5-2020

Maternal Stress and Child Internalizing Symptoms: Parent-Child Co-Regulation as a Proposed Mediator

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Maternal Stress and Child Internalizing Symptoms: Parent-Child Co-Regulation as a Proposed Mediator

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An Undergraduate Thesis Submitted in Partial Fulfillment

of the Requirements for the

Psychology Honors-In-Discipline Program

Honors College

College of Arts and Sciences

East Tennessee State University

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Abstract

The effects of maternal stress on child behavior, especially externalizing problems such as aggression, defiance, and lack of self-control, are well-established within psychological literature. Few studies, however, have examined the effects of maternal stress on child internalizing problems, such as loneliness, withdrawal, and symptoms of anxiety and depression. Moreover, there is much research within developmental psychology to support the notion that parent-child co-regulation, sometimes called dyadic synchrony, can predict child behavioral outcomes. Currently, researchers lack an understanding of how this process can interact with maternal stress to predict child internalizing symptoms. The following thesis details a multi-method assessment which is designed to examine the mediating effect of co-regulation on the relationship between maternal stress and child internalizing symptoms. In this research project, mothers and their three-year-old children complete questionnaires and a challenging dyadic task to assess their current stress, internalizing symptoms, and co-regulation strategies. Co-regulation scores are assigned through a macro coding scheme developed by a behavioral observation coding team. Due to ongoing data collection, data from a comparable project were collected to test this hypothesis using similar self-report measures. This study may have significant implications for the effects of everyday parent-child interactions on future child health outcomes.

Keywords: maternal stress, child internalizing symptoms, co-regulation

Maternal Stress and Child Internalizing Symptoms: Parent-Child Co-Regulation as a Proposed Mediator

Developmental psychologists have long been interested in the mechanisms by which parents can transfer mental health risk to their children. Within this field of inquiry, researchers often emphasize parental factors that lead to externalizing problems, such as physical aggression, defiance, and future substance use. However, internalizing problems, such as loneliness, withdrawal, and symptoms of anxiety and depression, receive far less attention. Parents may have difficulty detecting these issues, so much so that mothers often overestimate externalizing problems but underestimate internalizing problems in their children (Rodriguez, 2011). However, a growing body of research suggests that internalizing problems in young children are predictive of later clinically significant mental health (Conway, Swendsen, Husky, He, & Merikangas, 2016; Woodward & Ferguson, 2001) and physical health (Strine et al., 2008) outcomes. For example, the presence of pre-depressive symptoms during childhood predicts depression and anxiety in adolescence (Aronen & Soininen, 2000). Furthermore, the literature suggests that exposure to parental depression or anxiety disorders increases children's risk of developing the same problems later in life (Piche, Bergeron, Cyr, & Berthiaume, 2011). Many researchers have attempted to explain this phenomenon, sometimes referred to as the "intergenerational transmission of risk" (Creswell & Waite, 2015). While some prefer to focus on genetic factors, there are a variety of other parental, child, or family characteristics that could interact to produce internalizing symptoms.

Maternal Stress

To date, several findings have established an association between parental stress and child internalizing symptoms. Broadly, parental stress is defined as a perceived discrepancy

between one's demands and resources as a parent (Deater-Deckard, 1998; Xuan et al., 2018). This construct captures the experience of being a parent given the unique roles and responsibilities that a person undertakes when they become the caregiver of a child or children (Deater-Deckard, 1998). A parent's level of perceived stress can cause feelings of distress, frustration, inefficacy, and insensitivity. Matthew (2006) found that mothers reporting high-stress levels are more likely than their low-stress counterparts to lack warmth and responsiveness in their parent-child interactions. This withdrawn emotional climate within the household subsequently increases children's risk for negative emotional and behavioral outcomes, including both externalizing and internalizing problems (Matthew, 2006; Xuan et al., 2018). While there is evidence that parenting stress predicts child internalizing symptoms (Rodriguez, 2011), this pattern cannot be understood fully without examining the bidirectionality of the parent-child relationship. In other words, the parent and child reciprocally influence one another so that a child struggling with internalizing symptoms may increase her mother's stress just as a stressed mother may impact her child's internalizing symptoms (Rodriguez, 2011). Given that multiple studies have supported this notion (Matthew, 2006; McLean et al., 2018; Rodriguez, 2011; Stadelmann, Otto, Andreas, von Klitzing, & Klien, 2015; Xuan et al., 2018), the next step in the literature is to examine factors which could explain the relationship between maternal stress and child internalizing problems.

Individual Emotion Regulation and Parent-Child Co-Regulation

Proximal social interactions are one method by which children develop their emotion regulation (ER) skills, defined in part as the ability to monitor, evaluate, and modulate one's own emotional experiences (Thompson & Calkins, 1996). Self-regulation abilities are a vital component of healthy psychological functioning in childhood (Lunkenheimer, Olson,

Hollenstein, Sameroff, & Winter, 2011) and the development of a child's self-regulation skills will have effects on future health-related factors, including their internalization of coping strategies and potential behavior problems (Lunkenheimer, Kemp, Lucas-Thompson, Cole, & Albrecht, 2017). Previous research has supported the notion that ER develops biologically and behaviorally within the context of relationships (Davis, West, Bilms, Morelen, & Suveg, 2018; Feldman, 2012; Lunkenheimer et al., 2017). Children learn ER strategies from their parents, and their relationship to their social environment influences their ER abilities (Shipman & Zeaman, 2001). In particular, a child's self-regulation abilities will emerge in the context of a challenge or stress, for an internal or external change must occur for the system to activate and coordinate emotions, behavior, and physiological responses accordingly (Lunkenheimer et al., 2017). A lack of resources or social support for the parent (i.e., increased parental stress) will have indirect effects on the child in their environment. In early childhood, a child's ability to self-regulate is largely a dyadic process that is dependent on their parents' ability to regulate their own emotions and to teach their children regulation skills through discipline, socialization, and emotional support (Lunkenheimer et al., 2017). Therefore, any factor which interferes with a caregiver's ability to self-regulate will indirectly affect a child's ER skills through the process of co-regulation. Research indicates that parental stress exacerbates a mother's difficulties with self-regulation (Cao, Powers, Cross, Bradley, Jovanovic, 2016). Difficulties with self-regulation will reduce a mother's capacity to bolster her child's self-regulation abilities through co-regulation. Hindering the development of a child's ER skills, in turn, will put the child at an increased risk for internalizing maladaptive coping strategies, thus increasing their risk for internalizing symptoms and future mental health problems. Given this foundation of empirical knowledge, there is a growing need to understand the complex co-regulatory processes between parents and

children, sometimes referred to as dyadic synchrony.

