Thus, child scores on the WPPSI subtests were summed to create a single cognitive ability index (similar to computation of Olson and colleagues (2005) cognitive ability index), and child gender and cognitive ability were taken

into account in all analyses. Table 1 contains the descriptive statistics for the study variables, and correlations among the study variables are presented in Table 2.

Table 1

Means, Standard Deviations, and Range for Study Variables

Variable	<i>N</i>	<i>M</i>	<i>SD</i>	<i>Range</i>
Child Effortful Control	98	.00	2.01	-7.14-4.07
Mother-child interactions				
Dyadic Positive Affect	94	.07	.07	.00-.44
Flexibility, Range	94	4.02	1.54	1.00-9.00
Flexibility, Dispersion	94	.14	.12	.00-.64
Flexibility, Transitions	94	14.72	9.08	.00-45.00
Covariates and outcomes				
Internalizing, Partner T2	66	6.56	4.55	.00-19.00
Internalizing, Mother T2	91	5.07	4.21	.00-20.00
Internalizing, Mother T1	100	7.17	4.92	.00-18.00
Child Age in Months	100	41.0	3.0	35.5-47.4
Child Cognitive Ability (WPPSI Block Design, Vocabulary, Information)	94	56.73	12.43	19.00- 77.00

Table 2

Correlations Among Study Variables

Variable	1	2	3	4	5	6	7	8	9	10
1. Child EC	---	-.08	-.03	-.07	-.06	-.14	-.31**	.03	.22*	.38***
2. Dyadic Positive Affect		---	.54**	.98**	.57**	.24‡	.30**	.24*	-.02	-.18
3. Flexibility, Range			---	.58***	.78***	.20	.29**	.23*	.10	-.02
4. Flexibility, Dispersion				---	.63***	.26*	.28**	.24*	-.02	-.16
5. Flexibility, Transitions					---	.16	.25*	.13	-.01	-.08
6. Internalizing, Partner T2						---	.46***	.40**	-.12	-.11
7. Internalizing, Mother T2							---	.45***	-.07	-.14
8. Internalizing, Mother T1								---	.06	-.01
9. Child Age in Months									---	.40***
10. Child Cognitive Ability										---

‡ $p < .10$, * $p < .05$, ** $p < .01$, *** $p < .001$

Primary Analyses

Structural equation models were computed in Mplus version 5 (Muthen & Muthen, 1998-2007) using full information maximum likelihood estimation, a method that accommodates missing data by estimating each parameter using all available data for that specific parameter. Models were tested separately by dyadic flexibility and dyadic positive affect and by the inclusion of an interaction term between dyadic flexibility and EC and positive affect and EC, resulting in a total of four structural equation models. Models included dyadic interaction variables (latent factor of flexibility or observed dyadic positive affect), child EC, internalizing behaviors as rated by the mother at T1, child cognitive ability, child gender, child age, and a latent factor outcome of child internalizing behaviors at T2. Results are presented first for independent and interactive models of dyadic flexibility and EC, following with independent and interactive models of dyadic positive affect and EC.

Dyadic flexibility and EC as predictors of child internalizing. First, a measurement model was conducted for the latent factor of dyadic flexibility with the three observed indicators of range, dispersion, and transitions. The model converged with standardized factor loadings of .86, .70, and .90, respectively. A second measurement model was conducted for the latent factor of internalizing behaviors, with the two observed indicators of mother and partner report of child internalizing behaviors at T2. The model converged with adequate standardized factor loadings of .77 for mothers and .59 for partners. The latent internalizing behaviors construct was used in all four models as the outcome variable.

