# The Role of Maternal Trait and Real-World Emotion Dysregulation and Experiential Avoidance in Maternal and Child Anxiety Symptoms

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## DEDICATION

This dissertation is dedicated to my partner and best friend, Zack Glovak. You are the best thing I never expected to gain in graduate school, and I feel so fortunate to have shared this experience with you. Thank you for being my biggest fan, for challenging me to do my best, and for making everything in life more fun. I could not imagine this experience without you, I cannot wait for all of the new life experiences we will take on together.

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## ABSTRACT

Anxiety is among the most commonly diagnosed mental health conditions worldwide. Understanding factors associated with its development and maintenance throughout the lifespan remains a priority. Three potential factors are examined in the current study: emotion dysregulation, experiential avoidance, and the intergenerational transmission of anxiety via parental modeling of emotional responding. While there is support for each of these constructs as predictors of anxiety, particularly at a trait-based level, relationships among these constructs in the context of parenting remain poorly understood, especially during in-vivo stressful parent-child interactions. The present study utilized both trait-based self-report and real-world ecological momentary assessment measures of maternal anxiety, emotion dysregulation, and experiential avoidance in order to elucidate critical correlates of intergenerational anxiety transmission. The three primary aims were to: 1) examine associations among maternal trait anxiety, emotion dysregulation, and experiential avoidance 2) assess relationships among these maternal variables in real-world, stressful parent-child interactions, and 3) investigate the potential moderating role of maternal real-world emotion dysregulation and experiential avoidance in the parenting context in the relationship between maternal and child trait anxiety. Results indicated that there were positive associations between maternal trait anxiety, trait emotion dysregulation, and trait experiential avoidance. During stressful parent-child interactions, higher real-world emotion dysregulation and experiential avoidance both predicted higher real-world anxiety. Finally, while maternal trait anxiety positively predicted child trait anxiety, neither real-world emotion dysregulation nor experiential avoidance moderated this relationship. By providing a better understanding of the function of maternal emotion dysregulation and experiential avoidance in parenting contexts, results have important implications for the prevention and treatment of anxiety within families.

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# CHAPTER ONE

## INTRODUCTION

Anxiety disorders are among the most commonly diagnosed mental health disorders, with a lifetime prevalence rate of 29% in adults (Kessler et al., 2005) and approximately one in 14 people worldwide having an anxiety disorder at any given point in time (Baxter, Scott, Vos, & Whiteford, 2013). According to a study using data from the United States Census Bureau, 8.2% of adults endorsed symptoms of an anxiety disorder, and the prevalence of anxiety symptoms increased to approximately 30% of the sample in April-May 2020, after the onset of the COVID-19 pandemic (Twenge & Joiner, 2020). Anxiety typically onsets during childhood and follows a chronic course across the lifespan (Costello, Egger, & Angold, 2004). Anxiety disorders are associated with impairment in social and academic contexts, and they increase the risk of comorbid mental health difficulties such as depression, suicidality, and substance abuse (Antony, Federici, & Stein, 2009; Kessler, 2003).

While research to date has primarily focused on identifying factors contributing to impairing anxiety disorders, there is evidence that high trait anxiety symptoms are also independently associated with negative outcomes such as dysregulated attentional control (Bishop, 2009), functional impairment (McKnight, Monfort, Kashdan, Blalock, & Calton, 2016), and quality of life (Kang et al., 2015). Thus, a better understanding of the predictors that contribute to the development and maintenance of anxiety symptoms across the lifespan is critical for developing and refining effective interventions for these deleterious conditions. Furthermore, due to the large amount of symptom overlap across anxiety and other disorders, dimensional and transdiagnostic approaches to diagnosis and treatment, as opposed to syndromal or categorical approaches to psychopathology, have become more commonly practiced in the

field (Hayes, Hofmann, & Ciarrochi, 2020; Hofmann & Hayes, 2019; Kennedy, Bilek, & Ehrenreich-May, 2019; Waugh et al., 2017; Wilamowska et al., 2010). Gaining a better understanding of transdiagnostic treatment targets may help to optimize outcomes for individuals with high trait anxiety, regardless of a formal diagnosis.

## Emotion Dysregulation Models of Anxiety

Emotion dysregulation is one factor thought to contribute to the development and maintenance of anxiety. Emotion dysregulation is a multidimensional construct that is comprised of a lack of awareness and clarity about one's own emotions, nonacceptance of emotional experience, difficulty accessing effective emotion regulation strategies, and impulsive behavioral responses to emotional experiences (Gratz & Roemer, 2004). For individuals with high levels of anxiety, this is thought to include difficulty identifying primary emotions (e.g., anger, sadness; Mennin, Heimberg, Turk, & Fresco, 2005) and engaging in maladaptive emotion regulation strategies, such as emotional suppression, that actually increase physiological arousal in the moment (Hofmann, Heering, Sawyer, & Asnaani, 2009). There is evidence for emotion dysregulation as both a correlate of clinical anxiety and a significant factor in its development (Beauchaine, 2015; Bender, Reinholdt-Dunne, Esbjørn, & Pons, 2012; Kring & Bachorowski, 1999; McLaughlin, Hatzenbuehler, Mennin, & Nolen-Hoeksema, 2011; Mennin et al., 2005; Orgeta, 2011; Suveg, Morelen, Brewer, & Thomassin, 2010). It has additionally been posited as a mechanism by which anxiety is associated with other areas of mental health difficulty, such as depression (Malhi et al., 2021) and substance abuse (Collado, Felton, Taylor, Doran, & Yi, 2020; Rogers et al., 2021).

Multiple emotion dysregulation models of anxiety have been developed which postulate that emotion dysregulation is a key contributor to anxiety (Hofmann, Sawyer, Fang, & Asnaani,

2012; Mennin et al., 2005; Suveg et al., 2010). Empirical research has supported these models across the lifespan. Both cross-sectional and longitudinal findings indicate that emotion dysregulation predicts anxiety in childhood and adolescence beginning around the age of nine years old, and that this association is especially significant for girls compared to boys (Bender et al., 2012; McLaughlin et al., 2011). Further, a review by Beauchaine (2015) states that while children's and adolescents' trait anxiety alone does not determine whether they develop anxiety disorders and other forms of psychopathology, when trait anxiety is coupled with emotion dysregulation, children are at a much higher risk of developing such psychopathology, including anxiety disorders. This paper also discusses the ways in which family factors during childhood and adolescence, such as parental emotion socialization, as well as biological factors, such as an inhibited temperamental style, may precede the development of emotion dysregulation, which eventually goes on to increase risk for clinical levels of anxiety (Beauchaine, 2015).

Similar findings have been demonstrated in early adulthood among undergraduate students. First, in a series of studies utilizing undergraduate college student samples with generalized anxiety disorder (GAD), Mennin and colleagues (2005) found that individuals with GAD, compared to those without clinical levels of anxiety, reported greater reactivity to negative emotion, catastrophizing in response to emotions, and difficulty self-soothing, as well as difficulty identifying, describing, and clarifying their emotions (Mennin et al., 2005). Further, Suveg and colleagues (2010) investigated the mediating role of emotion dysregulation in the relationship between childhood biosocial factors and adult anxiety. In an undergraduate sample, they found support for their model, finding that emotion dysregulation partially to fully mediated the relationship between child temperament and later anxiety, and family emotional problems and later anxiety (Suveg et al., 2010). These findings suggest that emotion dysregulation in

response to biosocial factors during childhood contributes to anxiety long-term, with effects extending through early adulthood.

Finally, the relationship between emotion dysregulation and anxiety symptoms has also been found among older adults. In a cross-sectional study, Orgeta (2011) found that emotion dysregulation was positively associated with anxiety symptoms in a sample of older adults between the ages of 60 and 94 years old living in an assisted living facility. Further, they found that anxiety symptoms were positively correlated with four specific facets of emotion dysregulation: nonacceptance of emotions, difficulty engaging in goal-oriented behavior, increased impulsivity in emotional responding, and difficulty accessing adaptive emotion regulation strategies. While this study was primarily correlational, it provides preliminary support for a continued link between emotion dysregulation and anxiety that spans into the later stages of life.

These empirical findings have provided support for an emotion dysregulation model of anxiety, for which an informed theoretical framework has been proposed by Hofmann and colleagues (2012). This transdiagnostic emotion dysregulation model of anxiety and mood disorders posits that a biological diathesis, environmental triggers, and an individual's affective style all contribute to 1) emotion dysregulation in response to negative mood and 2) deficits in positive mood. In turn, these emotional deficits contribute to the development of anxiety and mood disorders (Hofmann et al., 2012).

Taken together, these models highlight an important link between emotion dysregulation and anxiety across the lifespan, as well as the influences of biosocial factors in childhood that precede the development of emotion dysregulation. However, many of these studies utilize retrospective, self-report designs to examine relationships between trait emotion dysregulation

and anxiety. While these studies have been essential in establishing our understanding that these two constructs are linked, the ways in which these constructs relate to one another in the context of specific, emotionally salient events remain to be understood. Additional studies are needed to contextualize the relationship between these variables in order to increase our understanding of the ways in which emotion dysregulation relates to clinical anxiety symptoms.

## Experiential Avoidance and Anxiety

Another factor thought to contribute to the development of anxiety is experiential avoidance. Experiential avoidance is characterized by active attempts to avoid experiencing unpleasant internal experiences, such as thoughts, emotions, and bodily sensations (Bond et al., 2011). This construct has been included as a target of mindfulness-based therapeutic interventions over the past several decades (Hayes, Strosahl, & Wilson, 2011), as it has been posited that emotional and behavioral dysregulation are a result of one's lack of willingness to interact with their painful internal experiences (Bond et al., 2011). Avoidance of painful experiences, such as anxiety, may function to alleviate discomfort in the moment, negatively reinforcing emotional avoidance. However, such avoidance may increase the intensity and frequency of those experiences in the long-term (Hayes, Luoma, Bond, Masuda, & Lillis, 2006). For example, continued experiential avoidance may lead individuals to develop a lack of awareness of their own emotional experiences or ineffective emotion regulation strategies, which ultimately increases the intensity of negative emotions, such as anxiety (Hayes et al., 2004).

Experiential avoidance has gained empirical support over the past decade as a transdiagnostic process underlying the development of anxiety, as well as other forms of psychopathology (Berman, Wheaton, McGrath, & Abramowitz, 2010; Im & Kahler, 2020). While experiential avoidance has been characterized as a maladaptive emotion regulation

strategy and correlated with emotion dysregulation, it has further been shown to moderate treatment outcomes and mediate the relationship between experiencing an emotional life event and resulting emotion regulation strategies (for a review, see Boulanger, Hayes, & Pistorello, 2010).

There is support for a link between experiential avoidance and anxiety in both adolescence and adulthood. For example, a recent cross-sectional study in Chinese adolescents found that experiential avoidance mediated the relationship between rumination and social anxiety (Cheng et al., 2021). Another study found that experiential avoidance mediated the relationship between stressful life events and anxiety in both clinical and nonclinical adult samples (Cookson, Luzon, Newland, & Kingston, 2020). Additionally, a review found moderate to strong associations across multiple studies between experiential avoidance and obsessive-compulsive disorder, hoarding disorder, body dysmorphic disorder, and trichotillomania, supporting the importance of targeting experiential avoidance in addition to utilizing exposure techniques in treating these disorders and their anxiety-related symptoms (Angelakis & Pseftogianni, 2021). Experiential avoidance has also been associated with worry, a common symptom of several anxiety disorders (Akbari & Khanipour, 2018; Newman & Llera, 2011). Finally, experiential avoidance has not only been supported as a correlate of anxiety disorders and related symptoms, but has also been shown to contribute to the maintenance of anxiety across time (Spinhoven, van Hemert, & Penninx, 2017). Thus, in adults, experiential avoidance is an important factor in both the development and maintenance of anxiety pathology.