Measuring Parent-Child Co-Regulation

The construct of co-regulation provides a framework for conceptualizing parent-child interactions, especially concerning how a parent and child influence one another's affective states (Martin, 2001). Broadly, parent-child co-regulation is an interactive, supportive process between parents and children that fosters self-regulation development (Rosanbalm & Murray, 2017). Co-regulation is occasionally measured through the use of specific strategies on the part of the parent or child, such as the child's social gaze to the parent, the parent using labeling words to help the child understand their emotions, the parent providing a nurturing supportive environment in which the child can express their feelings, the parent modeling self-calming strategies, and so on (Hirschler-Guttenberg, Feldman, Ostfeld-Etzion, Laor, & Golan, 2015). Some researchers have preferred to focus on positive or negative synchrony as well as nonsynchrony as characteristics of co-regulation, terms used to describe the level of affective and behavioral coordination of a dyad's interactions. In dyadic interactions that exhibit positive synchrony, the parent and child will be equally attentive, balanced, and responsive. In other words, the dyad is focused on the same goal (Harrist, Pettit, Dodge, & Bates, 1994). Furthermore, the parent and child will manage their emotion states effectively to advance the goals of the interaction (Martin, 2001). Some dyadic interactions can be mutually focused and reciprocal, but the affective tone is negative, making such interactions negatively synchronous (Harrist et al., 1994). Finally, nonsynchronous interactions are low in dyadic connectedness, involving imbalanced exchanges between parties. Nonsynchronous ER often results in discrepancies between child expectations and parent response, leading children to internalize maladaptive coping strategies (Harrist et al., 1994). Certain dyadic tasks are used in research to

measure parent-child ER observationally, such as a free play task to observe dyadic pleasure or a challenging task to measure dyadic stress (Martin, 2001). For example, Harrist et al. (1994) conceptualized what they referred to as dyadic synchrony through a free play task with parents and their children. The researchers defined positive, negative, and nonsynchronous interactions by engagement, or the number of back-and-forth exchanges in a social event; affective tone, which ranged from positive to neutral to negative; and connectedness, which was defined by reciprocity and the parent and child's mutual participation in the event. Similar studies have described dyadic synchrony or co-regulation as a construct represented by mutual responsiveness, cooperation, and reciprocity, and this construct is typically measured during a pleasurable dyadic task (Deater-Deckard & Petrill, 2004; Healey, Gopin, Grossman, Campbell, & Halperin, 2010; Lindsey & Caldera, 2015). Alternately, some studies use a challenging task to evoke stress in the dyad to analyze how the mother and child react to one another to modulate their reactions to a perturbation. In other words, researchers are interested in how a parent's and child's emotions, behaviors, and physiology are coordinated to meet a dyadic goal in the context of a challenge (Lunkenheimer et al., 2017). Lunkenheimer et al. (2017) developed the Parent-Child Challenge Task (PCCT) to assess how mothers and their children react under pressure to solve three puzzles that are beyond the child's ability level at a particular stage of their development. The nature of this task makes it appropriate to study both adaptive and maladaptive regulatory responses in parent-child interactions.

Co-Regulation, Maternal Stress, and Child Internalizing Symptoms

Although multiple studies have found evidence that difficulties in co-regulation can predict externalizing problems in children, few have examined the link between co-regulation and internalizing problems. Of those that have examined the relationship between co-regulation

and internalizing problems, Martin (2011) found that emotional negotiation via a mutually pleasurable task (such as the free play task) is associated with family emotionality and internalizing symptoms. In contrast, joint management of conflict is related to child temperament and externalizing symptoms (Martin, 2011). Harrist et al. (1994) found support for their hypothesis that high levels of positive synchrony are associated with fewer adjustment problems for children entering kindergarten. As stated previously, Shipman and Zeaman (2001) found that children's ER abilities are influenced by their relationship to their social environment, particularly when their parent or parents lack their own resources and social support, and any discrepancy between a parent's perceived demands and resources can increase parental stress (Deater-Deckard, 1998; Xuan et al., 2018). A parent experiencing elevated stress levels may grapple with a sense of uncontrollability; this maladaptive attributional style is hardly conducive to developing healthy coping strategies (Rodriguez, 2011). In sum, parental stress may interfere with a mother's ability to cope, thus reducing her capacity for implementing effective co-regulation strategies. Disruptions in co-regulation will reduce the child's ability to self-regulate, thus influencing the child's chance of forming internalizing problems. These internalizing problems will follow the child into adolescence and adulthood, putting them at an increased risk for developing depression and anxiety disorders. For this reason, there is a need to understand whether the mutual development of coping strategies via co-regulation can explain, or mediate, the relationship between maternal stress and child internalizing symptoms.

Study Aims and Hypotheses

This specific area of inquiry stems from a larger, ongoing research project called the Two Gen: Feeling Better Project. Broadly, the Two Gen Project aims to examine the physiological and behavioral markers of ER that interact to predict mental health outcomes in mothers and

their three-year-old children. Multiple studies have reported the salience of parent-child co-regulation around age three. During this time, children move from needing their caregiver's help when regulating their emotions to being able to regulate their emotions on their own (Feldman, 2015; Martin, 2001; Lunkenheimer et al., 2011). As a result, it is a prime window to investigate the effects of co-regulation. The Two Gen Project has multiple aims: to examine the link between maternal and child ER as assessed via the psychophysiological and behavioral battery, to examine the link between ER markers and mother and child internalizing symptoms, and to examine a multiple mediation model in which maternal and child ER are proposed mediators between mother and child internalizing symptoms. Additionally, the project involves an eight-week video intervention in which participants are randomly assigned to one of two groups and instructed to watch either behavior-focused videos or emotion-focused videos. At the end of eight weeks, the dyads will return to the research lab to complete their final ER assessments. The final aim of Two Gen is to see which group shows more improvement in ER.