Next, a longitudinal structural equation model was conducted to assess dyadic flexibility and EC as predictors of child internalizing behaviors, accounting for the contributions of internalizing at T1, child cognitive ability, child age, and child gender. Model fit was good, $\chi^2(19) = 16.23$, ns, CFI = 1.00, RMSEA = .00, SRMR = .04. Standardized model parameters are

shown in Figure 4. High levels of EC at T1 predicted lower levels of internalizing behaviors at T2 (Est. = $-.36$, SE = $.12$, $p < .01$), and dyadic flexibility as a predictor of internalizing behaviors at T2 approached significance, (Est.= $.22$, SE= 1.83 , $p < .10$). Explained variance was high for internalizing at T2 (Est.= $.56$, SE= $.14$, $p < .001$). In terms of covariates, higher levels of internalizing behaviors as reported by mothers at T1 were a significant predictor of higher levels of internalizing behaviors at T2, (Est.= $.56$, SE= $.11$, $p < .001$), indicating stability over time. Child cognitive ability, gender, and age did not contribute significantly to internalizing behaviors at T2 in the model. Flexibility was significantly associated with internalizing behaviors at T1 (Est.= $.22$, SE= $.11$, $p < .05$), but it was not associated with child EC, cognitive ability, child age, or child gender. Child EC was significantly associated with child age (Est.= $.21$, SE= $.10$, $p < .05$) and cognitive ability (Est.= $.41$, SE= $.09$, $p < .001$), and marginally associated with child gender in the model, (Est.= $-.17$, SE= $.10$, $p < .10$). Interestingly, child EC was not significantly related to internalizing behaviors at T1.

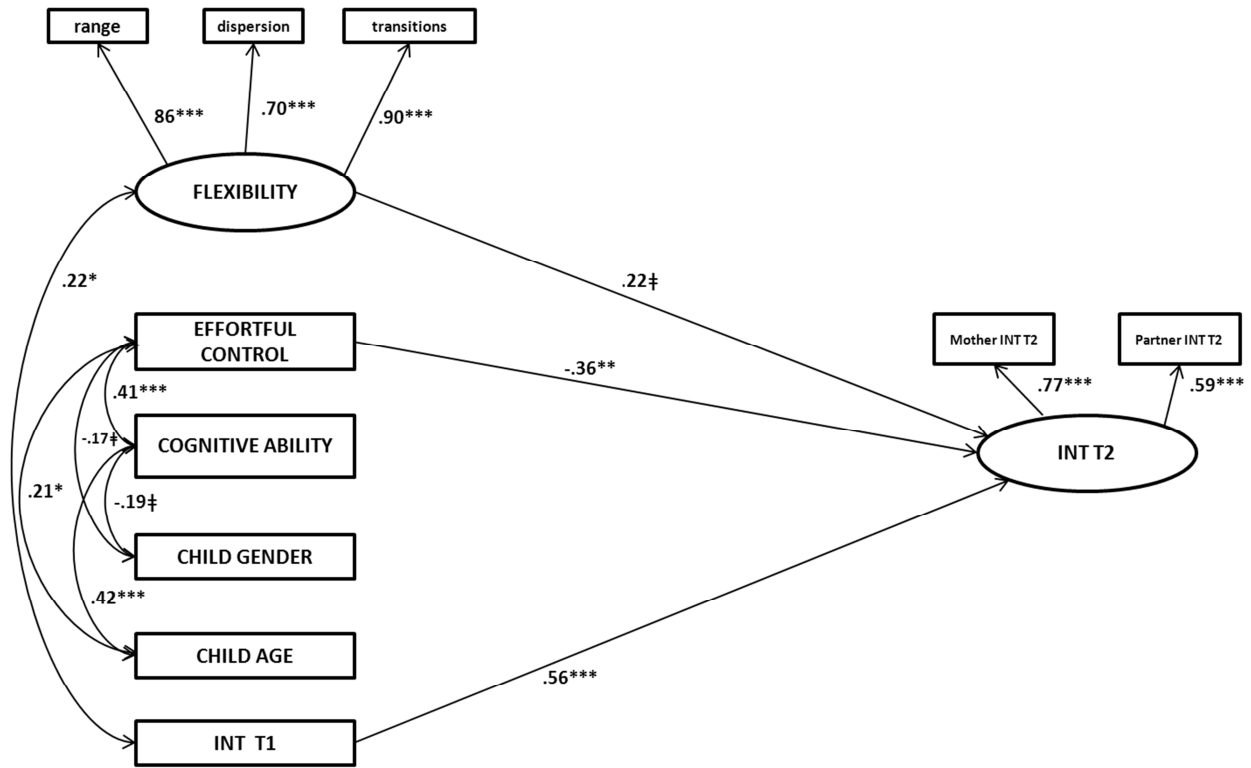


Figure 4

Structural equation modeling results for the independent test of child EC and flexibility as predictors of internalizing behaviors. NOTE: Nonsignificant paths have been omitted; † $p < .10$, * $p < .05$, ** $p < .01$, *** $p < .001$. INT= Internalizing Behaviors; T1= Time 1; T2= Time 2