Beyond the relationship between trait experiential avoidance and anxiety, recent work has also found links between these constructs in the context of both real-world and laboratory tasks. First, two studies were conducted by Kashdan and colleagues (2014) utilizing adults with and

without social anxiety disorder. The first study used ecological momentary assessment, and participants were asked to rate their state experiential avoidance and anxiety during each social interaction lasting over 10 minutes over the course of two weeks. During the second study, participants engaged in a 30-minute laboratory task in which strangers were paired together to answer personal questions about one another. Participants completed questionnaires regarding experiential avoidance and social anxiety every 10 minutes throughout the interaction. They found that in both studies, experiential avoidance predicted social anxiety. The same laboratory task was recently used in another sample of young adults (Asher, Hofmann, & Aderka, 2021). This study found that among individuals with social anxiety disorder, there was a reciprocal, positive relationship between social anxiety and experiential avoidance, whereas social anxiety only predicted experiential avoidance in individuals without social anxiety disorder. These studies consistently find that although experiential avoidance functions as an emotion regulation strategy to reduce anxiety, it may increase social anxiety instead. These findings are consistent with theory positing that experiential avoidance increases social anxiety during social interactions due to its emotional taxing nature and tendency to diminish responsiveness to social reward (Kashdan et al., 2014). However, as previously mentioned, broader theory suggests that experiential avoidance is a reinforcing strategy that functions to alleviate discomfort (e.g., anxiety) during a stressful event, but leads to increased anxiety long-term due to increased negative expectations about potentially distressing stimuli (Hayes et al., 2006). Thus, additional studies are needed to further examine this relationship in the context of particularly stressful events, especially as it relates to other types of anxiety beyond social anxiety.

Research in the past decade has established that there is a relationship between experiential avoidance and various anxiety-related disorders and symptoms at both the trait- and

state-based levels. However, it remains unclear how experiential avoidance relates to anxiety symptoms in general, given that most studies to date have focused on experiential avoidance as it relates to anxiety symptoms in samples diagnosed with specific anxiety disorders. A clear understanding about how this transdiagnostic construct of experiential avoidance relates to anxiety symptoms in general, both at the trait level and within specific contexts, would help to inform effective interventions for a wider range of individuals who experience anxiety but may not meet criteria for a mental health disorder.

## The Intergenerational Transmission of Anxiety

Finally, there is evidence to suggest that anxiety is passed down within families from parents to children (Cooper, Fearn, Willetts, Seabrook, & Parkinson, 2006; Eley et al., 2015), with children being seven times more likely to develop an anxiety disorder if their parents also have an anxiety disorder compared to children of parents without an anxiety disorder (Turner, Beidel, & Costello, 1987). This phenomenon is most commonly studied in mother-child dyads compared to father-child dyads, and some studies have found stronger relationships between maternal and child anxiety compared to paternal and child anxiety (Apsley & Padilla-Walker, 2020; Cooper et al., 2006; Schulz, Nelemans, Oldehinkel, Meeus, & Branje, 2020). Thus, anxiety is an important mental health concern to study within mother-child dyads. Although genetics play a role in this cross-generational relationship, there is evidence that environmental factors during childhood, such as maternal expression of anxious emotion and anxious parenting behaviors, predict the transmission of anxiety to children over and above genetic influences (Eley et al., 2015; Gregory & Eley, 2011). This makes elucidating environmental contributors of anxiety during childhood an essential priority.

Numerous studies have examined parental modeling and parenting behaviors as environmental factors contributing to child anxiety. For example, a review paper summarized empirical findings that anxious parents tend to interpret neutral stimuli as inherently threatening, and may engage in overprotection, accommodation, and encouragement of avoidance behaviors in response to anxiety provoking-stimuli. These behaviors may teach children they cannot approach anxiety-provoking stimuli on their own, leading to child anxiety (Ginsburg, Siqueland, Masia-Warner, & Hedtke, 2004). Further, a review of studies utilizing laboratory-based parent-child interaction tasks found that parental psychological control (e.g., manipulation or invalidation of children's emotions) and behavioral control (e.g., restricting behaviors children are allowed to engage in) were consistently associated with child shyness and anxiety symptoms (Wood, McLeod, Sigman, Hwang, & Chu, 2003). However, these reviews also highlight that the overwhelming majority of studies examining the relationship between parenting behaviors and both parental and child anxiety utilize only trait measures of anxiety (Ginsburg et al., 2004; Wood et al., 2003). Thus, the ways in which parental anxiety in the context of real-world situations contribute to maladaptive parenting behaviors, and ultimately child anxiety, remain poorly understood.

Given the clear influence of parental emotional responding and parenting behaviors in the transmission of trait anxiety to children, highlighting how these factors function during parent-child interactions in the real world is particularly important for understanding how they relate to child trait anxiety. During such interactions, parents may model anxious behaviors for children in response to their own anxiety, such as avoiding anxious stimuli (Lebowitz, Shic, Campbell, MacLeod, & Silverman, 2015), expressing worry, or exhibiting other anxious rearing behaviors (Zhou & Li, 2021). Parents may also transmit anxiety through behavioral responses to

their children's negative emotions, including through parenting behaviors such as psychological control (e.g., manipulation or invalidation of children's emotions), accommodation (e.g., alleviating a child's distress by attempting to remove the distressing stimulus), or lack of support in response to children's emotions (Hurrell, Hudson, & Schniering, 2015). Consequently, through classical conditioning, children's expressed negative emotions are consistently paired with parental invalidation, increasing the chances that children will develop high anxiety around experiencing and expressing negative emotions (Mineka & Oehlberg, 2008; Treanor, Rosenberg, & Craske, 2021).

The intergenerational transmission of anxiety from mothers to their children is an especially timely phenomenon to understand currently, as a recent longitudinal cohort study (Racine et al., 2021) conducted over the course of eight years showed that anxiety among participating mothers increased since the onset of the COVID-19 pandemic compared to earlier timepoints. It is more critical than ever before to better understand factors contributing to the intergenerational transmission of anxiety from mothers to children, in order to provide effective prevention and intervention efforts for mothers and their children.

## Parental Modeling of Emotion Dysregulation and Experiential Avoidance

Although there is clear evidence for the intergenerational transmission of anxiety, not all children whose parents have high anxiety and exhibit anxious parenting behaviors develop high anxiety themselves. Thus, among parents with high levels of anxiety, it is imperative to elucidate additional risk factors that may help to explain the variance in the relationship between parental and child anxiety – especially those which commonly occur in the context of parent-child interactions. Two potential parental factors that may be particularly important for the intergenerational transmission of anxiety are maternal emotion dysregulation and experiential

avoidance. These factors are relevant for two reasons: first, these constructs are common among individuals with high levels of anxiety, as previously discussed (e.g., Berman et al., 2010; Mennin et al., 2005). Second, they have been linked to the maternal emotion socialization and parenting practices described above that are associated with child anxiety (Cheron, Ehrenreich, & Pincus, 2009; Han et al., 2016; Kerns, Pincus, McLaughlin, & Comer, 2017). First, maternal emotion dysregulation in response to children's anxiety or other negative emotions may help to explain the relationship between maternal and child anxiety. According to Hofmann (2014), emotion regulation is not only an intrapersonal construct, but also an interpersonal construct, meaning that it can be elicited in response to others' emotions, others can play a role in the emotion regulatory process, and emotion regulation and dysregulation are learned social processes through modeling. These interpersonal aspects of emotion regulation also influence individuals' development of anxiety over time.

This interpersonal model of emotion dysregulation is particularly important within the parent-child relationship. Children's expression of emotions, such as anxiety, may elicit high levels of maternal emotion dysregulation, which in turn, increases the likelihood of maternal engagement in parenting behaviors that reinforce child anxiety (e.g., overprotection or accommodation of the child when distressed in order to prevent or alleviate the child's experience of distress; L. Murray, Creswell, & Cooper, 2009). For example, a study by Price and colleagues (2021) found that high levels of maternal emotion dysregulation predicted non-supportive emotion socialization practices (e.g., minimization or punishment of, or distress in response to, children's negative emotions), which contributed to higher child anxiety. Further, Kerns and colleagues (2017) found that during a laboratory task in which mothers were asked to listen to auditory clips of young children in distress, higher maternal trait anxiety predicted

maternal difficulties with emotion regulation (self-reported immediately following the task), which is turn predicted parental accommodation, which finally predicted higher child trait anxiety. Taken together, these studies support maternal emotion dysregulation as an important factor in the development of child anxiety.

Experiential avoidance of parent's own emotional experiences and their children's emotional expression has also been linked to the development of anxiety in children. Anxious mothers, in particular, may experience greater emotional reactivity and fewer adaptive coping strategies to manage negative emotions. Thus, they may engage in experiential avoidance to manage the emotional trigger of children's negative emotion, perpetuating a cycle of increased negative emotion between mother and child. For example, a review by Aktar and colleagues (2017) found that parental generalized anxiety was related to child generalized anxiety through experiential avoidance and intolerance of uncertainty in response to parental worry. Furthermore, experiential avoidance of parents' own emotions in response to child negative emotion has been associated with parental behaviors (e.g., psychological and behavioral control) that may exacerbate child anxiety (Cheron et al., 2009). Additional studies have supported relationships between experiential avoidance and other anxious parenting behaviors such as accommodation (Feinberg, Kerns, Pincus, & Comer, 2018) and overprotectiveness (Tiwari et al., 2008). Thus, it appears that parental engagement in experiential avoidance may contribute to behavioral responses (e.g., anxious parenting behaviors) that alleviate their own and their child's anxiety in the short-term, but that contribute to the development of child anxiety in the long-term.

In sum, there is support for parental emotion dysregulation and experiential avoidance as indicators of risk for the intergenerational transmission of anxiety from mothers to children, and these factors may help to explain some of the variance in whether the child of a highly anxious

parent will go on to develop high anxiety themselves. Investigating levels at which these constructs of maladaptive emotional responding influence the relationship between maternal and child anxiety would help to identify the children of anxious mothers who are especially at risk for the development of anxiety. Such knowledge could lead to more targeted interventions for those most at need; supporting the development of adaptive emotion regulation strategies and parenting behaviors in this population may help to both reduce maternal distress and mitigate the risk of child anxiety.

## Middle Childhood as a Period of Risk for Developing Psychopathology

Middle childhood may be a particularly critical period in which to study the intergenerational transmission of anxiety via modeling of emotion dysregulation and experiential avoidance, as well as controlling, overprotective, and accommodating parenting behaviors that are often linked to these types of parental emotional responses. This stage of development is one in which children's emotion regulation processes are heavily influenced by both their relationship with their parents (Brumariu, Kerns, & Seibert, 2012) and their parents' own emotional and behavioral responding (Morris, Silk, Steinberg, Myers, & Robinson, 2007). Children's emotion regulation abilities during this period are also associated with their risk for anxiety (Brumariu et al., 2012; Hannesdóttir, Doxie, Bell, Ollendick, & Wolfe, 2010). Children with both high anxiety and difficulty with emotion regulation as they begin the approach to adolescence are at increased risk of developing various forms of psychopathology (e.g., depression, substance abuse; Woodward & Fergusson, 2001) and maladjustment (e.g., decreased socioemotional adaptation; Riediger & Klipker, 2014). Furthermore, whereas anxiety in younger children tends to be unstable and less predictive of anxiety throughout the lifespan, children who experience high anxiety during middle childhood tend to exhibit stable anxiety symptoms

throughout adolescence and adulthood (Steinsbekk, Ranum, & Wichstrøm, 2021). Thus, elucidating factors that contribute to anxiety during this developmental period is essential for informing effective prevention and intervention efforts that foster healthy development.