The primary aim of the present study is to examine co-regulation as a proposed mediator between maternal stress and child internalizing symptoms. Thus, we hypothesize that co-regulation will mediate the relationship between maternal stress and child internalizing symptoms (see Figure 1 for the proposed mediation model and hypothesized direction of effects).

Method

Participants

The Two Gen study will involve approximately 100 female caregivers and their three-year-old children from a semi-rural, medium-sized Appalachian community. Recruitment efforts will include posting flyers in places where young children and their families may go, from doctor's offices to public parks, advertising through East Tennessee State University's social

media platforms, and distributing information about the study to various preschools, head start programs, and daycare centers. The children participating in this study should be between three and four years of age, or 36 and 48 months, at the time of the assessment. As mentioned previously, children of this age range offer a look into a unique developmental period between complete reliance on co-regulation and some self-regulation abilities. The mothers must be at least eighteen years of age and be the child's primary caregiver. The child must be in the mother's custody so that she can provide permission for him or her to participate. Both mother and child participation in the study is voluntary. The mother will complete an informed consent document, and she will have the choice to allow her child to participate. The mother and child can withdraw from the study at any time. Participants are compensated for their time with a 40-dollar gift card for the mother and a developmentally appropriate toy for the child.

Materials and Procedure

This study will employ both self-report and observational methods to examine the relationships between maternal stress, child internalizing symptoms, and co-regulation. Though the broader study involves pre-, post-, and follow-up assessments, the present study will only utilize data gathered from the pre-assessment. Upon entering the lab, mothers will complete the Parental Stress Scale (PSS) (Berry & Jones, 1995) to assess both their positive and negative themes of parenthood as part of a bidirectional model of stress. Positive themes assessed on this scale include self-enrichment, emotional benefits, and personal development. Conversely, negative themes include demands on resources, opportunity cost, and restrictions. This measure shows strong internal psychometrics ($\alpha = 0.83$, test-retest = 0.81). Additionally, mothers will complete the Pediatric Symptom Checklist (PSC; Jellinek et al., 1988; Murphy et al., 1996) and Achenbach Child Behavior Checklist, 1.5 to 5-year-old version (CBCL 1.5-5; Achenbach &

Rescorla, 2001) to assess their children's internalizing symptoms. Both measures show good internal consistency ($\alpha = 0.91$ and 0.87, respectively; Jellinek et al., 1988; Kariuki, Abubakar, Murray, Stein, & Newton, 2016; Murphy et al., 1996).

Finally, the dyads will participate in a dyadic stressor task in which they will need to construct a three-dimensional wooden puzzle called Castle Logix by Smart Games. During this task, they will be left alone in a room with a couch, table, the puzzle itself, and a video camera to record their interaction. This puzzle is designed to be two years above the natural ability level of the child. The mother is only allowed to use her words to help her child construct the puzzle. Although the dyad will not be informed of a time constraint, they will be interrupted by the experimenter before they are allowed to finish. The dyad will be told that they will receive a prize only if they finish the puzzle on time. In reality, they will receive a prize regardless of the progress made on the puzzle. This task is designed to see how the mother and child can jointly manage stress, as well as how the mother can help her child cope by using only verbal instruction. The videos of the dyadic stressor task will be coded for themes of co-regulation by two research assistants to establish inter-rater reliability. After all of the questionnaires and tasks have been completed in the lab, the dyad will be debriefed and dismissed.

Development of Codes

The dyadic codes used in this research are based on previous studies related to the observational coding of co-regulation. Firstly, this study uses a macro coding scheme, meaning that researchers assign a global code to a given interaction or task (Davis, Bilms, & Suveg, 2017). Additionally, past researchers who studied co-regulation typically defined this construct through multiple codes, teasing aspects of this complex process apart to increase reliability and construct clarity. For example, Deater-Deckard and Petrill (2004) referred to co-regulation as

consisting of joint attention, collaborative behavior, and matching positive affect. They used the Parent-Child Interaction System, or PARCHISY, to distinguish between three dyadic codes: reciprocity, conflict, and cooperation. There are dozens of peer-reviewed publications that utilize this system for understanding the dyadic regulation processes in parent-child interactions. Similarly, Harrist et al. (1994) defined dyadic synchrony through scales that represented engagement, affective tone, and connectedness. While there are many other variations on the definitions of these constructs, generally speaking, the literature describes co-regulation as a combination of positive affective sharing and coordinated, reciprocal interactions (Deater-Deckard & Petrill, 2004; Harrist et al., 1994; Healey et al., 2010; Lindsey & Caldera, 2015; Lunkenheimer et al., 2011; Lunkenheimer et al., 2017).

Additionally, it is useful to separate individual parent or child ER from the process of co-regulation. Both parents and their children may exhibit behavioral indicators of adaptive ER or emotion dysregulation. As discussed above, these individual behaviors are part of the greater, more complex co-regulatory process. For example, a child may engage in support-seeking during a difficult or stressful task. This is a behavioral indicator of adaptive emotion regulation that may involve a child seeking her mother's assistance, either by asking verbally or through non-verbal cues such as a social gaze or physical contact with the mother (Hirschler-Guttenberg, Feldman, Ostfeld-Etzion, Laor, & Golan, 2015). However, for construct clarity, these behaviors are included under individual parent or child codes, and the dyadic co-regulation process is defined separately.

The codes in this study were adapted primarily from the MACY Parent-Toddler Coding System (MPTCS) (Martinez-Torteya et al., 2014). This MPTCS includes three 5-point Likert rating scales for dyadic interactions. These scales are reciprocity, shared affective valence, and

overall quality of the parent-child relationship. Likewise, the current study includes three scales: reciprocity, shared positive affect, and relationship quality. Each is rated using a 5-point Likert system. The combined scores that a dyad receives from the reciprocity and shared positive affect scales represent their overall co-regulation score (see Appendix for more detailed descriptions of codes).