Interaction of dyadic flexibility and EC as predictors of child internalizing. The three observed indicators of flexibility were standardized and computed into an aggregate in IBM SPSS 20. A multiplicative interaction term (Baron & Kenny, 1986) between the flexibility aggregate and child EC was computed in IBM SPSS 20 and then entered into the model as a predictor in Mplus. For the model testing the interaction between dyadic flexibility and EC as predictors of child internalizing behaviors, accounting for the contributions of internalizing at T1, child cognitive ability, child age, and child gender, model fit was good, $\chi^2(22) = 24.87$, ns, CFI = .99, RMSEA = .04, SRMR = .05. High levels of EC at T1 still predicted lower levels of

internalizing behaviors at T2, even with the interaction term in the model (Est. = -.37, SE = .12, $p < .01$), and dyadic flexibility as a predictor of internalizing behaviors at T2 approached significance, (Est.=.22, SE= 1.83, $p < .10$). The interaction term between child EC and dyadic flexibility at T1 was not a significant predictor of internalizing behaviors at T2. Explained variance was high for internalizing at T2 (Est.=.56, SE=.14, $p < .001$).

Dyadic positive affect and EC as predictors of child internalizing. For the model of dyadic positive affect and EC as predictors of child internalizing behaviors, accounting for the contributions of internalizing at T1, child cognitive ability, child age, and child gender, model fit was good, $\chi^2(5) = 3.37$, ns, CFI = 1.00, RMSEA = .00, SRMR = .03. Standardized model parameters are shown in Figure 5. High levels of EC at T1 predicted lower levels of internalizing behaviors at T2 (Est. = -.38, SE = .12, $p < .01$), and dyadic positive affect as a predictor of internalizing behaviors at T2 approached significance, (Est.= .20, SE= .11, $p < .10$). Explained variance was high for internalizing at T2 (Est.=.55, SE=.14, $p < .001$). In terms of covariates, findings were similar to those mentioned in the model consisting of dyadic flexibility and child EC. Again, higher levels of internalizing behaviors as reported by mothers at T1 were a significant predictor of higher levels of internalizing behaviors at T2, (Est.=.56, SE=.11, $p < .001$). Child cognitive ability, gender, and age did not contribute significantly to internalizing behaviors at T2 in the model. Dyadic positive affect was significantly associated with internalizing behaviors at T1 (Est.=.24, SE= .10, $p < .05$), but it was not associated with child EC, cognitive ability, child age, or child gender. Child EC was significantly associated with child age (Est.= .21, SE=.10, $p < .05$) and cognitive ability (Est.= .41, SE=.09, $p < .001$), and marginally associated with child gender in the model, (Est.= -.17, SE=.10, $p < .10$). Similarly, child EC was not significantly related to internalizing behaviors at T1.