## The Present Study

While there is considerable support for both emotion dysregulation and experiential avoidance as indicators of the onset and maintenance of various anxiety disorders, as well as how anxiety is transmitted from highly anxious parents to their children, the present study aimed to address several gaps in the literature and provide a more comprehensive understanding of these relationships. These gaps include a lack of understanding regarding: 1) ways in which trait emotion dysregulation and experiential avoidance relate to trait anxiety in a sample of mothers with elevated symptoms of anxiety but not diagnosed with a specific anxiety disorder, 2) the effect of emotion dysregulation and experiential avoidance on maternal anxiety within the context of real-world, stressful parent-child interactions, and 3) ways in which maternal emotion dysregulation and experiential avoidance interact with maternal anxiety to predict child anxiety, potentially explaining some of the variance in the relationship between mother and child trait anxiety. Given the relevance of these constructs to the development and maintenance of one's own anxiety, as well as modeling and engagement in parenting behaviors that contribute to child anxiety, filling these gaps is critical to improving intervention efforts.

In a sample of mothers with a range of clinically significant anxiety symptoms and a child between the ages of seven to nine years old, the present study assessed both cross-sectional and longitudinal associations among maternal anxiety, emotion dysregulation, and experiential avoidance, as well as child anxiety. In order to address the aforementioned gaps in the literature, this study: 1) examined associations among maternal trait emotion dysregulation, experiential

avoidance, and general anxiety symptoms, regardless of whether mothers had been diagnosed with a specific anxiety disorder, 2) examined relationships among these variables in the context of real-world, stressful parent-child interactions using ecological momentary assessment (EMA) surveys that were administered three to four times per day over approximately two weeks, and 3) assessed whether these real-world measures of maternal emotion dysregulation and experiential avoidance moderated the relationship between maternal and child trait anxiety. By utilizing both trait and real-world measures, this study design allowed us to examine relationships among these variables at multiple levels (i.e., in the context of parenting specifically versus in mothers' lives more generally). It also helped to distinguish between long-term, fixed relationships between these variables for mothers at the trait level and more short-term relationships between these variables specifically in the parenting context. Furthermore, by examining how real-world maternal emotion dysregulation and experiential avoidance interact with trait anxiety to predict child trait anxiety, this study aimed to highlight ways in which these processes might be modeled to children during stressful interactions with their parents, potentially explaining some of the variance between maternal and child trait anxiety. Understanding relationships between these constructs in the context of general high anxiety symptoms, rather than in the context of specific anxiety disorders, is important given that high trait anxiety has previously been related to negative functional outcomes.

The present study had three aims, which are outlined below.

**Aim 1:** To examine associations among maternal trait emotion dysregulation, experiential avoidance, and anxiety. It was hypothesized that:

**Hypothesis 1a:** Maternal trait emotion dysregulation would be positively associated with maternal trait anxiety.

**Hypothesis 1b:** Maternal trait experiential avoidance would be positively associated with maternal trait anxiety.

**Aim 2:** To assess relationships among real-world maternal emotion dysregulation, experiential avoidance, and anxiety in stressful parent-child interactions. It was hypothesized that:

**Hypothesis 2a:** Real-world maternal emotion dysregulation would be positively associated with anxiety during stressful parent-child interactions.

**Hypothesis 2b:** Real-world maternal state experiential avoidance would be negatively associated with anxiety during stressful parent-child interactions.

**Aim 3:** To examine the potential moderating roles of real-world maternal emotion dysregulation and experiential avoidance in the relationship between maternal and child trait anxiety. It was hypothesized that:

**Hypothesis 3a:** The relationship between maternal trait anxiety and child trait anxiety would be moderated by real-world maternal emotion dysregulation (i.e., the relationship between maternal trait anxiety and child anxiety would be strongest at high levels of real-world maternal emotion dysregulation; see Figure 1).

**Hypothesis 3b:** The relationship between maternal trait anxiety and child trait anxiety would be moderated by real-world maternal experiential avoidance (i.e., the relationship between maternal trait anxiety and child anxiety would be strongest at high levels of real-world maternal experiential avoidance; see Figure 2).

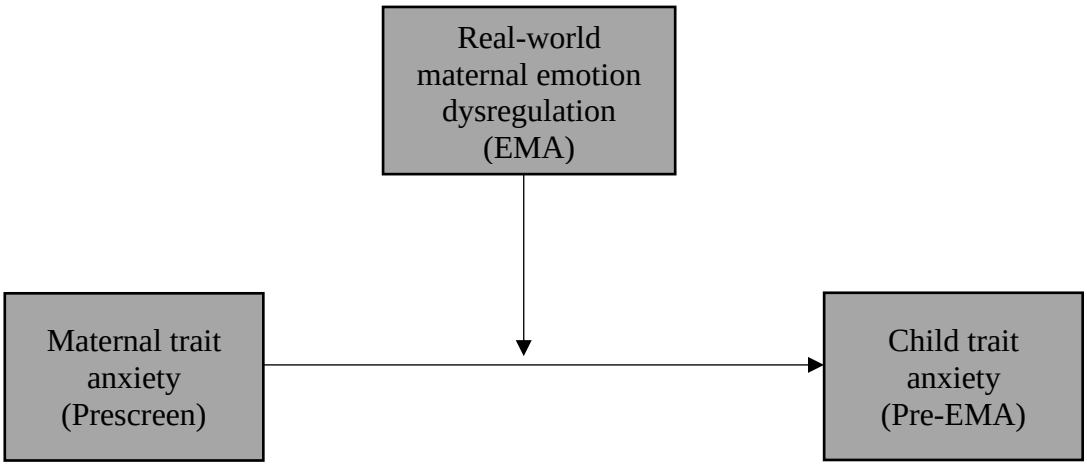


**Figure 1.** Hypothesis 3a: Model examining real-world maternal emotion dysregulation as a moderator of the relationship between maternal and child trait anxiety.

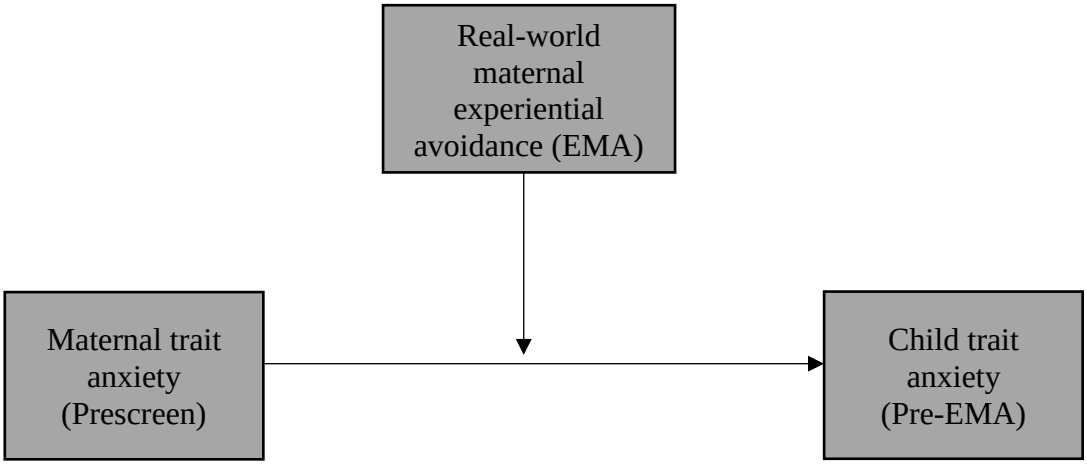


**Figure 2.** Hypothesis 3b: Model examining real-world maternal experiential avoidance as a moderator of the relationship between maternal and child trait anxiety.

# CHAPTER TWO

# METHODS

## Participants

A community sample of mothers ($n$ = 43) who had a child between the ages of seven and nine years old ($M$ = 7.74, $SD$ = .79; 60.5% female) were recruited for the present study. This age range was chosen as it is a developmental period during which parents have a primary influence on children's internalizing symptoms and development of emotion regulation processes (Emerson, Ogielda, & Rowse, 2019; Han & Shaffer, 2013). Demographic characteristics of mothers in the present sample are outlined in Table 1.

Participants included mothers who reported a range of high anxiety symptoms (see below for more details). Mothers were recruited in four ways: 1) a database of potential research participants from the local community and surrounding areas, maintained by the developmental psychology faculty, 2) ResearchMatch, a national database of potential research participants who agreed to be contacted about a recruitment email they received regarding our study, 3) recruitment posts on social media platforms, including Facebook, Twitter, and Instagram, and 4) flyers posted in the community at businesses frequented by parents (e.g., libraries, coffee shops, after-school programs).

Mothers interested in participating in the study first completed an online prescreen survey via Qualtrics that assessed current anxiety symptoms and exclusionary criteria for mothers and children. Mothers were excluded from the present study if they did not meet the cutoff score for high anxiety symptoms on our anxiety screening measure (see additional details below). Additional exclusionary criteria for mothers included endorsing an active substance use disorder,

**Table 1.** Demographic and baseline characteristics of mothers in the present sample.

| | *M (SD)* | Range |
|---|---|---|
| Child Age | 7.74 (.79) | 7 - 9 |
| Child Pre-EMA SCARED Total (Mother-reported) | 19.39 (10.71) | 4 - 47 |
| Maternal Age | 37.19 (5.66) | 25 - 46 |
| Maternal Pre-EMA SCAARED Total | 40.02 (15.91) | 23 - 78 |
| Maternal Pre-EMA DERS-SF Total | 39.93 (11.20) | 21 - 61 |
| Maternal Pre-EMA AAQ-II Total | 23.44 (10.19) | 7 - 43 |
| Maternal Averaged EMA Modified PANAS Total* | 1.70 (.38) | 1 - 3 |
| Maternal Averaged EMA S-DERS Total* | 32.84 (2.98) | 33 - 46 |
| Maternal Averaged EMA SMEA Total* | 9.76 (3.16) | 6 - 21 |
| % of Pre-EMA Data Completed | 100 | -- |
| % of EMA Surveys Completed – Overall Study | 57.96 (30.08) | 6 – 98% |
| % of Surveys Completed about Parent-Child Interactions | 32.32 (21.28) | 3 – 81% |
| % of Surveys Completed about General Events – Pilot Only | 24.80 (18.86) | 0 – 77% |
| | % (*n*) | |
| Child Gender | | |
| Female | 60.5 (26) | |
| Male | 39.5 (17) | |
| Race | | |
| Caucasian | 88.4 (38) | |
| African American/Black | 2.3 (1) | |
| Asian American | 4.7 (2) | |
| Other | 4.7 (2) | |
| Hispanic/Latino Origin | | |
| No | 90.7 (39) | |
| Yes | 9.3 (4) | |
| Highest Level of Education | | |
| Completed graduate school | 44.2 (19) | |
| Graduated from college | 27.9 (12) | |
| Attended college or specialized training | 16.3 (7) | |
| Graduated from high school | 11.6 (5) | |
| Employed | | |
| Yes | 65.1 (28) | |
| No | 34.9 (15) | |
| Estimated Gross Family Income | | |
| $100,000 or above | 37.2 (16) | |
| $80,000-89,999 | 14 (6) | |
| $60,000-69,999 | 9.3 (4) | |
| $50,000-59,999 | 9.3 (4) | |
| $40,000-49,999 | 9.3 (4) | |
| $90,000-99,999 | 7 (3) | |
| $70,000-79,999 | 4.7 (2) | |
| $30,000-39,999 | 2.3 (1) | |

**Table 1 Continued**

| | % (*n*) |
|---|---|
| Estimated Gross Family Income (continued) | |
| $20,000-29,999 | 2.3 (1) |
| $10,000-19,999 | 2.3 (1) |
| $0-9,999 | 2.3 (1) |
| Distribution of SCAARED Total Scores† | |
| 23 (Clinical cutoff)-44 | 65.1 (28) |
| 45-66 | 25.6 (11) |
| 67-88 | 9.3 (4) |

*Averaged across 53 EMA survey timepoints (after multiple imputation of missing data); †The three categories of clinical anxiety scores on the SCAARED represent the three categories in which we attempted to recruit roughly equal numbers of participants – however, the numbers provided indicate that the majority of the participants in our sample fell within the lower range of clinical anxiety symptoms (23-44)

acute suicidality or risk of harm to self or others, or a lifetime history of autism or developmental delay, bipolar disorder, or psychosis. Mothers were also excluded from the study if they endorsed that their child had an active substance use disorder, acute suicidality or risk of harm to self or others, or a lifetime history of autism or developmental delay, bipolar disorder, oppositional defiant disorder, or conduct disorder.