Here, reciprocity is defined as the co-creation of relatively stable behavioral and emotional exchanges between parent and child (Lindsey & Caldera, 2015). Interactions high in reciprocity are characterized by the "goodness of fit" of the parent and child's energy, interest levels, and engagement. These dyads exhibit contingent responsivity and turn-taking throughout their interaction. Dyads may also be high in reciprocity when the mother and child exhibit complementary, rather than similar, behavior. For example, if the mother successfully soothes a moody child, this dyad would exhibit the same "goodness of fit" as a dyad whose behavior is similar. On the low end of this scale, dyads are mismatched and non-contingent. If a child becomes fussy, the mother may become frustrated with the child, even yelling at him or her or threatening the child with consequences if he or she does not comply with the mother's requests. In other words, a low-scoring dyad is considered "out of sync."

The shared positive affect scale describes the reciprocal exchange of positive emotional expressions between the parent and child. Although this research does include individual positive affect scales, this scale is more focused on the synchrony of parent-child affective sharing. For example, in dyads at the high end of this scale, expressions of positive affect from one party (e.g., smiling or laughing) are consistently met with expressions of positive affect from the other person. The coordination of positive affect appears relatively smooth and natural, indicating that the dyad regularly interacts in this manner. Low-scoring pairs may express little to no positive

affect at all, or expressions of positive affect from one person may be met with neutral or negative expressions from the other. Occasionally, a person may express positive affect, but the timing and coordination of the response make it seem awkward, strained, or faked for the assessment. These cases also lower a dyad's score on this scale.

Finally, the quality of interaction scale combines both affective and behavioral aspects of the parent-child interaction. High scores on this scale reflect both mutual engagement and reciprocity as well as a high level of shared positive affect. A high-scoring pair seems to enjoy each other's company and recover quickly from conflict. A low-scoring pair, on the other hand, does not appear to enjoy each other's company. In these interactions, there may be an absence of shared positive affect and contingent responsivity. Alternately, these dyads may display a degree of hostility, resentment, frustration, or indifference toward one another. If the pair experiences conflict, they may have difficulty returning to a neutral or positive state. Overall, a pair's score on this scale is determined by their proportion of positive to negative interactions during a task. Scores can range from positive to neutral to negative depending on the quantifiable instances of relationship quality that are observed.

Analyses

Due to ongoing data collection of the Two Gen Project, data from a comparable study called the Mom Power in Tennessee Project were collected to test the current hypotheses using similar self-report measures (see Figure 2 for the current mediation model as it relates to the Two Gen Project). Forty-two female caregivers with young children (age M = 11.41 months, SD = 14.19) participated in a trauma-informed parenting intervention for mothers with adverse childhood experiences (ACEs). To assess their feelings of stress, they completed both the Parental Stress Index—Short Form (PSI-SF) and the Perceived Stress Scale (PSS). Z-scores were

calculated to give each mother a standardized score for stress. Their difficulties in ER were assessed via a total score from all subscales of the Difficulties in Emotion Regulation Scale (DERS). Finally, the Emotional Problems subscale of the Strengths and Difficulties Questionnaire (SDQ) was used to assess their child's internalizing symptoms. The analyses for this project were conducted using the Statistical Package for the Social Sciences (SPSS). The mediation model was tested using the Hayes Process Macro (version 3.0, Model 4). Specifically, maternal parenting stress was entered as the predictor variable, maternal ER difficulties as the mediator, and child internalizing symptoms as the outcome variable.

Results

Results show that the total effect of the mediation model was not significant, $F(1, 21) = 0.65$, $p = 0.43$, $R^2 = 0.03$. The direct effect of maternal stress on child emotional problems (c path) was not significant, $B = 0.96$, $SE = 1.19$, $t(21) = 0.81$, $p = 0.43$. This indicates that maternal stress did not significantly predict child emotional problems in our sample. The path from difficulties in maternal ER to child emotional problems (b path) was also not significant, $B = 0.02$, $SE = 0.06$, $t(20) = 0.32$, $p = 0.75$, meaning that when controlling for maternal stress, difficulties in maternal ER did not significantly predict child emotional problems. The indirect effect of maternal stress on child emotional problems through difficulties in maternal ER (c' path) was not significant, $B = 0.60$, $SE = 1.65$, $t(20) = 0.36$, 95% CI = [-2.84, 4.03], $p = 0.72$. For significant mediation to occur, the value of p must be $< .05$, and the 95% confidence interval must not include a zero. Therefore, according to the current model, difficulties in maternal ER are not a potential mechanism through which maternal stress may impact child emotional problems. These results do not lend support to the current hypotheses. However, the effect of maternal stress on difficulties in mothers' ER abilities was significant, $B = 18.08$, $SE = 4.31$,

$t(21) = 4.19$, $p < .001$. This result supports previous research which states that increased parental stress does lead to an increase in difficulties regulating emotions.

Discussion

There is mounting evidence to suggest that internalizing problems in young children predict depression and anxiety disorders later in life, and there are ongoing efforts to understand how parents may be involved in a child's risk of developing internalizing symptoms. Parents may indirectly affect their children's risk of developing emotional problems through their emotional disturbances and coping mechanisms, particularly when the parent is experiencing elevated levels of parenting stress. Parenting stress is a parent's perception of the demands and responsibilities associated with parenting. There is an established, reciprocal relationship between maternal stress and child internalizing symptoms, suggesting that one may lead to an increase in the other and vice versa. Furthermore, there is a growing interest in emotion regulation (ER), or the process by which a person modulates their emotional responses to meet the demands of any given situation. Notably, children learn how to regulate their emotions throughout their early years with their parents in a process called co-regulation. In particular, age three is a critical developmental window when children gain the ability to regulate their emotions without parental assistance. However, difficulties in ER are one mechanism through which environmental factors in early childhood, such as the parent's level of stress, can manifest as later symptoms. Additionally, elevated maternal stress leads to difficulties in ER. Because co-regulation is a process involving parent ER, the dyad's joint ER, and the child's ER, if any one piece of this circular process suffers, so too does the rest of the system. In other words, if stress interferes with a mother's ability to cope, it will consequently affect her ability to help her child co-regulate, thus reducing the child's ER abilities at a crucial developmental stage. This

impairment, in turn, puts the child at an increased risk for developing internalizing symptoms and later clinically significant mental health problems. Thus, this thesis sought to answer the research question of whether a dyad's co-regulation abilities are one mechanism through which maternal stress may lead to an increase in child internalizing symptoms. This thesis sought to move the field closer to answering this question through 1. A thorough literature review on the constructs of maternal stress and dyadic co-regulation; 2. Development of a behavioral observation code to assess dyadic co-regulation for future data analysis relevant to the research question within the Two Gen Project; and 3. Analysis of proxy pilot data from the Mom Power project.

