RELATIONS OF PARENT-CHILD RELATIONSHIPS AND BIOLOGICAL FACTORS WITH ANXIETY IN EARLY ADOLESCENCE: EXAMINING THE MEDIATING ROLE OF EMOTIONAL FACTORS

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by

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Introduction

Anxiety is the most prevalent mental health problem experienced in childhood and adolescence (Brown, Antonuccio, DuPaul, Fristad, King, Leslie, et al., 2008). A recent epidemiological study revealed that within a 12-month period, 3% of eight to 11 year olds and 5% of 12 to 15 year olds experienced an anxiety disorder that resulted in severe impairment of everyday functioning (Merikangas, He, Brody, Fisher, Bourdon, & Koretz, 2010). Moreover, anxious youth often experience other problems in addition to anxiety including difficulties in peer relationships (Grover, Ginsburg, & Ialongo, 2007; Kingery, Erdley, Marshall, Whitaker, & Reuter, 2010), impaired academic performance (Grover et al., 2007; Hughes, Lourea-Waddell, & Kendall, 2008), and difficulties with aggression (Grover et al., 2007) and depression (Cole, Peeke, Martin, Truglio, & Seroczynski, 1998; Grover et al., 2007; Reinherz, Giaconia, Pakiz, Silverman, Frost, & Lefkowitz, 1993). Given that anxiety is a prevalent mental health problem with many negative consequences in childhood and adolescence, it is essential to better understand the development and maintenance of anxiety.

Several etiological models of anxiety in childhood and adolescence have been put forth emphasizing the role of various cognitive, environmental, biological, and emotion factors in the development and maintenance of anxiety. Past work has focused on the role that cognitive factors, such as attention or interpretation biases, may play in the development and maintenance of anxiety in youth (Daleiden & Vasey, 1997; Kendall & Ronan, 1990; Murray, Creswell, & Cooper, 2009; Weems & Stickle, 2005). Moreover, many environmental factors have also been implicated in etiological models of anxiety in youth. Some of these environmental factors
include parental anxiety, life events (e.g. negative life events, conditioning events), parent-child attachment, and emotion socialization (Ginsburg, Siqueland, Masia-Warner, & Hadtke, 2004; Kerns, Siener, & Brumariu, 2011; Manassis & Bradley, 1994; Murray et al., 2009; Weems & Stickle, 2005). Biological factors, such as genetic vulnerability, temperament (i.e. behavioral inhibition, greater sympathetic arousal), psychophysiology (e.g. heart rate, respiratory sinus arrhythmia), and pubertal development have also been suggested etiological factors (Kerns et al., 2011; Manassis & Bradley, 1994; Murray et al., 2009; Weems & Stickle, 2005).

These etiological factors that are proposed to influence anxiety in children have often been studied in isolation and rarely have been examined together. The current study aims to examine in conjunction several etiological factors that have been shown to be particularly important, including parent-child relationship factors (i.e. mother-child attachment security, non-accepting maternal reactions to children’s negative emotions, maternal psychological control), biological factors (i.e. heart rate, respiratory sinus arrhythmia), and emotion factors (i.e. lack of verbal emotional expression, lack of emotion understanding, nonacceptance of emotions, maladaptive emotion management – avoidance) in relation to anxiety in early adolescence. In addition, the current study aims specifically to test recent models of anxiety by examining emotion factors as potential mediators of the relations of mother-child relationships and biological factors with anxiety in adolescence.

**Parent-Child Relationship Factors and Anxiety**

One area that has often been implicated in the development and maintenance of anxiety in youth is parent-child relationships (Ginsburg et al., 2004; Kerns et al., 2011). The parent-child relationship is the primary context in which children’s emotional development occurs (Eisenberg, Cumberland, & Spinrad, 1998), and parent-child relationships are often identified as
Parent-child attachment is a specific parent-child relationship factor that has received much attention in prior literature regarding influence in childhood anxiety. Bowlby (1969, 1980) described the attachment relationship between caregiver and child, with the caregiver serving as a *safe haven* from which a child can seek comfort in times of distress as well as a *secure base* from which a child can explore the environment. When a caregiver is consistently available to the child when needed and persistently responsive and sensitive to the child’s needs, the child will form a secure attachment to the caregiver. Bowlby (1973) indicated that attachment relationships impact later personality development, including the development of anxiety. Specifically, Bowlby theorized that children who have an insecure attachment to their caregiver are more uncertain about the availability and responsiveness of the caregiver and display greater anxiety than securely attached children, especially in distressing situations.