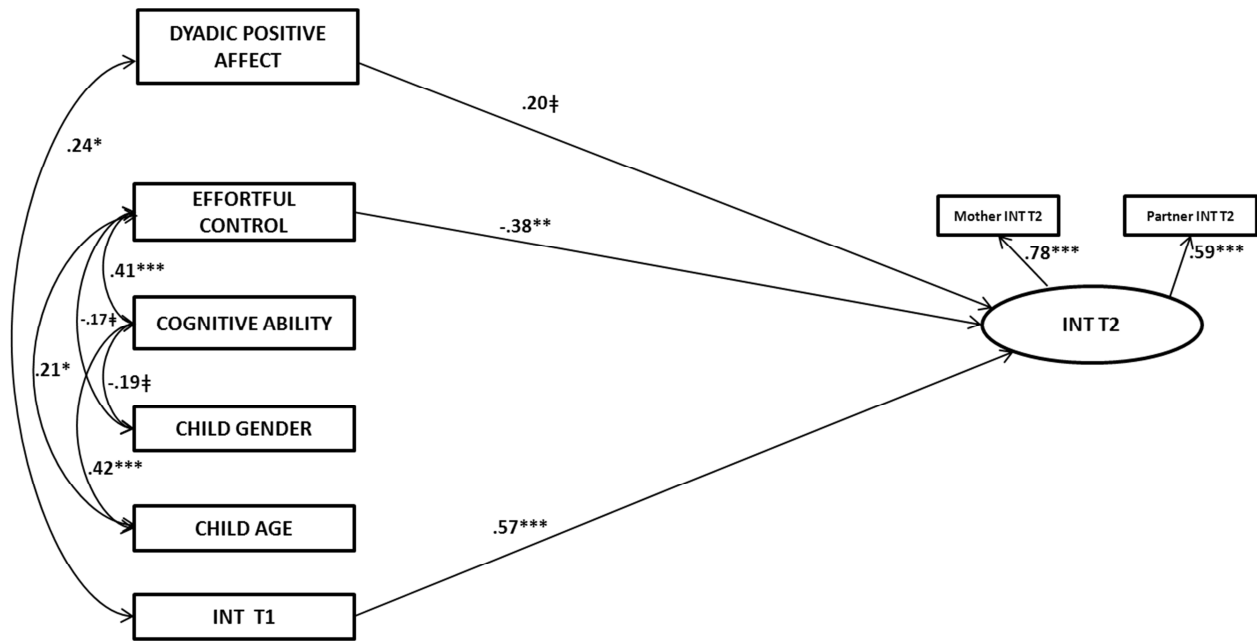


Figure 5

Structural equation modeling results for the independent test of child EC and dyadic positive affect as predictors of internalizing behaviors. NOTE: Nonsignificant paths have been omitted; † $p < .10$, * $p < .05$, ** $p < .01$, *** $p < .001$. INT= Internalizing Behaviors; T1= Time 1; T2= Time 2

Interaction of dyadic positive affect and EC as predictors of child internalizing. A multiplicative interaction term (Baron & Kenny, 1986) between dyadic positive affect and child EC was computed in IBM SPSS 20 and then entered into the model as a predictor in Mplus. For the model testing the interaction between dyadic positive affect and EC as predictors of child internalizing behaviors, accounting for the contributions of internalizing at T1, child cognitive ability, child age, and child gender, model fit was good, $\chi^2(6) = 5.37$, ns, CFI = 1.00, RMSEA = .00, SRMR = .02. However, child EC was not a significant predictor of internalizing at T2. Dyadic positive affect was not a significant predictor of internalizing at T2, and the interaction term between child EC and dyadic positive affect at T1 was not a significant predictor of

internalizing behaviors at T2. Explained variance was high for internalizing at T2 (Est.=.59, SE=.14, $p < .001$).

CHAPTER V

DISCUSSION

A central aim of this study was to examine how child EC and dynamic structure and affect in parent-child interaction contribute to internalizing behaviors in early childhood. Researchers have emphasized the importance of considering the dynamic contributions of both child temperament (i.e., EC) and parenting in the development of psychopathology (Posner & Rothbart, 2000). Additionally, some have suggested that there is a need to explore how both the content (Valiente & Eisenberg, 2006) and the structure (Lunkenheimer et al., 2011) contribute to child behavioral adjustment, by exploring whether child EC acts as a modifier or mechanism in this relationship. This is essential for addressing the transactional nature of parent-child relationships and distinguishing risk factors that may lead to developmental psychopathology. Furthermore, the current study was able to account for the transactional nature of mother-child interaction with the use of state space grids. Thus, the independent and interactive contributions of child EC and dyadic affective flexibility, as well as the independent and interactive contributions of child EC and dyadic positive affect, were tested as predictors of children's internalizing behaviors.