## Procedures

This fully online study was conducted as part of a larger pilot study assessing parenting and anxiety, which was fully approved by the University of Tennessee Institutional Review Board. Mothers interested in participating in the study first completed a prescreen survey to ensure their eligibility. Upon being invited to participate in the study, mothers electronically signed a consent form, which a trained research assistant then reviewed with each mother via telephone to ensure her understanding of the study details and provide an opportunity to ask questions. After consenting to participate, mothers completed a series of questionnaires online via Qualtrics which assessed demographic information and maternal and child trait psychological functioning.

Next, mothers were asked to report on their real-world emotion dysregulation, experiential avoidance, and anxiety in specific parenting interactions. To accomplish this, we utilized ecological momentary assessment (EMA; Stone & Shiffman, 1994). This method allowed for more accurate and ecologically valid measurement of emotional experiences than retrospective questionnaires could have provided, given the minimization of recall bias. Additionally, administering repeated measures across time allowed for greater accuracy in assessing these processes in daily life, as well as examining between- and within-person differences in these constructs (Stone & Shiffman, 1994). In this study, EMA also allowed the

participant to respond to questionnaires at their convenience (within one hour of receiving a notification on their smartphone), and researchers were able to easily monitor data and communicate with participants as needed throughout the study. Using a mobile application called ExpiWell, brief surveys were sent to mothers to assess constructs of interest in the present study within participants' natural parenting environment. Mothers downloaded the free ExpiWell application on their smartphones and subsequently received three to four surveys each day (three during weekdays, four on weekend days). Each prompt assessed their real-world emotion dysregulation, experiential avoidance, and anxiety during the most stressful interaction with their child since the last survey they completed. Notifications were sent over the course of 16 days, for a total of 53-54 possible data points (depending on the day of the week on which they enrolled in the study). This number of surveys was deemed feasible based on feedback gathered in a focus group with four mothers who were given information about this study and asked for their feedback. Additional information regarding the EMA protocol is outlined in the Appendix.

Importantly, a trained research assistant worked with each mother to ensure that their EMA start date and notification times worked with their schedule. Each mother received a phone call from a research assistant prior to beginning the EMA portion of the study to ensure that the application was working on their phone. During this call, the researcher and participant collaboratively completed a practice survey, and the research assistant answered any questions the participant had. Research assistants were available throughout each participant's scheduled EMA period to answer questions via email or telephone. Additionally, in order to monitor any participant distress that arose as a result of completing the surveys, a one-question assessment of distress was delivered to participants at the end of one survey every four days (i.e., "How distressed are you as a result of completing this survey today?"). Participants were prompted to

rate their distress on a scale of 1-10, and any participant who rated a "7" or higher was automatically provided with mental health resources and contacted by a graduate student to further assess and provide support and resources.

Mothers were compensated in the form of electronic Amazon gift cards for their participation in the pre-EMA survey and EMA portions of the study. In an effort to prevent missing EMA data collected in this study to the extent possible, the amount of total participant compensation varied based on the percentage of EMA surveys completed over the course of the study. Participants were compensated $1 per survey in Amazon gift cards (rounded up to the nearest $5 increment) for each EMA survey they completed, for a total of up to $55 for this part of the study, with the exception that they earned the full $55 if they completed at least 80% of their EMA surveys – equivalent to completing approximately 43 of 53-54 total EMA surveys. This amount of compensation ($1 per survey) is a common amount that other EMA researchers in the field of psychology reimburse their participants for completing EMA surveys of similar length. Mothers were compensated an additional $10 in Amazon gift cards for completing the pre-EMA survey, as well as another $5 Amazon gift card for completing a final post-survey for the larger pilot study, which assessed feasibility and acceptability of the EMA protocol. The total amount of compensation possible was $70 for participating in all parts of the pilot study.

## Measures

Measures were administered at three study phases, which are outlined below in Figure 3.

### *Prescreen Survey*

**Maternal anxiety symptoms.** The Screen for Adult Anxiety-Related Disorders (SCAARED; Angulo et al., 2017) was used as a screening measure of maternal anxiety symptoms. The SCAARED is a 44-item self-report questionnaire assessing symptoms of anxiety

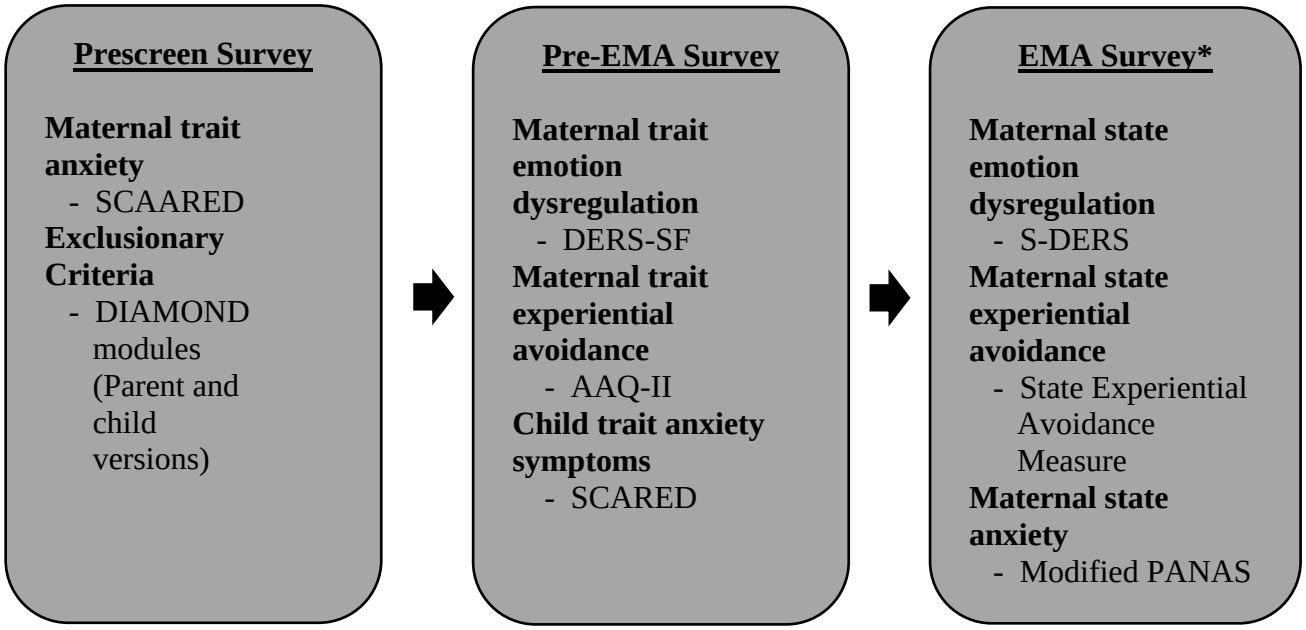


**Figure 3.** Timing of administration of measures.

**Repeated measures during EMA portion of the study (3-4 times per day for 16 days)*

disorders within the past three months. Items are rated on a three-point scale, where 0 indicates "not true or hardly ever true," 1 indicates "somewhat true or sometimes true," and 2 indicates "very true or often true." The scale yields a total anxiety symptom score ranging from 0 to 88, with a cutoff score of 23 or greater indicating the presence of an anxiety disorder. It also yields four subscale scores for panic disorder/somatic symptoms, generalized anxiety disorder, separation anxiety disorder, and social phobia, but the present study utilized the total score only to determine mothers' study. If mothers produced a score of 23 or higher (the published clinical cutoff; Angulo et al., 2017) on the SCAARED, they were invited to participate in the study (as long as they did not meet any of the exclusionary criteria described below). Total SCAARED scores for participants in our study ranged from 23 to 78. Of note, while we aimed to recruit an approximately equal number of mothers across the full range of high anxiety symptoms (23 to 88), mothers with higher levels of anxiety often also endorsed exclusionary criteria, and thus the majority of our sample fell on the lower end of the clinical range. Of note, the SCAARED has demonstrated good psychometric properties, including internal consistency and discriminant validity (Angulo et al., 2017). Internal consistency within the present sample was excellent ($\alpha$ = .94).

**Maternal exclusionary criteria.** The Diagnostic Interview for Anxiety, Mood, OCD, and Related Neuropsychiatric Disorders (DIAMOND; Tolin et al., 2018) is a structured clinical interview that assesses criteria for DSM-5 diagnoses. It has demonstrated good to excellent psychometric properties, including interrater reliability, test-retest reliability, and convergent validity (Tolin et al., 2018). This measure includes a 30-item self-report screening measure designed to determine which modules to administer during the structured clinical interview. Each item represents a hallmark symptom of a DSM-5 disorder, and participants are asked to respond

"yes" or "no" if they have experienced that symptom. The present study utilized the seven items that assessed our exclusionary criteria: within the past month having an active substance use disorder, acute suicidality, or risk of harm to others, or a lifetime history of autism or developmental delay, bipolar disorder, or psychosis. If mothers endorsed any of these items, they were presented with a free response item asking them to provide additional context. If further clarification about whether a mother met exclusionary criteria was necessary based on their free response, they were contacted via telephone and administered the corresponding module of the DIAMOND clinical interview. That information informed the mother's suitability to participate in the study.

**Child exclusionary criteria.** The Diagnostic Interview for Anxiety, Mood, OCD, and Related Neuropsychiatric Disorders, Child Version (DIAMOND-KID; unpublished) is an adaptation of the DIAMOND clinical interview (Tolin et al., 2018) for child DSM-5 diagnoses. Validation studies are currently in progress for the child version of this measure. This clinical interview includes a parent-report screening measure similar to that of the DIAMOND. Parents are asked to respond "yes" or "no" to a series of questions regarding whether their child experiences hallmark symptoms of child DSM-5 disorders. The present study utilized the nine questions that assessed our exclusionary criteria: within the past month having an active substance use disorder, acute suicidality, or risk of harm to others, or a lifetime history of autism or developmental delay, bipolar disorder, oppositional defiant disorder, or conduct disorder. If mothers endorsed any of these items regarding their children, they were presented with a free response item asking them to provide additional context. If further clarification about whether a child met exclusionary criteria was necessary based on their free response, that mother was contacted via telephone and administered the corresponding module of the DIAMOND clinical

interview about their child. That information informed the mother's suitability to participate in the study.

### *Trait-Based Measures*

**Maternal trait anxiety symptoms.** As mentioned above, mothers were invited into the study if they reported a total score between 23 and 88 on the SCAARED, indicating likely clinical levels of anxiety. This anxiety symptom score was also utilized as the maternal measure of trait anxiety for the present study. Additional information about the SCAARED is included above.

**Maternal trait emotion dysregulation.** The Difficulties in Emotion Regulation Scale – Short Form (DERS-SF; Kaufman et al., 2016) is an 18-item, self-report measure of emotion dysregulation. Each item is rated on a five-point scale, ranging from 1 (almost never) to 5 (almost always). It yields a summed total score ranging from 18 to 90, with some reverse-scored items. Higher scores indicate greater emotion dysregulation. It additionally includes six subscale scores assessing specific facets of emotion dysregulation: nonacceptance of emotional responses, difficulty engaging in goal-directed behavior, impulse control difficulties, lack of emotional awareness, lack of access to emotion regulation strategies, and lack of emotional clarity. The present study utilized the total trait emotion dysregulation score. Participants' total scores on the DERS-SF in the present study ranged from 21 to 61. The DERS-SF has demonstrated excellent psychometric properties that are comparable to the original, 36-item measure (Gratz & Roemer, 2004; Kaufman et al., 2016). Internal consistency within the present sample was good ($\alpha$ = .88).