Indeed, there is a vast amount of empirical evidence which consistently supports the relation between a lack of security in the parent-child attachment relationship and greater anxiety in childhood and adolescence. A complete narrative review (Brumariu & Kerns, 2010) and a meta-analysis (Colonnesi, Draijer, Stams, Van der Bruggen, Bögels, & Noom, 2011) of the empirical literature on the relation between attachment insecurity and anxiety in children were recently published. These reviews, therefore, will be the focus of the literature review on this topic in the interest of being concise. The narrative review reported that less attachment security was associated with greater anxiety in children and also proposed a model that illustrated how attachment security may work in conjunction with other factors to influence anxiety in children (Brumariu & Kerns, 2010). The meta-analysis found that there is a moderate relation between
attachment security and anxiety (Colonnesi et al., 2011). In sum, theories of child anxiety have often identified the parent-child attachment relationship as an important influence on the development of child anxiety, and there is consistent evidence that greater attachment security is associated with less anxiety.

In addition to parent-child attachment, parenting behaviors have also been implicated in the development of anxiety. A meta-analysis of the literature on parenting and anxiety in children was performed and found that the broad construct of negative parenting only accounted for 4% of the variance in child anxiety (McLeod et al., 2007). The authors examined rejection and control as important dimensions of negative parenting that are theoretically and empirically related to child anxiety, and they also examined subdimensions of parental rejection (e.g. withdrawal, warmth) and control (e.g. over-involvement, autonomy granting) as moderators of relations between negative parenting and child anxiety. The dimensions of parental rejection and parental control accounted for 4% (small effect size) and 6% (medium effect size) of variance in child anxiety, respectively. The specific subdimensions of parental rejection and control helped to explain larger amounts of variance of child anxiety, compared to the broad construct of negative parenting. Granting of autonomy accounted for the greatest amount of variance in child anxiety. They concluded that examining specific aspects of parental rejection and control, rather than broad parenting constructs, may be helpful to better understand the development of child anxiety (McLeod et al., 2007).

One specific aspect of parental rejection that is related to child anxiety is parents’ non-accepting reactions to children’s expressions of emotion. Parents’ reactions to children’s negative emotions may be an important way in which children learn about how to express, think about, and manage emotions, such as anxiety. Specific parental emotion socialization behaviors
have not received much attention in the child anxiety literature. Emotion socialization is defined
as the processes which influence the development of emotion competence (Halberstadt, Denham,
& Dunsmore, 2001; Saarni, 1999). Emotion competence is defined as being self-efficacious in
situations which elicit emotions and often involve social interaction with others (Saarni, 1999).
Parents may socialize children’s emotions in various ways, including how they react to
children’s emotional expressions (i.e. punishment, minimization, focus on problem-solving),
how emotions are discussed (or not discussed), and modeling of how emotion is expressed
(Eisenberg et al., 1998; Morris, Silk, Steinberg, Myers, & Robinson, 2007).

One specific facet of parental rejection that is related to anxiety in childhood and involves
emotional socialization is parents’ non-accepting reactions to children’s expressions of emotion,
such as punitive or minimizing reactions. Evidence suggests that parents of anxious children
listen to their children less (Dadds, Barrett, Rapee, & Ryan, 1996) and provide less warmth and
support (Brumariu & Kerns, 2015; Hudson, Comer, & Kendall, 2008) during discussions of
emotional situations. Moreover, there is evidence that mothers of anxious children engage in less
explanatory discussion of emotions with their children during discussions of negative emotions
(Suveg, Zeman, Flannery-Schroeder, & Cassano, 2005; Suveg, Sood, Barmish, Tiwari, Hudson,
& Kendall, 2008), discourage children’s discussion of emotion compared to mothers of non-
anxious children (Suveg et al., 2005), and elaborate less during a discussion involving negative
emotion (Brumariu & Kerns, 2015). Furthermore, there is evidence that early adolescents with
greater social anxiety symptoms have mothers who focus less on problem-solving in response to
adolescents’ negative emotions (Mathews, 2012). In summary, evidence suggests that parents’
non-accepting emotion socialization behaviors are associated with child anxiety. Additional
research is needed to examine the associations of non-accepting parental reactions to children’s
negative emotions with anxiety in adolescence as it is likely that this specific subdimension of parental rejection may be particularly important.