Overall, results demonstrated a statistically significant and independent contribution of child EC in the prediction of internalizing behaviors, with higher levels of child EC at T1 predicting lower levels of child EC at T2. In terms of dyadic flexibility and dyadic positive affect, separate independent models indicated a trend towards significance in predicting internalizing behaviors at T2, albeit the direction of these relationships was unexpectedly positive. Specifically, dyadic affective flexibility and dyadic positive affect showed statistically

significant within-time relations to internalizing, but only a marginally significant association with higher levels of internalizing behavior problems at T2. Finally, results demonstrated that in the current normative sample of preschool-aged children, a moderation hypothesis was not supported for models involving dyadic positive affect and EC or dyadic flexibility and EC. The following sections provide a discussion of the key findings, according to the research question and model that was tested.

Research question 1

The first research question in this study addressed the question of how child EC and dyadic affective flexibility in mother-child interaction relate to the development of child internalizing behaviors. It was expected that child EC would be related to lower levels of internalizing behaviors, and dyadic flexibility would also be related to lower levels of internalizing behaviors. Results supported the hypothesis surrounding child EC and internalizing, demonstrating that child EC was negatively predictive of parent reports of internalizing behaviors, controlling for child gender, cognitive ability, and stability in internalizing behaviors at T1. This suggests that in a normative sample of three-year-olds, higher levels of child EC may serve as a protective factor from behavioral problems including anxiety, withdrawn behavior, depression, and somatic symptoms. However, it is important to note that child EC was not related to internalizing behavior problems at T1, as reported by mothers. This is interesting in light of previous work that has documented stronger within time than across time relations between EC and adjustment (e.g., Spinrad et al., 2007). In the current sample of three-year-olds, findings suggest that that the relation between developing EC and internalizing behaviors becomes more stable with age, which supports research that links EC to behavioral adjustment (see Eisenberg, Spinrad, & Eggum, 2010).

The second part of this research question involved how dyadic flexibility during mother-child interaction at T1 was related to the development of child internalizing behaviors at T2. It was expected that dyadic affective flexibility would be negatively related to the development of internalizing behaviors at T2. Contrary to this hypothesis, results showed a trend towards a significant positive relation between flexibility and internalizing behaviors, such that higher levels of flexibility predicted higher levels of child internalizing behaviors at T2. Additionally, there were statistically significant positive associations between dyadic flexibility at T1 and mother-reported internalizing behaviors at T1. These results contrast with an earlier study that shows low levels of flexibility, or greater rigidity, are associated with more internalizing behaviors in young children (Hollenstein et al., 2004). However, Hollenstein and colleagues assessed a high-risk sample of children in kindergarten. It is possible that the relationship between flexibility and child internalizing may vary according to contextual factors associated with sociodemographic risk.

Other work has shown mother-child dyadic affective flexibility during a challenging interaction task predicted higher levels of mother-reported externalizing behaviors, but the interaction between affective flexibility and dyadic positive affect was predictive of lower levels of teacher-reported externalizing behaviors (Lunkenheimer et al., 2011). The authors hypothesized that a salient aspect of mother-child interaction in early childhood is structuring and contingent responsiveness, parenting behaviors that may coincide with less affective flexibility. However, mothers and children were observed interacting in a challenging puzzle task, which may pull for more structuring and consequently less flexibility on the part of the mother. Caution must be used when applying this hypothesis to the current study, where a semi-structured free-play task was used to assess mother-child affective flexibility.

Research Question 2

The second research question involved how children's EC and dyadic positive affect in mother-child interaction relate to the development of child internalizing behaviors. Consistent with the previous model of child EC and dyadic flexibility, child EC in this model negatively predicted child internalizing behaviors at T2, and was unrelated to internalizing behaviors as reported by mothers at T1. The original hypothesis surrounding the relationship between dyadic positive affect and child internalizing behaviors at T2 was that greater dyadic positive affect would be related to lower levels of child internalizing behaviors. Once again, this relationship was marginally significant but in the unexpected direction; more dyadic positive affect in mother-child interaction approached being significantly predictive of higher levels of internalizing behaviors at T2. Additionally, more dyadic positive affect was statistically and significantly related to higher levels of internalizing behaviors at T1. On the basis of previous findings that have operationalized dyadic positive affect in the same way and found that dyadic positive affect negatively predicted teacher and mother reports of child externalizing behaviors (Lunkenheimer et al., 2011), the current results warrant further consideration.