The Two Gen Project attempts to answer this question through a multi-method assessment that uses self-report measures to assess maternal stress and child internalizing symptoms as well as a challenging dyadic task to measure co-regulation abilities. A team of behavioral observation coders worked together to develop codes that could capture co-regulation, mainly through reciprocity, shared positive affect, and overall relationship quality in interactions. This ongoing observational research is the best method for measuring such a complex, interactive process. However, due to the intensive nature of writing codes, meeting to discuss necessary changes, and multiple rounds of coding for reliability before dyads can receive their final co-regulation scores, already collected data from a similar project were used as pilot data to test a proxy of the current hypothesis. This study called the Mom Power in Tennessee Project surveys mothers of young children about their difficulties in ER, parenting stress, and their child's emotional or internalizing problems, among other constructs of interest. A new mediation model parallel to the proposed Two Gen model was created to test the hypothesis that difficulties in maternal ER would explain the relationship between maternal stress and child internalizing

symptoms. Results showed that this was not the case; however, maternal stress did significantly predict difficulties in maternal ER.

One explanation for the lack of significant results is that only about half of the original sample in the Mom Power Project completed the Strengths and Difficulties Questionnaire (SDQ) to assess their child's emotional problems (n = 23), thereby significantly decreasing the already small sample size. As a result, the study was notably underpowered due to its small sample size. However, even with low power, a significant positive relation between maternal stress and difficulties in maternal ER emerged. As stated previously, a mother with poor self-regulation abilities will struggle to help her child co-regulate. This then reduces a child's ability to develop their own ER skills (Lunkenheimer et al., 2017; Rosenbalm & Murray, 2017). Thus, the results of this analysis do not preclude the need for further research on the effects of parent-child co-regulation on child mental health outcomes. Rather, these results highlight the need to develop reliable, comprehensive codes to capture this unique interpersonal and developmental process.

In addition to using observational methods to capture the co-regulation process rather than administering questionnaires that focus solely on maternal ER difficulties, other changes have been implemented to improve the Two Gen Study based on the pilot data analyzed from the Mom Power Project. In the Mom Power Project, mothers completed questionnaires to assess their levels of parental stress and perceived stress. Based on these separate measures, each mother received a standardized score for stress. However, the Two Gen Project uses just one validated measure of parenting stress. This measure specifically examines positive and negative themes of parenthood, forming a more complex picture of the bidirectional nature of stress in a parent-child relationship and improving upon the design of the Mom Power Study. Finally, because the children involved in the Two Gen Project must be between 36 and 48 months at the

time of their first assessment, we have employed a different measure of child internalizing symptoms to assess multiple ways that these problems may manifest during this critical developmental period. The CBCL 1.5-5 includes four subscales that indicate the presence of child internalizing problems: Anxious/Depressed, Withdrawn, Sleep Problems, and Somatic Problems. Using this tool instead of the Emotional Problems subscale of the SDQ will provide us with a more comprehensive understanding of the range and presentation of child internalizing symptoms.

Due to the unique nature of this thesis, the following section will discuss the process of coding development and lessons learned from that experience. Beginning in the fall of 2019, members of the behavioral observation coding team met regularly to discuss various aspects of the coding process. First, we chose the codes that we wished to include, later coming together to write and revise the codes after reviewing previous literature. Finally, we practiced coding together to fine-tune the anchor points of each code and work towards reliability. This surprisingly intensive process, though rewarding, presented multiple challenges.

Initially, there were issues with the video recordings of participants during the Challenging Puzzle Task and other dyadic tasks. Video recording was chosen as the ideal method of data collection because it enabled the researchers to replay the videos multiple times during coding to identify all relevant behaviors or emotional responses during a dyad's interaction. Recording the dyad also allowed the researchers to leave the room during each task, giving them additional privacy with the hope that this would make their interactions as natural as possible. Of course, participant reactivity, or the phenomenon that occurs when individuals change their behavior due to the knowledge that they are being observed, is an issue with any observational research (Paterson, 1994). Further, the presence of a camera acts as an "eye"

during behavioral observation, so participants may still alter their behavior or performance knowing that the camera is recording them (Haidet, Tate, Divirgilio-Thomas, Kolanowski, & Happ, 2009). Additionally, various problems with the camera itself arose. If not mounted at the proper angle, the camera would fail to capture the participants' faces, thus rendering the video unusable for behavioral observation purposes. This early issue was later resolved due to changes in the study protocol.

Once the coding team decided to implement a macroanalytic coding scheme in which each interactional process would be viewed in its entirety, we formed comprehensive definitions of constructs looking to other studies for guidance. Even still, when coding began, members of the team often disagreed on the intended meaning behind nuanced human behavior. For example, does a laugh indicate nervousness or positive affect? How do we interpret this behavior in the context of the task? Once again, is this participant influenced by the knowledge that they are being recorded? Moreover, how can we quantify these behaviors to make the coding scheme more objective? Do we record the amount of time a participant spends engaging in a specific behavior or the number of times when it occurs? Overall, there was no one answer that we could apply across all constructs of interest; consequently, the coding strategy varied from code to code, making the process of writing and editing them effortful and time-consuming.

When reliability coding began, we revisited the dyadic codes due to additional issues illuminated by the coding process. Namely, it was difficult to isolate a dyad's interaction during one task to code for their reciprocity, shared positive affect, and overall relationship quality in the context of their entire assessment. In other words, by observing the mother and child interact outside of the task, the researcher may develop some idea of the nature of their relationship, thus introducing bias into the coding process. This factor presented yet another obstacle in the path

toward reliability. However, the team proceeded with the understanding that revisions to the coding manual could be made if discussion among the team warranted a change to the codes. In sum, the lessons learned from my involvement in the development of this coding manual include the potential of participant reactivity, the difficulty of reaching consensus among a group in coding, and the challenge of avoiding experimenter bias.