**Maternal trait experiential avoidance.** The Acceptance and Action Questionnaire – II (AAQ-II; Bond et al., 2011) is a seven-item, self-report measure of experiential avoidance. Items are rated on a 7-point scale, where "1" indicates "never true," and "7" indicates "always true."

Each item focuses on the participant's perception of her ability to engage with her own internal experiences (e.g., "I'm afraid of my feelings," "Worries get in the way of my success"). Items are summed to create a total score ranging from 7 to 49, with higher scores indicating greater experiential avoidance. Total scores for participants within the present sample ranged from 7 to 43. This measure has demonstrated good internal and test-retest reliability (Bond et al., 2011). Internal consistency within the present sample was excellent ($\alpha$ = .93).

**Child trait anxiety symptoms.** The Screen for Child Anxiety-Related Disorders – Parent Report (Birmaher et al., 1997) is a 41-item parent-report questionnaire that assesses for children's anxiety disorder symptoms across five diagnostic categories: panic, general anxiety, social phobia, school avoidance, and separation anxiety. Items are rated on a three-point scale ranging from 0 (not true or hardly ever true) to 2 (very true or often true), with a total anxiety score ranging from 0 to 82. The total score was used for the current study, and scores within the present sample ranged from 4 to 47. The SCARED has demonstrated good internal consistency, test-retest reliability, and discriminative validity within and between anxiety disorders (Birmaher et al., 1997). Internal consistency within the present sample was excellent ($\alpha$ = .91).

### *Real-World EMA Measures*

**Maternal real-world emotion dysregulation.** The State Difficulties in Emotion Regulation Scale (S-DERS; Lavender, Tull, DiLillo, Messman-Moore, & Gratz, 2017) is a 21-item measure of state emotion dysregulation, and it served as the measure of real-world emotion dysregulation in the present study. Each item is rated on a five-point scale ranging from 1 (not at all) to 5 (completely). This scale was adapted from the DERS (Gratz & Roemer, 2004), the original trait-based measure of emotion dysregulation from which the DERS-SF, described above in greater detail, was also adapted. This scale yields an overall summed score with some

items reverse-scored, as well as four subscales: a) nonacceptance of current emotions, b) difficulties modulating emotional and behavioral responses in the moment, c) limited awareness of current emotions, and d) limited clarity about current emotions. The present study utilized the total emotion dysregulation score. Preliminary studies have supported the reliability and validity of the S-DERS (Lavender et al., 2017). Internal consistency averaged across time points within each participant was acceptable ($\alpha$ = .77).

**Maternal real-world experiential avoidance.** The State Measure of Experiential Avoidance (SMEA; Kashdan et al., 2014) is a four-item, self-report measure of experiential avoidance in response to experiencing anxiety-related emotions during a recent situation. Items are rated on a 7-point scale, where "1" indicates "not at all," and "7" indicates "very much." Higher scores indicated greater experiential avoidance. Each item focuses on the participant's perception of their ability to engage with their own internal experiences (e.g., "How upset or bothered were you by anxiety-related feelings or thoughts?"). Items were reworded to assess their relevance to any uncomfortable thoughts or emotions, rather than only anxiety-related thoughts or emotions, given that the larger study (of which the present study is a part) assessed a range of negative emotions beyond anxiety (e.g., "How upset or bothered were you by uncomfortable feelings or thoughts?"). This measure has demonstrated good reliability and construct validity in various studies that have used it to measure experiential avoidance in the context of social interactions in both experience sampling and daily diary studies (Kashdan et al., 2013; Kashdan et al., 2014; Machell, Goodman, & Kashdan, 2015). Internal consistency averaged across time points within each participant was excellent ($\alpha$ = .91).

**Maternal real-world anxiety symptoms.** The present study used a modified version of the Positive Negative Affect Schedule (PANAS; Watson, Clark, & Tellegen, 1988) that was

designed for this study to better capture emotions related to anxiety. The PANAS is a 20-item self-report measure that assesses general positive and negative affect at a given timepoint (e.g., in general, in the moment, today, over the past few days). Each item is rated on a 5-point scale ranging from "very slightly or not at all" to "extremely." The original measure yields two summed subscale scores: 1) positive affect (e.g., "interested," "excited"), and 2) negative affect (e.g., "distressed," "nervous"). Each subscale's scores range from 10 to 50, with higher scores indicating higher positive or negative affect. The PANAS has demonstrated good internal consistency, convergent and discriminant validity, and test-retest reliability (Watson et al., 1988). While the negative affect subscale of the PANAS and the Fear subscale of the extended version of the PANAS (Watson & Clark, 1999) have shown convergent validity with commonly used, well-validated measures of anxiety (Rossi & Pourtois, 2012; Schalet, Cook, Choi, & Cella, 2014), most of the items better capture general negative affect (e.g., "angry") and the construct of fear (e.g., "afraid") rather than anxiety specifically (e.g., emotions such as "worried," or "anxious"). Thus, for the present study, we modified the emotions that mothers rated in order to help capture real-world anxiety in mothers during stressful parenting interactions. The emotions utilized for this study are: worried, stressed, and anxious. Mothers were prompted to rate each of these emotions at the end of each stressful interaction with their child. An average of mothers' scores on all three items during each EMA survey timepoint were utilized as an overall measure of maternal real-world anxiety in the present study. Internal consistency averaged across time points within each participant was good ($\alpha$ = .84).

## Data Analytic Plan

All analyses were conducted using SPSS version 28, except for multilevel multiple imputation, which was conducted in RStudio 2022.02.3. A missing data analysis was first

conducted in SPSS using Little's MCAR test (Little, 1988), which revealed that data were not missing completely at random ($\chi^2 = 1377.36$, $p < .001$). Due to the nested nature of the data, multilevel multiple imputation was used to impute missing data values. Multilevel multiple imputation is regarded as a best practice for handling missing data in multilevel datasets. This approach performs comparably to a maximum likelihood estimation approach to missing data, and it generally produces less bias in smaller samples with large amounts of missing data, such as in the current sample (Black, Harel, & Matthews, 2011; Van Buuren, 2011) . Additional information regarding missing data is described in Table 1 and Chapter 3: Results.

To test hypotheses 1a and 1b, that maternal trait emotion dysregulation and experiential avoidance, respectively, would be positively associated with level of maternal trait anxiety, Pearson's correlations were conducted to assess relationships among these variables. To test hypotheses 2a and 2b, that maternal real-world emotion dysregulation would be positively related to maternal real-world anxiety and that maternal real-world experiential avoidance would be negatively related to maternal real-world anxiety, two mixed-effects linear regression models were conducted. These models accounted for the nesting of individual EMA surveys within participants (Hedeker & Gibbons, 2006). In each model, EMA sampling time point was entered as a repeated measure, participant and intercept as random effects, and maternal real-world anxiety as the outcome variable. Maternal real-world emotion dysregulation and experiential avoidance were entered as fixed effects in their respective models. This method of analysis has been utilized in previous studies assessing real-world parenting processes via EMA (Benoit Allen et al., 2016).

Finally, to test hypotheses 3a and 3b, which posited that maternal real-world emotion dysregulation and experiential avoidance would moderate the relationship between maternal and

child trait anxiety, we conducted a standard hierarchical linear regression with moderation using the PROCESS macro (Hayes, 2016) in SPSS. In these models, child trait anxiety was entered as the outcome. In the first step of each model, maternal trait anxiety was entered as a predictor, as well as an aggregated score of real-world emotion dysregulation or experiential avoidance, respectively. Aggregated scores were obtained by calculating the average score for each real-world variable across all 53 EMA observations for each participant. In the second step of each model, the interaction term for maternal trait anxiety by real-world emotion dysregulation or experiential avoidance, respectively, was entered as an additional predictor. Since the outcome variable in these two models was a level 2 variable at the person level, testing this hypothesis was not well suited to a mixed effects regression model. While conducting this analysis as a structural equation model (SEM) would have been the optimal approach to account for both between- and within-person differences, these models require much larger sample sizes, with the recommendation being 200 participants with a minimum of 20 sampling time points each (Croon & van Veldhoven, 2007; Foster-Johnson & Kromrey, 2018). Thus, while the current approach does not account for within-person variability, it serves as an important preliminary analysis providing information about these constructs in the context of stressful parenting interactions and investigating their role in the intergenerational transmission of anxiety.

While child age and gender have been associated with child anxiety and may be controlled for in other studies of child anxiety (Riediger & Klipker, 2014), models in the present study did not include these covariates. This is due to recent guidance within the field which suggests that in order to avoid atheoretical partialling, covariates should only be included in regression models if theory supports their specific relationships to both the predictor and outcome variables (Jaccard, Guilamo-Ramos, Johansson, & Bouris, 2006). Furthermore, because

covariates associated with missingness were accounted for in the multilevel multiple imputation (see below for further information), they were not included in any of the regression models (Black et al., 2011).

# CHAPTER THREE

# RESULTS

## Missing Data

Trait-based data collected via the Prescreen Survey and Pre-EMA Survey were fully accounted for, with 0% missing data. Missing data rates for repeated measures data collected via EMA were calculated based on the typical, maximum 53 surveys per participant (described in greater detail in the following paragraph). Importantly, in the overall pilot study, mothers were given the option to answer questions about a general stressful event they experienced since the last survey they completed if they did not have a stressful parent-child interaction during that time. However, the present study only included data from stressful parent-child interactions. Missing data analyses and imputations described below were conducted for all timepoints when mothers did not report about a stressful parent-child interaction, which was 1,547 (68%) of the 2,279 total sampling timepoints possible across all participants. However, it is important to note that of these 1,547 missing EMA timepoints, 62% of those timepoints in the present study were considered truly missing (i.e., mothers did not complete any measures for that survey timepoint), while the remaining 38% of missing EMA timepoints were missing because mothers completed other surveys about general stressful interactions (which were not used in the present study) due to not having a stressful interaction with their child at that specific sampling timepoint. Information about the average percentage of completed surveys in the overall study across participants, as well as the average percentage of surveys that were completed both regarding stressful parent-child interactions and general stressful events, is included in Table 1.

Of note, three participants completed the prescreen and pre-EMA surveys, but dropped out before completing a single EMA survey. To reduce potential bias in the dataset, they were

removed from the present sample as they did not provide any valid EMA data to inform the imputation of their missing data, and thus imputation may be unreliable.

The number of EMA surveys that each participant received throughout the study varied slightly based on participants' individual schedules and needs (see Appendix for additional details about the EMA protocol and survey schedule). Of the 43 participants in the study, 36 participants received the typical 53 survey notifications. Five participants received one extra notification for a total of 54 notifications (because they started the protocol on a weekend and weekend days have an extra notification). For these participants, the $54^{th}$ survey was removed from the dataset, as none of the participants completed this final survey. One participant asked that an additional 10 days of surveys be added to the end of her 16-day survey schedule due to losing access to her personal cell phone for approximately one week, preventing her from responding to survey notifications during that week. This participant received a total of 94 survey notifications. Finally, one participant had difficulties with the ExpiWell app which prevented her from receiving 4 survey notifications, so these notifications were added to the end of the study for her, for a total of 57 notifications. For each of the latter two participants, incomplete survey notifications which were sent during periods of time when participants were unable to complete them were removed from the dataset. The removal of these extra surveys resulted in an even 53 time points remaining in the dataset for each participant.