Specifically, why would more dyadic positive affect be related to higher levels of child internalizing behaviors? There is the possibility that a mother might rely on positive affect to draw her child out and engage him or her in interaction, particularly if she is reporting her child as having higher levels of internalizing behaviors, such as withdrawn behaviors. Smeekens, Riksen-Walraven, & van Bakel (2008) compared the quality of parent-child interactions across profiles of well-adjusted children, children demonstrating internalizing behaviors, or children demonstrating externalizing behaviors in kindergarten. Parents of internalizing children were observed as being just as positive toward their children as parents who interacted with their well-

adjusted children. Thus, researchers hypothesized that temperamental inhibition may have played a role in the interaction between parents and their children considered to be internalizing. This is one potential explanation for the significant within-time relationship between higher levels of dyadic positive affect and more internalizing behaviors, and the trend towards significance at T2.

Other work has demonstrated that mother's supportive and unsupportive responses to toddler's emotions predicted higher levels of internalizing (anxiety, depression, inhibition to novelty, and separation distress; Luebke, Kiel, & Buss, 2011). Toddlers' internalizing behaviors at age 2 predicted an increase in maternal supportive responses to child emotions. Moreover, these supportive maternal behaviors did not predict a decrease in later internalizing behaviors. Authors hypothesized that mothers of children with internalizing behaviors may be more reactive to their children's emotional displays, regardless of content, which is associated with a greater risk for child internalizing behaviors. Thus, mothers of children who they interpret as being higher in internalizing behaviors may be more sensitive and responsive to the child's emotions, and thus rely more on positive affect within the context of mother-child interaction.

A different explanation for this unexpected finding involves the idea these children are not necessarily inhibited, but rather more likely overall to express emotion, positive or negative. The higher levels of positive affect may reflect exuberance and comorbid dysregulation, across both internalizing and externalizing domains. A recent study by Stifter, Putnam, and Jahromi (2008) demonstrated that toddlers classified as exuberant on the basis of higher levels of positive affect and approach behaviors in unfamiliar situations were more likely than children deemed inhibited or low reactive to be classified as higher in both internalizing and externalizing behaviors at 4.5 years of age. In the context of the current findings, it is possible that the children classified as internalizing were also more exuberant or dysregulated overall, and this is related to

the higher levels of dyadic positive affect that were observed. Furthermore, it is possible that children were temperamentally more exuberant and their mothers were more reactive to their child's emotions, which would also account for increased levels of dyadic positive affect being related to higher levels of child internalizing behaviors at T1, with a trend towards this same relation at T2. Although this is currently speculation, as the current study did not assess children's temperamental exuberance or include externalizing behaviors as an outcome, these ideas provide a promising direction for future research. Specifically, future studies could address the possibility that mothers are more likely to be reactive to children's emotions when their child demonstrates internalizing behavior problems. Another interesting question is whether or not exuberant children's shared positive affect with mothers indeed is related to the development of problem behaviors, internalizing and externalizing.

Overall, it is interesting that both dyadic flexibility and dyadic positive affect (tested separately in different models) were positively related to children's internalizing behaviors within time, and showed a trend towards this same relationship across time. Although this was contrary to the original hypotheses, an important area for future work involves further exploration of the relationship between affective flexibility and dyadic positive affect, and the development of children's behavior problems. It appears there is still much to learn about how the dynamic affective processes that unfold during parent-child interaction contribute to child adjustment.