Overall, the codes developed for the Two Gen Project are useful for capturing some aspects of the co-regulatory process between a parent and a child. We believe that these codes can accurately assess a dyad's level of reciprocity, shared positive affect, and the tone of their interactions. While many studies use these constructs to describe and measure co-regulation, co-regulation also includes specific strategies implemented by both parent and child, which are not included in these codes. For example, we do not have a dyadic code to capture specific co-regulation strategies that a mother may use to help her child regulate, such as vocal comfort or reassurance, physical comfort, redirection of attention, or labeling emotions. (Ting & Weiss, 2017). Our dyadic codes also do not account for behaviors that capture a child's co-regulation attempts, such as social gaze to parent, physical proximity-seeking, and engaging the mother for distraction (Hirschler-Guttenberg et al., 2015). Instead, adaptive ER strategies and indicators of emotion dysregulation are captured in a mother and child's separate codes. Although maternal ER, child ER, and co-regulation are closely interrelated, they are different elements of a more extensive, complex, and circular process. Therefore, to gain a broader understanding of co-regulation, it may be necessary to include both individual ER codes and dyadic codes (reciprocity, shared positive affect, and relationship quality) in a future coding scheme. Finally, theorists believe that ER is a multidimensional process involving both behavior, emotion, and physiological responses. In the context of stress, regulation on the physiological level includes

how well the body returns to homeostasis when physiological systems are perturbed. Thus, many believe that examining only behavioral aspects in the absence of this bioregulation piece may form an incomplete picture of emotion regulation and co-regulation (Lunkenheimer et al., 2017). While the Two Gen Project does measure physiological markers of stress, this proposed investigation focuses solely on the observable behavioral aspects of co-regulation. Using this method on its own may exclude a critical element of co-regulation that is needed to understand its effect on the parent-child relationship and the intergenerational transmission of mental health risk.

Limitations and Future Directions

As discussed above, the limitations of this study include the possibility of participant reactivity during behavioral observation, difficulty reaching a comprehensive understanding of parent-child co-regulation without the inclusion of physiological measures, and the challenge of creating codes that accurately measure the construct of interest. While our codes are useful for analyzing some behavioral aspects of co-regulation, they are limited in their ability to measure all dimensions of the co-regulatory process. Furthermore, due to the extensive protocol of the Two Gen study and the arduous nature of coding, obtaining enough data to perform the proposed mediation analysis will require more time and increased recruitment efforts. The process of coding itself requires immense concentration, and coding for long periods of time without breaks can cause fatigue and lead to decreased reliability and accuracy. Even a researcher's current emotional state can influence the behavioral observations that they make. Therefore, check-in sessions would need to occur regularly to ensure that reliability is maintained among the coding team if there is a lapse in study participation.

Future studies should consider developing a code that can capture aspects of parent-child

interactions that are unique to co-regulation and are not included in individual definitions of ER for either person. For example, researchers might wish to assign dyads a co-regulation score based on the number of times they employ specific strategies, such as the mother using modeling to teach her child ER skills. Even after decades of research, there is still no consensus on what this interactive process should *be called*, much less how it should be defined. Co-regulation seems to be the standard term used by most psychologists. However, others still prefer parent-child or dyadic synchrony despite a lack of evidence that these constructs differ significantly. Developing one reliable definition and coding scheme for co-regulation will advance research in this area as psychologists can more easily design and replicate studies to answer a variety of questions about this aspect of caregiver-child relationships.

Clinicians and facilitators of parenting programs should emphasize strategies that mothers can use to reduce stress and enhance their ER skills given the evidence which suggests that stress leads to an increase in ER difficulties and ER difficulties interfere with a mother's ability to help her child co-regulate. Programs like the Mom Power in Tennessee Project focus on teaching mothers about self-care skills, mindfulness, attachment, and child development to achieve this goal. In doing so, programs like this one hope to prevent mothers with mental health problems from transferring this risk to their children.

To summarize, parent-child co-regulation of emotion may be a critical factor in the intergenerational transmission of mental health risk from mother to child. A mother who is ineffective in her attempts to deal with stress may experience problems regulating her emotions. Thus, she may inadvertently teach her child maladaptive coping skills, leading them to develop internalizing problems. These internalizing problems are predictive of psychopathology in adolescence and adulthood. Therefore, understanding the cause of this transmission and

harnessing the proper tools to intervene will help us to reduce mental health risk in young children and promote the well-being of future generations.

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Figure 1

Mediation Model for the Proposed Study (Two Gen Project)