Because data were not MCAR, Pearson's (for continuous variables) and Kendall's b tau correlations (for rank order variables) were first conducted to assess which variables were associated with the percentage of missing EMA surveys for each participant. These correlations are included in Table 2. The only variable correlated with percentage of missing surveys was the estimated gross annual income within the family. For categorical variables, one-way ANOVAs

**Table 2.** Correlations among variables.

| | 1 | 2 | 3 | 4 | 5 | 6 | 7 | 8 | 9 | 10 |
|---|---|---|---|---|---|---|---|---|---|---|
| 1. Maternal Trait Anxiety | -- | | | | | | | | | |
| 2. Maternal Trait Emotion Dysregulation | .31* | -- | | | | | | | | |
| 3. Maternal Trait Experiential Avoidance | .51** | .74** | -- | | | | | | | |
| 4. Maternal EMA Anxiety ◊ | .37* | .10 | .21 | -- | | | | | | |
| 5. Maternal EMA Emotion Dysregulation ◊ | .22 | .42** | .39** | .53** | -- | | | | | |
| 6. Maternal EMA Experiential Avoidance ◊ | .48** | .05 | .33* | .67** | .47** | -- | | | | |
| 7. Child Trait Anxiety | .53** | .48** | .47** | .30 | .09 | .21 | -- | | | |
| 8. % Missing EMA Surveys – Present Study | .17 | -.08 | -.07 | .04 | -.23 | .01 | .23 | -- | | |
| 9. Maternal Age | -.34** | -.03 | .07 | .09 | .17 | .20 | -.06 | -.07 | -- | |
| 10. Child Age | -.13 | -.14 | -.20 | .03 | -.07 | -.04 | -.13 | -.06 | -.08 | -- |
| 11. Income† | -.25** | .11 | .02 | -.01 | .11 | -.00 | -.05 | -.23* | .56** | -.01 |

*$p < .05$, **$p < .01$; ◊Scores on real-world EMA measures after multiple imputation, averaged across all 53 EMA time points for each participant; †Kendall's tau b correlations for rank order variable – Income coded 1-11, with 1 = $0-9,999 and 11 = $100,000 or above, and each number in between representing the next $9,999 increment in ascending rank order.

were conducted. Results indicated no differences in the mean percentage of missing data between categories of employment (i.e., employed or not employed), $F(1, 478.54) = 1.03$, $p = .32$ or maternal race, $F(2, 833) = .89$, $p = .42$. Of note, since only one participant identified their race as Black/African American, in order to obtain an ANOVA statistic, this participant was recoded to be included within the "Other" category for the purpose of this analysis. A one-way Welch ANOVA assessed differences in the mean percentage of missing data across levels of maternal education, as this variable did not meet the assumptions of homogeneity of variance. Welch's F indicated significant differences among levels of maternal education, Welch's $F(3, 16.43) = 5.46$, $p < .01$.

Mixed effects binary logistic regressions were conducted to assess the amount of variance that maternal education and annual family income accounted for in the model predicting missingness, in order to determine whether data can be assumed to be missing at random (MAR), while also accounting for the nested nature of the data. This is a strategy commonly used to more accurately assess patterns of missingness in EMA research (McLean, Nakamura, & Csikszentmihalyi, 2017; Sommet & Morselli, 2017). In addition, EMA researchers find that the time of day when EMA notifications are sent, as well as the time point in the study (i.e., EMA sampling time point) are common predictors of missingness (McLean et al., 2017). Thus, these two variables were also tested as potential predictors of missingness in the present study.

In each model, a dichotomous variable coded 0 = Not Missing, 1 = Missing was entered as the outcome variable and indicated whether there was missing data at each EMA sampling time point. Coefficients and standard errors of the fixed and random effects for each model can be found in Table 3. The baseline model included only the random intercept. This model, which correctly classified 75% of cases, indicated there was a 76% chance of missing a survey

**Table 3.** Mixed effects logistic regression models predicting missingness.

| Fixed effect | *B* | *SE* | *t* | AIC |
|---|---|---|---|---|
| | Model 1 | | | |
| Intercept only | 1.32 | .20 | 6.75** | 10712.40 |
| | Model 2 | | | |
| EMA call number | .02 | .003 | 4.83** | 10696.44 |
| | Model 3 | | | |
| Time of day EMA survey received | | | | 10769.68 |
| Morning = 1 (Comparison group) | -- | -- | -- | |
| Afternoon = 2 | .32 | .12 | 2.78* | |
| Evening = 3 | -.13 | .14 | -.97 | |
| | Model 4 | | | |
| Maternal education | | | | 10731.10 |
| Graduated high school = 4 (Comparison group) | -- | -- | -- | |
| Attended college = 6 | -1.42 | .66 | -2.15* | |
| Graduated from college = 7 | -.87 | .61 | -1.44 | |
| Completed graduate school = 8 | -1.14 | .57 | -2.00* | |
| | Model 5 | | | |
| Annual gross family income | | | | 10793.76 |
| $0-9,999 = 1 (Comparison group) | -- | -- | -- | |
| $10,000-19,999 = 2 | -.76 | 1.67 | -.46 | |
| $20,000-29,999 = 3 | .43 | 1.74 | .24 | |
| $30,000-39,999 = 4 | -2.06 | 1.62 | -1.28 | |
| $40,000-49,999 = 5 | -1.46 | 1.32 | -1.10 | |
| $50,000-59,999 = 6 | -1.26 | 1.33 | -.95 | |
| $60,000-69,999 = 7 | -2.37 | 1.32 | -1.80 | |
| $70,000-79,999 = 8 | -.90 | 1.44 | -.63 | |
| $80,000-89,999 = 9 | -1.91 | 1.28 | -1.49 | |
| $90,000-99,999 = 10 | -.70 | 1.37 | -.51 | |
| $100,000 or above | -2.07 | 1.23 | -1.68 | |

*$p < .05$, **$p < .01$; Note: Each of the models listed above was a separate model building on the intercept-only model; each listed variable was entered as a fixed effect in the intercept-only model.

notification, with a confidence interval ranging from 73% to 80%. Random effects of the model indicated significant within-person variability. EMA call number, or the sequential survey notification number (1-53) was added as a fixed effect in the next model, and all other parameters were kept the same. This model suggested that as the study progressed, participants were more likely to miss EMA survey notifications. In a separate model, time of day when survey notification was sent (coded 1 = Morning, 2 = Afternoon, and 3 = Evening) also emerged as a significant predictor of missingness, indicating that when compared to the morning surveys, participants were more likely to miss EMA surveys for which they were notified in the afternoon. In another separate model, maternal education (coded 4 = graduated high school, 6 = attended college or a specialized training program, 7 = graduated college, and 8 = completed graduate school) also significantly predicted missingness, indicating that when compared to participants whose highest level of education was graduating high school, those who either attended college or completed graduate school were less likely to miss survey notifications. Annual family income, when added as a fixed effect in a separate model, did not significantly predict missingness.

The multilevel multiple imputation model included only variables that predicted missingness – EMA call number, time of day, and highest level of education completed. This is consistent with a typical strategy for analyzing missing data in EMA research (McLean et al., 2017; Sommet & Morselli, 2017). The RStudio package "jomo" was used to impute missing data, as this package accounts for both the nested structure of the data, as well as the random intercept intended in the final model. Imputation of missing EMA data occurred at the item level, with 40 imputations being performed based on recent guidance (Graham, Olchowski, & Gilreath, 2007; Heymans & Eekhout, 2019). Data were then exported back into SPSS and total scores

were calculated based on each imputation. Given that SPSS does not recognize multiply imputed datasets for some of the analyses conducted in the present study, imputations for each missing value were aggregated across all 40 imputations using the Bar Procedure (Baranzini, unpublished). These aggregated datasets were used for the mixed effects models that addressed hypotheses 2a and 2b, as well as for the linear regression models with moderation that addressed hypotheses 3a and 3b.

## Distress Assessments

Participants were administered distress assessments once every four days throughout their time in the EMA portion of the study (described under Procedures in Chapter Two). Of the 43 participants in this study, 6 of them endorsed a score of 7 or higher on the distress scale one time each. During each of these instances, local and national mental health crisis resources were automatically sent to participants' phones, and members of the research team (i.e., the lead graduate student and two research assistants) were notified via a deidentified email that a participant had endorsed a rating of 7 or higher on this scale. As soon as possible, the lead graduate student contacted each of these participants via telephone, left a voicemail, and followed up via email to assess the situation and provide support and resources. Each participant also received a follow-up call and/or email the following day if there was no response. All participants responded either via telephone or email, and each reported that the distress was due to 1) accidentally missing a survey notification and feeling badly about how this might affect the research, or 2) feeling frustrated because the app had either crashed or not sent a notification when a recent survey was ready. The lead graduate student on the project provided validation to each participant, apologized for any trouble they were having related to the study, and worked to

troubleshoot any difficulties with the app. No participants reported feeling as if they were experiencing a mental health crisis as a reason for providing a high distress rating.

## Correlations among Variables of Interest

Correlations among demographic variables and variables of interest are outlined in Table 2. Pearson's correlations supported hypothesis 1a, which posited that maternal trait emotion dysregulation and maternal trait anxiety would be positively associated. Hypothesis 1b was also supported, indicating that maternal trait experiential avoidance was also positively associated with maternal trait anxiety. Notably, maternal trait emotion dysregulation and experiential avoidance were positively associated with one another. Mother-reported child anxiety was also positively associated with all maternal trait variables: anxiety, emotion dysregulation, and experiential avoidance. Child trait anxiety was not, however, associated with any of these maternal variables measured during real-world parent-child interactions. Although maternal trait emotion dysregulation, experiential avoidance, and anxiety were each positively correlated with real-world measures of the same construct, it is noteworthy that correlations for each pair of constructs displayed medium effect sizes. This suggests that although these trait and real-world constructs share overlap, they are somewhat unique from one another.

## Relationships between Real-World Emotion Dysregulation, Experiential Avoidance, and Anxiety

Results of linear mixed effects regression models are outlined in Table 4. The first model, in which real-world emotion dysregulation was entered as a fixed effect predicting real-world anxiety, supported hypothesis 2a. This result indicated that maternal real-world emotion dysregulation positively predicted real-world anxiety in the context of stressful parenting interactions. The second model, in which real-world experiential avoidance was entered as a

**Table 4.** Linear mixed effects regression models predicting maternal real-world anxiety during stressful parent-child interactions.

| Model 1: Hypothesis 2a | | | |
|---|---|---|---|
| Fixed effect | *b* | *SE* | *t* |
| Maternal real-world emotion dysregulation | .03 | .002 | 22.16** |
| **Model 2: Hypothesis 2b** | | | |
| Fixed effect | *b* | *SE* | *t* |
| Maternal real-world experiential avoidance | .06 | .003 | 22.24** |

***p* < .01; Akaike's Information Criterion (AIC) for Model 1 = 653.48, Model 2 = 653.10.

fixed effect predicting real-world anxiety, did not provide support for hypothesis 2b. Contrary to the hypothesis that real-world experiential avoidance would negatively predict real-world anxiety during stressful parenting interactions, results indicated that experiential avoidance was positively related to anxiety in this context.

### Maternal Real-World Emotion Dysregulation and Experiential Avoidance as Potential Moderators of the Relationship between Maternal and Child Trait Anxiety

Results of the hierarchical multiple regression models are outlined in Table 5. The first moderation model tested hypothesis 3a, which posited that the relationship between maternal trait anxiety and child trait anxiety would be strongest at high levels of maternal real-world emotion dysregulation. In the first step of this model, maternal trait anxiety and maternal real-world emotion dysregulation were simultaneously entered as predictors of child trait anxiety. Maternal trait anxiety was a significant predictor, but maternal real-world emotion dysregulation was not. The interaction term, which was entered in the second step of the model, was also not significant. Thus, hypothesis 3a was not supported.

The second moderation model testing hypothesis 3b used the same approach as the previous model, with maternal real-world experiential avoidance entered as a predictor in the first step and the interaction term in the second step of the model. Again, maternal trait anxiety was a significant predictor of child trait anxiety at each step of the model, but maternal real-world experiential avoidance did not significantly predict child trait anxiety, and the interaction term was also not significant. Thus, hypothesis 3b was also not supported.