Another parental emotion socialization behavior that is linked to anxiety is parental psychological control, a subdimension of parental control. Parental psychological control is defined as a parent’s attempts to control a child in ways that encroach upon and are detrimental to the child's normative psychological and emotional development (Barber, 1996). Parental psychological control often includes coercive parental attempts to influence a child's way of thinking, the emotions the child experiences, and how the child expresses himself/herself (Barber, 1996). Parental control is theorized to be related to child anxiety in that it may limit children’s opportunities to experience situations and emotions for themselves and thus limit their ability to learn and develop skills to manage anxiety-provoking situations independently (Chorpita & Barlow, 1998; Rapee, 1997; Wood, McLeod, Sigman, Hwang, & Chu, 2003). Additionally, parental control may send the message to children that there are constant threats in the environment, and children are not equipped to handle anxiety-provoking situations independently. Hence, children may develop the belief that they are not able to control or effect change on their circumstances (Chorpita & Barlow, 1998; Rapee, 1997; Wood et al., 2003).

Parental psychological control is likely to prevent children from being able to independently experience and express emotions and thoughts, which may impede children’s learning of emotion competence skills or developing a sense of competence in managing their own anxious emotions. Thus, parental psychological control is a particularly important subdimension of parental control that may impact child anxiety.

Evidence for the association between parental psychological control and child anxiety is beginning to emerge. Parents of children with anxiety disorders have demonstrated greater use of
psychological control with children compared to parents of children without an anxiety disorder (Siqueland, Kendall, & Steinberg, 1996). Additionally, Settipani, O’Neil, Podell, Beidas, and Kendall (2013) found that a decrease in parental psychological control predicted a decrease in anxiety symptoms of children and adolescents in treatment for anxiety disorders. Greater parental psychological control has also been linked to greater child anxiety symptoms in middle childhood (Brumariu & Kerns, 2015; Nanda, Kotchick, & Grover, 2012). McShane and Hastings (2009) found that maternal psychological control predicted preschool-age boys’ anxious behavior, although no significant results were found for girls or for paternal psychological control.

Although evidence has emerged recently to support the association between parental psychological control and child anxiety, the majority of research on parental control and child anxiety focuses on the broad construct of parental control. As the meta-analysis by McLeod et al. (2007) suggested, it is important to examine specific subdimensions of parental control in an attempt to account for more variance in child anxiety, and parental psychological control may be a particularly important subdimension given its focus and effects on the child’s emotional development. Thus, additional research is needed on the relations of parental psychological control and anxiety.

**Biological Factors and Anxiety**

Another area that has received increasing emphasis in theories regarding the development and maintenance of anxiety in children is biological factors (Eley, 2001; Gunnar, 1991). It is suggested that some children are born with a genetic predisposition to anxiety, and children who are genetically predisposed to anxiety may show exaggerated physiological reactions (i.e. increased heart rate) to potentially threatening or anxiety-provoking situations (Weems &
Stickle, 2005). Indeed, hyperphysiological arousal has been implicated as a distinguishing characteristic of anxiety (Clark & Watson, 1991), and anxiety is often accompanied by reactivity of the autonomic nervous system (Friedman, 2007). The autonomic nervous system (ANS) is composed of the sympathetic and parasympathetic nervous systems which both serve to regulate organs throughout the body. The sympathetic nervous system (SNS) is related to preparing the body to respond (i.e. fight or flight) to environmental challenges, whereas the parasympathetic nervous system (PNS) is related to growth and restoration of bodily systems and allows for rapid changes in cardiac activity (Berntson, Quigley, & Lozano, 2007; Porges, Doussard-Roosevelt, & Maiti, 1994). Cardiovascular activity is influenced by both the SNS and PNS components of the ANS in addition to a number of other factors (Beauchaine, 2001; Berntson et al., 2007). The PNS is thought to account for very rapid changes in cardiac activity in response to environmental stimuli, and a component of the PNS, the tenth cranial nerve known as the vagus, regulates rapid changes in heart rate. When a stressor occurs in the environment, SNS activity typically increases and PNS activity decreases (i.e. vagal stimulation of the heart is withdrawn) so that cardiac activity can increase to allow the individual to respond to the environmental demands (Porges, 1992). Anxiety is thought to be accompanied by a physiological pattern of sympathetic nervous system activation and parasympathetic nervous system withdrawal (Friedman, 2007).