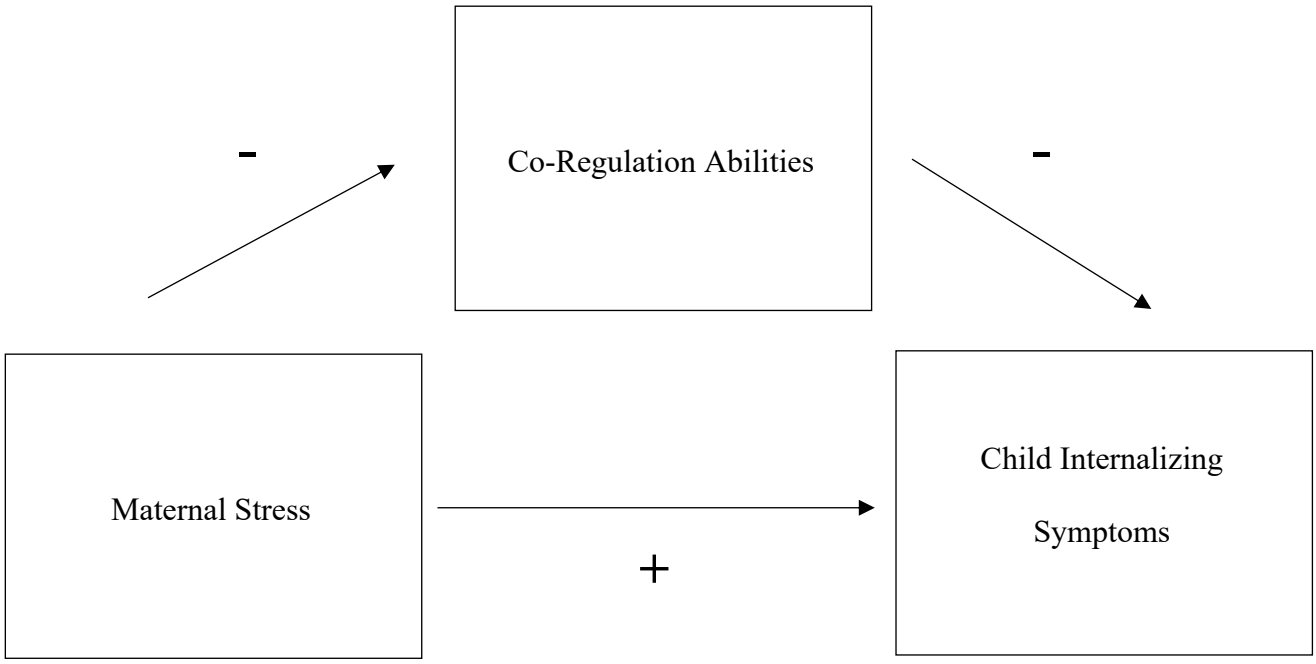
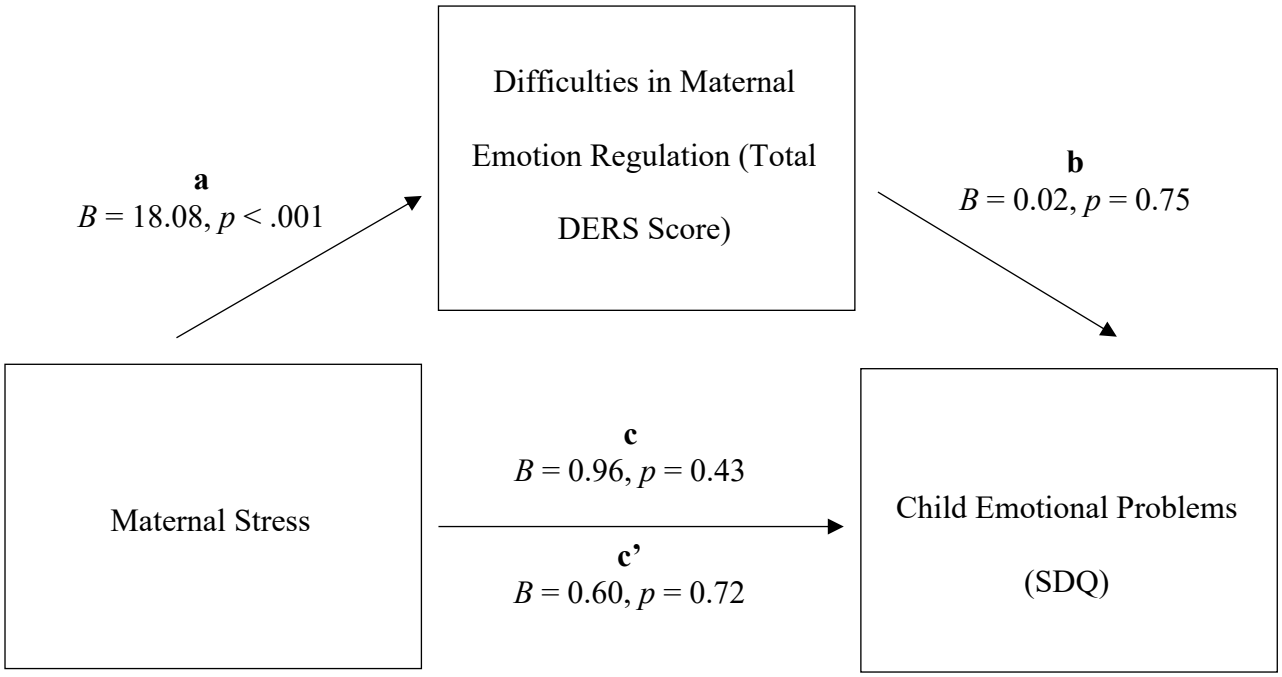


Figure 2

Mediation Model for the Current Study (Mom Power in Tennessee Project)



Note. DERS = Difficulties in Emotion Regulation

Note. SDQ = Strengths and Difficulties Questionnaire

Appendix

A. Reciprocity

This scale describes the co-creation of relatively stable behavioral and emotional exchanges between parent and child. It assesses the dyad's degree of similarity, "goodness of fit," or rhythm and flow. Interactions with high reciprocity flow smoothly with no sharp turns or changes in levels of affect, rhythm, activity level, or dyadic involvement. Bouts of interaction and turn-taking are characterized by contingent responsivity and engagement on the parts of both mother and child, rather than the mother overriding the interest, engagement, or emotional states of the child. In addition, dyads can be complementary rather than similar. For example, the mother may be soothing while the child is fussing, but the dyad will exhibit the same "goodness of fit" as dyads that are similar in that their interactions. Complementary dyads will be less common than similar dyads.

1. No reciprocity. The interaction is primarily characterized by one or both partners either dominating or disengaging from the interaction. Behavioral exchanges are mismatched and non-contingent. If the child becomes frustrated while trying to complete the task, the parent may frequently raise her voice/yell at the child, threatens him/her with consequences if they do not continue, or denies him/her something s/he wants to have/do. The dyad is out of sync.

2. Some Reciprocity. The interaction is somewhat reciprocal. There is an occasional flow and rhythm in the dyads' energy and interest levels, engagement, and emotional states.

3. Moderate reciprocity. The interaction is moderately reciprocal. There is a flow and rhythm in the dyads' energy and interest levels, engagement, and emotional states half of the time. 3 vs. 4: If there are two or more clear instances of disjointment in dyad (e.g., child says no in response

to parent request/command, caregiver expresses frustration in response to child's bids), then code a 3.