**Table 5.** Hierarchical regression models examining maternal real-world emotion dysregulation and experiential avoidance as potential moderators of the relationship between maternal and child trait anxiety.

| Model 1: Hypothesis 3a | | | | | | |
|---|---|---|---|---|---|---|
| | Step 1 | | | Step 2 | | |
| | *B* | *SE B* | *β* | *B* | *SE B* | *β* |
| Maternal Trait Anxiety | .33 | .09 | .50** | .33 | .09 | .50** |
| Maternal Real-World Emotion Dysregulation | .57 | .49 | .16 | .57 | .50 | .16 |
| Maternal Trait Anxiety x Maternal Real-World Emotion Dysregulation | -- | -- | -- | .00 | .03 | -.01 |
| **Model 2: Hypothesis 3b** | | | | | | |
| | Step 1 | | | Step 2 | | |
| | *B* | *SE B* | *β* | *B* | *SE B* | *β* |
| Maternal Trait Anxiety | .38 | .10 | .56** | .39 | .10 | .54** |
| Maternal Real-World Experiential Avoidance | -.19 | .52 | -.06 | .27 | .61 | .08 |
| Maternal Trait Anxiety x Maternal Real-World Experiential Avoidance | -- | -- | -- | -.03 | .02 | -.16 |

*$p < .05$, **$p < .01$; Model 1: Step 1 - $\Delta R^2 = .02$, $p = .25$, Step 2 - $\Delta R^2 = .00$, $p = .95$; Model 2: Step 1 - $\Delta R^2 = .003$, $p = .71$, Step 2 - $\Delta R^2 = .03$, $p = .18$.

# CHAPTER FOUR

# DISCUSSION

Positive associations between emotion dysregulation, experiential avoidance, and clinically significant trait anxiety have been well-documented across anxiety disorders and throughout the lifespan. Associations between experiential avoidance and anxiety in the context of specific stressful interaction have been established, but the direction of the associations between these constructs remains unclear. Further, few studies examine these associations in the context of real-world stressful interactions. This study sought to understand how these constructs relate to one another in a sample of highly anxious mothers with children in middle childhood, both at the trait level and in the context of stressful parent-child interactions. Results both supported and extended existing literature, showing that both emotion dysregulation and experiential avoidance are related to anxiety at the trait level, as well as in the context of stressful daily parent-child interactions. This study also sought to better understand how these constructs relate to child anxiety; however, results suggested that maternal anxiety was not more likely to be related to child anxiety when higher levels of emotion dysregulation and experiential avoidance were present during parent-child interactions.

The first aim of the present study was to determine whether trait emotion dysregulation and experiential avoidance were related to trait anxiety in a sample of high anxiety mothers with children in middle childhood. Results from correlational analyses supported this hypothesis, showing that mothers who reported higher trait emotion dysregulation and experiential avoidance also reported higher trait anxiety. This is consistent with the literature, including emotion dysregulation models of anxiety (e.g., Hofmann et al., 2012) and theory suggesting that experiential avoidance of perceived negative emotion, such as anxiety, actually perpetuates those

emotions in the long-term (Hayes, Wilson, Gifford, Follette, & Strosahl, 1996). These findings also extend upon existing literature by examining these constructs in a sample of highly anxious mothers with children in middle childhood. Various studies have been conducted which examine how these maternal constructs relate to early attachment and childhood mental health outcomes within samples of mothers with mood, trauma, and personality disorders (Binion & Zalewski, 2018; Cao, Powers, Cross, Bradley, & Jovanovic, 2017; Lotzin et al., 2015). However, little is known about how they characterize the experience of anxious mothers. These results provide a preliminary understanding that future studies may build upon, with the goal of providing effective interventions to mothers struggling with high trait anxiety.

The second aim of the present study was to examine real-world emotion dysregulation and experiential avoidance as potential predictors of real-world anxiety, specifically in the context of stressful parent-child interactions. Findings from multilevel regression models indicated that higher levels of maternal emotion dysregulation and experiential avoidance during multiple stressful parent-child interactions over the course of 16 days predicted higher levels of anxiety at the end of those interactions. This emotion dysregulation finding was consistent with our hypothesis, as well as with studies suggesting that higher emotion dysregulation tends to be associated with higher levels of anxiety (Mennin et al., 2005). However, it extends upon previous research by highlighting that emotion dysregulation also predicts anxiety in the context of specific stressful events – in this case, stressful parent-child interactions. This finding is important to understanding how emotion dysregulation functions for anxious mothers in real-world contexts and provides important information to inform emotion regulation or parenting interventions that aim to reduce mothers' anxiety within parenting contexts.

The finding that higher maternal experiential avoidance during stressful parent-child interactions was related to higher maternal anxiety at the end of these interactions contradicted the hypothesized direction of this relationship in the present study. However, this finding is supported by studies examining the contextual relationship between experiential avoidance and social anxiety in laboratory tasks meant to elicit social anxiety. In particular, Kashdan and colleagues (2014) noted that for individuals with clinically significant social anxiety symptoms, there was a positive, bidirectional relationship between experiential avoidance and social anxiety in the context of both an experience sampling study and an anxiety-provoking laboratory task. These findings are of interest because they seem to contrast the theory that experiential avoidance serves as a strategy for regulating or decreasing levels of negative emotion in the moment (Boulanger et al., 2010).

One potential explanation for the mismatch between the findings of these studies and theory about experiential avoidance is the retrospective timing with which experiential avoidance measures have been administered. For example, Kashdan and colleagues' laboratory and experience sampling studies (2014) captured participants' experiential avoidance and social anxiety ratings following an anxiety-provoking event they encountered. The present study used a similar approach by prompting mothers to recall a stressful interaction with their child since the last survey they completed and provide ratings of anxiety and experiential avoidance after the event occurred. Although each of these study designs likely provided more ecologically valid ratings than truly retrospective, one-time measures provide, none of them were able to capture ratings of experiential avoidance and anxiety in the moment. Experiential avoidance is thought to temporarily reduce anxiety in the moment, but it increases anxiety in the long-term (for a review, see Boulanger et al., 2010). It is possible that there was a time-scale issue in the present study,

such that asking mothers to report about their experience after the event occurred instead of in the moment, as the stressful interaction was occurring, captured a long-term increase in anxiety following experiential avoidance rather than the short-term relief that may have been observable during the interaction. Future research should include studies in which participants are prompted to provide such ratings in the middle of stressful interactions, rather than shortly afterward. Physiological measures of stress and anxiety (e.g., heart rate variability) may be useful tools to ensure that app notifications are being delivered in a manner that will maximize our ability to tease apart the time-course of how these variables interact in the short-term compared to long-term.

These situational findings from real-world parent-child interactions provide an important window into both maternal mental health in the context of stressful parenting situations, as well as for the mother-child relationship among mothers with high anxiety. Social learning theory suggests that mothers' responses to their own negative emotions and their children's negative emotions (e.g., via emotion dysregulation or avoidance of the emotion) are modeled for their children (Fisak & Grills-Taquechel, 2007). In turn, children learn that these particular strategies are appropriate responses to their negative emotions, which may increase their own anxiety about experiencing these negative emotions (Mineka & Oehlberg, 2008; Treanor et al., 2021), as well as the likelihood that children will use these maladaptive emotion regulation strategies themselves (Li, Li, Wu, & Wang, 2019). This is important because when children adopt maladaptive emotion regulation strategies, it increases their risk of developing anxiety and mood disorders, as well as maintaining maladaptive ways of managing their emotional experiences throughout the lifespan.

Relatedly, the third and final aim of the present study examined whether maternal real-world emotion dysregulation and experiential avoidance in the context of stressful parent-child interactions moderated the relationship between maternal and child trait anxiety, which would suggest evidence that these constructs interact with maternal trait anxiety to predict the intergenerational transmission of anxiety to their children. Results of the moderation analyses indicated that the relationship between maternal and child trait anxiety did not differ as a function of mothers' average levels of emotion dysregulation or experiential avoidance during stressful interactions. However, maternal trait anxiety, independent of real-world emotion dysregulation and experiential avoidance, was positively related to child trait anxiety, providing evidence of the potential intergenerational transmission of anxiety. Furthermore, while it was not central to the hypotheses outlined in the present study, higher child anxiety was also related to higher maternal trait emotion dysregulation and experiential avoidance. These findings suggest that these constructs are related to child anxiety, but that they may not be particularly influential in the context of maternal modeling in stressful parent-child interactions.

Alternatively, it is possible that the analyses conducted in the present study could be improved to better detect the relationships between these variables within the parenting context. It may be that maternal trait anxiety shares a high amount of covariance with both maternal real-world emotion dysregulation and experiential avoidance. Thus, when both are entered into a regression model, there may be too much overlap for the real-world variables to contribute additional variance to the model. Another possibility is that using an SEM approach, which would be the ideal analytical framework with a larger sample size, may allow for the parsing of within- and between-person variability in the model that would enable potential relationships to emerge. There were high standard error values for real-world emotion dysregulation and

experiential avoidance variables in the present study when they were averaged across the 53 time points, and an SEM approach may have provided a more accurate representation of these constructs and the role they play in the intergenerational transmission of anxiety.

Many studies examine ways in which high levels of maternal anxiety may increase the likelihood that mothers will engage in detrimental parenting behaviors with their children beginning in infancy, particularly overinvolvement and overcontrol (Degnan, Henderson, Fox, & Rubin, 2008; Garcia, Carlton, & Richey, 2021; Hudson & Dodd, 2012). Such parenting strategies have been associated with perpetuated anxiety in addition to a variety of maladaptive outcomes throughout the lifespan, such as children's behavioral inhibition in middle childhood (Degnan et al., 2008), risky behavior in adolescence (Miller, Borelli, & Margolin, 2018), and external locus of control in adulthood (Spokas & Heimberg, 2009). These constructs are closely related to the variables of interest in the present study, and it will be important for future studies to include these variables when attempting to explain the variability in whether children with highly anxious mothers experience high anxiety themselves.

## Strengths and Limitations

The present study had three notable strengths. First, this study was novel in the sense that it utilized EMA to assess mothers' anxiety, emotion dysregulation, and experiential avoidance during stressful interactions with their children. This repeated-measures study design allowed for a better understanding of how these constructs functioned in the context of the parent-child relationship compared to retrospective measures or one-time, lab-based measures. In addition to providing more ecologically valid measurement of these variables, this design increased the ease with which mothers could participate in the present study compared to a laboratory design, as

they were able to respond to questionnaires on their personal cell phones and participate fully online.

Relatedly, another strength of the present study is that it utilized a challenging-to-recruit sample of mothers with clinically significant anxiety who were asked to participate over the course of multiple weeks. In addition to the study design providing an easier alternative to research participation then laboratory studies, it is possible that the present study allowed for clinically anxious mothers to feel more comfortable participating because it required no face-to-face interactions with researchers. The overall pilot study included a post-EMA feedback survey where mothers were asked to provide feedback about their participation in the study, which will help to inform future versions of the present study and increase participant recruitment and retention.

The third major strength is that the missing data analyses conducted for this study were able to thoroughly assess which demographic and study design variables were associated with missing an EMA survey notification. This information is important for the current pilot study, as it will inform improvements to future iterations of the study in terms of recruiting a larger and more diverse sample. It is also important information for the field in general, as predicting and preventing missingness in experience sampling research is currently a popular topic of interest (McLean et al., 2017; Silvia, Kwapil, Walsh, & Myin-Germeys, 2014). Experience sampling methods are commonly used to identify potential treatment targets, as well as to both evaluate and deliver psychosocial interventions (e.g., Kammerer, Mehl, Ludwig, & Lincoln, 2021; A. Murray, Lavoie, Booth, Eisner, & Ribeaud, 2021; Van der Gucht et al., 2019). Thus, identifying ways to improve EMA methodology, as well as ways to tailor this methodology to fit specific

subsets of the population (e.g., mothers with clinically significant trait anxiety) is an essential priority.