Research Question 3 and 4

The third and fourth hypotheses addressed the possibility that child EC would serve as a moderator in the relation between dyadic flexibility and internalizing, and dyadic positive affect

and internalizing; specifically, that higher levels of EC would buffer the effects of dyadic flexibility on internalizing, and the effects of dyadic positive affect on internalizing. Although these hypotheses were not supported in either model, exploring EC as a moderator of parenting on child adjustment is an important task for developmental researchers interested in delineating the complex relationships between parent-child transactions and child development (Gallagher, 2002; Posner & Rothbart, 2000). Several limitations of the current study may have prevented the significance of a moderator hypothesis: one includes the use of a normative sample of three-year-olds and their mothers. Use of this type of sample may have prevented the ability assess variability and individual differences in children's problem behaviors. In addition, the outcome variable of interest was internalizing behaviors. Perhaps including externalizing behaviors would have provided a stronger test for the effects of EC as a moderator in the relation between parent-child affect and flexibility and the development of problem behaviors. In addition, EC was not significantly associated with dyadic positive affect or dyadic flexibility. Future research would do well to explore the interactive role of child EC and parenting on child adjustment, with attention to the context in which child adjustment is studied, how child adjustment is defined, and different parenting behaviors that may differentially relate to child EC and adjustment.

Limitations

In the process of addressing the relation between child EC, parent-child dyadic flexibility and positive affect, and child internalizing behaviors, the current findings must be interpreted with caution. As previously mentioned, the use of a relatively high socioeconomic and well-educated convenience sample may have prevented a thorough investigation of variability in children's internalizing behaviors. This calls into question whether or not the current study was truly able to assess anxiety, withdrawn behavior, and other internalizing symptoms, or rather

typical variations in young children's behaviors. Replication of these findings in a more diverse sample may shed light on individual differences and internalizing behaviors. In addition, prior work demonstrated inconsistencies in the links between internalizing behaviors and child EC during early childhood, and a goal of the current study was to further explore this relationship. However, externalizing behaviors are often comorbid with internalizing behaviors, even in young children (Egger & Angold, 2006). Moreover, the strength and nature of the relationship between EC and children's problem behaviors may vary, depending on whether or not both types of behavior problems are included (Eisenberg, Spinrad, & Eggum, 2010). Thus, the relation between EC and internalizing may be inflated by overlap with children's overall dysregulation. A future question to address includes testing the same models with both internalizing and externalizing behaviors, to directly address the question of comorbidity and overlap between young children's internalizing and externalizing behaviors.

In terms of the assessment of mother-child interaction, the current study used a free-play interaction as the basis for deriving measures of dyadic positive affect and dyadic affective flexibility. Although this may be an ecologically valid context for mother-child interaction that is also likely to occur in the context of the home, use of a context that did not necessarily pull for child regulatory behaviors including EC may have prevented thorough examination of the links between mother-child interaction, child EC, and dysregulation in the form of internalizing. Additionally, dyadic positive affect and affective flexibility may not be as salient in this context for the development of children's self-regulation and adjustment. Lunkenheimer and colleagues (2011) have suggested that behavioral regulation (as opposed to affective regulation) should also be considered within the context of mother-child interaction, and this coincides with current research on specific parenting behaviors, such as maternal teaching strategies (see Eisenberg,

Vidmar, et al., 2010) that relate to children's EC. Thus, a promising direction for future work involves investigation of mother-child behavioral flexibility and dyadic behaviors and the relations to child EC and corresponding behavioral adjustment.

Conclusions

In conclusion, the results of the current study support prior research demonstrating higher levels of child EC relate to lower levels of child internalizing behaviors. Within-time relations among dyadic positive affect and flexibility during mother-child interaction were unexpectedly related to higher levels of internalizing behaviors, suggesting more work is needed to improve understanding of the ways in which mother-child interaction, the context in which this occurs, and the aspects of mother-child interaction that are measured relate to the young children's behavioral and emotional adjustment. Thus, child EC remains an important factor in the development of children's behavior problems, and future research should continue to utilize dynamic methods of assessment in studying mother-child interaction and child adjustment. Understanding of the ways in which child self-regulation and parenting influence each other within and across time can move the field of developmental psychopathology forward, to a more integrated and dynamic view of parent-child relationships and child development.

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