4. Much reciprocity. The interaction is reciprocal more than half of the time. There is a consistent flow and rhythm in the dyads' energy and interest levels, engagement, and emotional states more than half of the time. 4 vs. 5: If there are one or more clear instances of disjointment in dyad (e.g., child says no in response to parent request/command, caregiver expresses frustration in response to child's bids), then code a 4.

5. Very High Reciprocity. The interaction is primarily characterized by mutual responsiveness, smoothness of behavioral coordination, mutual engagement, and balanced participation. If the child becomes frustrated while trying to complete the task, the parent shows warmth and compassion, encourages him/her to keep trying, and employs strategies to effectively calm him/her down to get back on track and complete the task. The entire interaction is reciprocal and fluent. There is a consistent flow and rhythm in the dyads' energy and interest levels, engagement, and emotions almost all of the time.

B. Shared PA

This scale assesses the expression of reciprocal positive affect between the mother-child pair. Thus, the scale focuses on the degree of synchrony and acknowledgment of positive affect within the pair rather than individual positive affect. At the high end of the scale, the pair is characterized by high affective sharing. The expressions of positive affect by one person (smiling, laughing, sharing happy feelings, showing physical or verbal affection) are consistently met with positive affect from the other. This coordination of affect seems smooth and natural, conveying a sense that the pair regularly interacts in this manner. To obtain a low score on the scale, reciprocal positive affect must be nearly absent. For some pairs at the low end of the scale,

neither person expresses positive affect. Alternatively, one person may display positive affect, but these expressions are responded to with neutral or negative affect by the other person.

1. Low. Little or no positive affect is shared by this pair. In some pairs, the lack of affective sharing is due to expressions of positive affect of either person going unreciprocated or unacknowledged by the other person. Interactions may seem extremely awkward or strained. In other pairs, the lack of shared positive affect can be attributed to the lack of positive affect in general. Neither person expresses any positive affect that could be shared or reciprocated. Also scored at this point are cases where some reciprocation of positive affect is seen, but the extremely poor timing and coordination of the responses make the interaction seem faked for the assessment situation.

2. Moderately low. A few instances of sharing of positive affect are evident, such as occasional smiles or laughs. The expressions of shared positive affect are minimal because positive affect generally goes unreciprocated or only small amounts of positive affect are expressed at all. In addition, pairs falling at this scale point may share more than occasional positive affect, but the timing and tone seem artificial or stilted. This gives the impression that some of the affect is being exaggerated for the assessment situation or used mostly for tension reduction.

3. Moderate. Some positive affect is shared by this pair. There are several instances of smiling, laughing, or other sharing of expressions of positive affect. However, some expressions of positive affect by one person may be met with neutral or negative affect by the other. Also scored at this scale point are pairs where in a few isolated instances the reciprocation of affect seems exaggerated for the assessment situation or is used for tension reduction.

4. Moderately high. Many of the expressions of positive affect in the pair are acknowledged

and reciprocated. There may still be a few instances, however, where expressions of positive affect are met with neutral affect or perhaps even a low intensity negative expression. Overall, this pair gives mostly genuine, pleasant responses to each other's expressions of positive affect.

5. High. Considerable affective sharing occurs in this pair. Almost all expressions of positive affect are acknowledged and reciprocated. The affective sharing seems smooth, natural, and well-coordinated. The affective interactions do not seem awkward for either person, giving the impression that this might be a familiar mode of interaction for the pair.

C. Quality of Interaction

This is a dyadic global scale reflecting the reciprocal affective and behavioral aspects of both mother and child interacting together. Higher scores reflect higher levels of mutual positive engagement and reciprocity. This may be evidenced by a high level of affective and/or verbal sharing (i.e. sharing gazes, smiling, vocalizing, or prolonged conversational turn-taking) and other forms of contingent responding to each other. The pair seems relaxed, harmonious, and "in tune." Their interaction is smooth and natural. A feeling of tension or mild conflict would result in a lower score. If any conflicts occur, they are very brief and minimal, and any that occur are quickly, easily, and amicably resolved with little or no escalation. Mother and child quickly return to mutual relatedness after the problem or conflict.

To obtain a low score on this scale, a core sense of mutual relatedness as described above must be essentially absent. Mother and child do not interact contingently or in a mutually responsive manner, do not seem to be "in tune" with one another, as evidenced by neutral detachment (ignoring or dismissal) by either the mother or the child, or by prolonged engagement in parallel play. Alternatively, there may be a high level of conflict or mutual

rejection or dismissal going on, and the dyad does not seem to enjoy being together. In either case, little or no contingent responsivity or positive affective sharing occurs, or any attempts made by either one for contingent responding or affective sharing are either ignored or rebuffed. The pair does not seem relaxed. There may be a sense of tension or negativity between the two characterized either by frustration, anxiety, fearfulness, arguments/conflicts, or hostility, or there may be a sense of disengagement, passivity, boredom, or detached neutrality. In cases where the child is easily upset, the mother is ineffective in supporting the child and in helping him/her calm down for long. Child distress or mother-child conflicts if present are not resolved quickly, easily, or amicably, and are characterized by escalation. There is little sense of relatedness between the mother and child after the conflict.

1. Negative. Parent and child appear detached. There may be little eye contact, and they may appear physically removed from each other. Interactions may be characterized by hostility, rejection, and indifference without any moments of contingent responding. There is a marked absence of positive interaction. If there are no instances of shared enjoyment, code a 1.

2. Slightly negative. There are clearly more instances of negative than positive interactions. There are 4 or more instances of negative interactions (conflict, mutual frustration, mom not attending to child's emotions, mom rejecting/not responding to child's bids/emotions).

3. Neutral. The interactions appear neutral, or there are relatively equal instances of both positive and negative interactions.

4. Slightly positive. Your impression is one of a relationship that appears slightly more positive than negative. There are clearly more instances of positive than negative interactions. If there are 1-2 subtle, negative interactions, code a 4.

5. Positive. There is a high proportion of positive interactions. Both child and parent appear

to enjoy each other's company and appear engaged/attached. Overall, eye contact may be high, and they may sit close together. There is a sense of a strong bond. There are no instances of negative interactions.