This study also has several limitations, the sample size and composition being the most significant. Although this is a pilot study and there are strengths of the sample as previously mentioned, it is a small sample ($n$ = 43), which could potentially lead to biased results. Additionally, this sample is relatively homogeneous, largely consisting of Caucasian women who have completed graduate school and are currently employed. The largest percentage of the sample in terms of annual gross family income fell within the "$100,000 or above" category, indicating that the majority of participants were of high socioeconomic status. Finally, within the range of possible clinical anxiety symptoms (scores of 23-88 on the SCAARED), it was difficult to recruit mothers with higher levels of anxiety. As outlined in Table 1, 65% of mothers in the present sample fell within the lower range of clinical symptoms (23-44), 26% fell within the next highest range (45-66), and only 9% fell within the highest range of symptoms (67-88). Mothers in the two highest symptom ranges were often screened out of the study due to meeting exclusionary criteria (they most often met criteria for clinically significant alcohol use, or their child met criteria for clinically significant oppositional defiant disorder symptoms). Taken together, these characteristics limit the generalizability of the present findings to the larger population of mothers with high trait anxiety. Future studies should consider adjusting inclusionary and exclusionary criteria to include mothers with a wider range of anxiety symptoms and should consider adding different recruitment methods to reach a wider range of potential participants. The primary form of recruitment used was internet databases of individuals who previously signed up and agreed to be contacted regarding research

participation. Thus, incorporating more in-person and other methods of recruitment may help to increase the diversity of the sample.

Due to the small sample size, limited data analytic strategies were available to answer our research questions. In the case of Hypotheses 3a and 3b, it was not possible to analyze these data in the most accepted way, which would have been to conduct an SEM analysis that would allow for testing within-person effects of the moderator. Given that the present sample was about 25% of the size needed to conduct this type of analysis, the most feasible data analytic option available was to average each variable across sampling time points for each participant, in order to obtain an aggregated score that would allow for a standard hierarchical linear regression model with moderation to be conducted. The small sample size increases the likelihood that the results presented in this paper are biased, and they represent preliminary pilot analyses that should be replicated within a larger, more diverse sample in the future.

Another limitation of the present study was the high percentage of missing EMA data. The average percentage of missing EMA surveys was approximately 68% for the present study (although, as discussed, 38% of those missing data points were missing because mothers did not have a stressful parent-child interaction and opted to complete different survey measures about a general stressful event), compared to a typical percentage in mental health-related EMA studies of about 30% missingness (McLean et al., 2017). This suggests that it was often challenging for mothers to recall multiple stressful interactions with their child each day on average, and future research would benefit from alternative approaches to maximize the likelihood that mothers will have an opportunity to report about stressful parent-child interactions (e.g., collecting data during the summer when mothers might be with their children more frequently, including a lab-based

task, sending fewer notifications over a longer period of time, or exploring other cell phone apps for delivering EMA surveys due to occasional technical difficulties with the current application).

Although the most recommended method of handling missing multilevel data for small sample sizes (multilevel multiple imputation) was utilized, preventing missing data is still considered the best approach (Silvia et al., 2014). The present study is part of a pilot, which had several missing data prevention strategies (e.g., ensuring that participants understood what they were being asked to do by reviewing the consent form, study details, and completing a practice survey over the phone, ensuring the app worked on participants' phones, and communicating with participants if they were slow to begin completing surveys). However, future iterations of this study will use the identified variables associated with missingness, as well as feedback from the feasibility and acceptability surveys, to develop a refined missing data prevention plan. This may include providing more options for mothers regarding times of the day when they can complete surveys, reducing the size of the surveys, and providing additional compensation. Furthermore, some studies specify in advance a minimum number of surveys that constitute a "valid" set of EMA responses, such as requiring one third of all survey notifications to be completed in order to consider each participant valid and retain them in analyses (Palmier-Claus et al., 2011). The present study did not specify a number of surveys needed for a participant to be valid as it was a pilot, but this specification may be added in future iterations of the study.

## Implications and Future Directions

The present study has implications for future intervention and prevention efforts. According to the present findings, high levels of emotion dysregulation and experiential avoidance are related to maternal anxiety at both the trait level and in the context of stressful parent-child interactions. This suggests that among highly anxious mothers, emotion

dysregulation and experiential avoidance are worthwhile treatment targets to help manage mothers' levels of anxiety, both in general and during stressful interactions with their children. Future studies should focus on the development and evaluation of ecological momentary interventions that assess levels of these constructs for participants throughout the day and deliver useful strategies such as mindfulness techniques, distress tolerance skills, and parenting or interpersonal skills when needed. Providing such interventions to highly anxious mothers in their daily lives may lead to them using effective emotion regulation strategies over time. As a result, an additional benefit may include preventing such emotion regulation difficulties in children by helping mothers to model more effective regulatory skills for their children.

There are additional exciting directions that may be incorporated into future research on this topic. For example, future studies may incorporate measures of child anxiety and emotion dysregulation, as well as behavioral observations of parenting. While it would be challenging to send EMA surveys to children aged 7- to 9-years-old, these measures could be obtained via parent-child interaction tasks conducted in the laboratory or via a video conferencing platform such as Zoom, as researchers have recently adapted parent-child interaction tasks to occur via Zoom since the onset of the COVID-19 pandemic (Bambha & Casasola, 2021; Segal & Moulson, 2021). Conducting a similar study in which mothers and their adolescent children both provide EMA measures would also be useful, as adolescence is considered the period during which high anxiety tends to develop into additional mental health concerns, such as substance abuse and depression (Cooper et al., 2006; Kessler, 2003). Thus, identifying maternal and child variables associated with anxiety at this stage could inform interventions targeting this unique stage of development.

Another potential future research direction could be utilizing an EMA design in which physiological responses are collected from participants throughout each day they are enrolled in the study (e.g., heart rate). Participants may be prompted to respond to surveys when physiological markers indicate a potential change in emotion, thereby increasing the accuracy of EMA surveys, as they would be obtained during a stressful interaction. Some experience sampling programs allow for the collection of physiological data, and studies have successfully incorporated similar methodology in the past (e.g., Ebner-Priemer & Trull, 2009). Physiological markers would also be useful to prompt ecological momentary interventions to mothers, ensuring that they are being delivered when mothers are most in need of adaptive emotion regulation and interpersonal strategies. Evolving experience sampling/EMA methodology presents numerous opportunities for expanding upon the present research in ways that are helpful to highly anxious mothers and their children.

## Summary

The present study found that mothers with clinically significant trait anxiety also experience higher levels of trait emotion dysregulation and experiential avoidance. Emotion dysregulation and experiential avoidance during stressful parent-child interactions also contributed to higher anxiety at the end of these interactions for these mothers, suggesting that parent-child interactions may be particularly challenging times for mothers to effectively regulate their emotions and manage their anxiety. Although child trait anxiety was related to maternal trait anxiety, there was no evidence that mothers' emotional responding (i.e., emotion dysregulation, experiential avoidance) in the context of stressful parenting interactions influenced this relationship. These findings provide preliminary evidence for emotion dysregulation and experiential avoidance as important intervention targets for mothers with

clinically significant trait anxiety. If successfully ameliorated with treatment, this could prevent children of anxious mothers from learning maladaptive emotional responding and, in turn, developing clinically significant anxiety.

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# APPENDIX

## Ecological Momentary Assessment Procedures

**Frequency of Prompts:**

- Mothers were prompted to respond to survey notifications three times during each weekday.
- Mothers were prompted four times on weekend days, given that they were likely be spending more time with their child.
- Upon receiving a survey notification, mothers were required to respond within the hour in order to minimize recall bias. Mothers were allowed to go back and complete closed surveys; they were instead instructed to wait until the next prompt.
- The study lasted 16 days total, for 53-54 possible time points (depending on which day of the week they enrolled in the EMA portion of the study).
- Mothers were allowed to choose the times of day which they received survey notifications (in order to maximize times when they were typically with their child and minimize significant disruption in their daily routine), as well as their study start date.
    - There were parameters around mothers' choices of survey timeslots. Each mother was required to specify:
        - **<u>One weekday morning timeslot:</u>** The default timeslot was a randomized survey sent between 7:00 – 10:00am. Mothers were allowed to choose a slightly modified timeslot if it was essential to fit with their schedules (e.g., one participant was a schoolteacher who needed a fixed morning timeslot occurring at 6:30am).

- **One weekday afternoon timeslot:** The default timeslot was a randomized survey sent between 4:00 – 7:00pm. Mothers were allowed to choose a slightly modified timeslot if it was essential to fit with their schedules (e.g., one participant did not return home from work until 5:00pm and needed their notification window to start after they arrived at home).
- **One weekday evening timeslot:** The default timeslot was a randomized survey sent between 7:00 – 10:00pm. Mothers were allowed to choose a slightly modified timeslot if it was essential to fit with their schedules (e.g., one participant indicated a need to receive surveys before their bedtime, so her timeslot was scheduled to end at 9:00pm).
- **Four weekend timeslots between 9:00am and 8:00pm:** The default timeslots occurred between 9:00 – 11:30am, 11:30 am – 2:00 pm, 2:00 - 5:00 pm, and 5:00 – 8:00 pm. Mothers were allowed to slightly modify any of those timeslots if it was essential (e.g., one participant indicated that she did not wake up until 10:00 am and requested that the first notification not be sent prior to that time).

- There were also parameters around which day mothers were allowed to enroll in the study, described below.
  - Phone calls with a research assistant to enroll participants in the study were typically scheduled to occur on a Thursday (any time), and participants began receiving surveys on Fridays.
    - This was to minimize variability across participants' schedules and number of total survey notifications (53), as well as to ensure that

each participant could reach a research team member on a weekday (Friday) if they had any questions or needed to troubleshoot the ExpiWell application.

- If mothers absolutely could not enroll in the study on the above schedule, they were scheduled for a phone call on a Friday and began receiving surveys on Saturday to minimize the difference in number of survey notifications (these moms received 54 survey notifications instead of 53 due to the extra weekend day).

**EMA Survey:**

- Mothers were prompted to reflect on the most stressful interaction with their child since the last survey notification to which they responded. They were given a text box in which to input details about the interaction that occurred. Mothers were encouraged to think of a stressful interaction as both significant events (e.g., an argument with their child) or smaller events (e.g., helping their child complete homework that they are struggling with, trying to complete another task while their child is also asking for their attention, etc.).
- Mothers completed each EMA measure in regard to how they responded during the interaction with their child:
    - State Difficulties in Emotion Regulation Scale (S-DERS) – Assessed real-world emotion dysregulation
    - State Experiential Avoidance Measure - Assessed real-world experiential avoidance
- Mothers completed the following EMA measure regarding how they felt immediately after the interaction occurred:

- Modified Positive and Negative Affect Schedule (PANAS) items – Assessed real-world anxiety following the stressful interaction

# VITA

Samantha Glovak began her educational journey in psychology when she earned her Associate of Arts degree in Psychology from Truckee Meadows Community College in Reno, Nevada in 2014. She subsequently attended the University of Nevada, Reno, where she obtained her Bachelor of Arts degree in Psychology with an emphasis in Research Specialization and a minor and certificate in Addiction Treatment Services. Following the completion of this degree in 2016, Samantha worked as a post-baccalaureate research assistant for one year at the University of Nevada, Reno before beginning her doctoral study at the University of Tennessee, Knoxville in 2017. There, she earned her Master's degree in Clinical Psychology in 2019. She will obtain her Doctor of Philosophy degree in Clinical Psychology from the University of Tennessee, Knoxville in 2023 following the completion of her predoctoral internship at the Department of Veterans Affairs (VA) Puget Sound, American Lake Division in Tacoma, Washington.