Common indicators of ANS activity include heart rate (HR), heart period (HP), heart rate variability (HRV), and respiratory sinus arrhythmia (RSA; see Berntson et al., 2007 and Kreibig, 2010 for reviews). HR is an indicator of heart beats per minute, and HP is the time interval between heart beats, typically measured in milliseconds. These two indicators are reciprocals and can be converted from one to another (Berntson et al., 2007). HRV refers to the changes in heart rate or heart period across time. RSA, a metric generated from high frequency HRV that is
influenced by respiration, is the preferred metric of vagal cardiac control, as it is thought to be primarily influenced by the PNS (Berntson et al., 2007; Fox, Schmidt, Henderson, & Marshall, 2007; Porges et al. 1994). Rapid heart rate changes, regulated by the PNS, may be particularly important in relation to emotion regulation (Porges, 1992, Porges et al., 1994). It is generally expected that greater anxiety will be associated with increased HR, decreased HP, decreased HRV, lower RSA during a baseline period, and excessive suppression of RSA during a stressor (Berntson et al., 2007; Kreibig, 2010; Porges et al., 1994; Zisner & Beauchaine, in press).

There is preliminary empirical evidence that ANS activity is related to anxiety in children. Three studies examined the response of ANS activity in children with anxiety disorders. Monk, Kovelenko, Ellman, Sloan, Bagiella, Gorman, and Pine (2001) investigated HR and high frequency HRV (RSA) in children in middle childhood and adolescence with and without an anxiety disorder diagnosis. At baseline, they found that children with anxiety disorders showed greater HR and less RSA (although the difference on RSA was no longer significant after controlling for respiration). During a CO2 inhalation stress task, there were unexpectedly no differences between groups on HR. The anxiety disorder group evidenced less change in RSA during the stress task, but this association was attenuated when controlling for respiration (Monk et al., 2001).

Two studies examined these relations in children with specific types of anxiety disorders. Anderson and Hope (2009) examined differences between adolescents with social phobia and those without an anxiety disorder on HR. They did not examine baseline differences between the two groups, and they found socially anxious adolescents did not show differences in HR in response to social stressor tasks (controlling for baseline HR) compared to adolescents without a diagnosis (Anderson & Hope, 2009). The authors posited that their results suggest that all
adolescents experience physiological arousal in a social stressor task, but socially anxious adolescents perceive themselves as feeling more anxious and fear embarrassment as a result of their anxious feelings more so than non-socially anxious adolescents (Anderson & Hope, 2009). Another group of researchers (Scheeringa, Zeanah, Myers, & Putnam, 2004) investigated differences in HP and RSA between three groups of young children in early childhood: those exposed to a traumatic event with PTSD symptoms, those exposed to a traumatic event without PTSD symptoms, and children who had never been exposed to a trauma. At baseline, they (Scheeringa et al., 2004) found no differences in HP or RSA between all three groups of children. However, during a stress-inducing interview about a traumatic event, the two groups of children who experienced a traumatic event demonstrated hypothesized decreased HP compared to the control group, whereas there were no differences between the three groups on change in RSA during the stressor.

In addition to anxiety disorders, the relations between ANS activity and anxiety symptoms in children have also been examined. Weems, Zakem, Costa, Cannon, and Watts (2005) examined HR in children in middle childhood and adolescence in relation to total symptoms of anxiety disorders. At baseline, they found no differences in HR between high-anxious and low-anxious children. However, the highly anxious children evidenced greater HR during the stressor and following exposure to the stressor compared to the low anxious children, as would be expected. Hannesdóttir, Doxie, Bell, Ollendick, and Wolfe (2010) examined mean HR and HRV in relation to total anxiety symptoms in middle childhood. They unexpectedly did not find significant associations between HR or HRV and anxiety symptoms at baseline or during a speech stress task. Another study (Matthews, Manuck, & Saab, 1986) examined adolescents’ mean HR in response to a naturalistic social stress task and found that adolescents
who were high on trait anxiety symptoms showed greater HR several minutes before the task, during the task, and after the task in comparison to adolescents who had fewer trait anxiety symptoms (Matthews et al., 1986). Beidel (1988) examined changes in HR in response to performance-related stressors in elementary school age children who evidenced either high test anxiety or low test anxiety. Although differences in HR between groups at baseline were not examined, Beidel (1988) found that test-anxious children showed a greater increase in HR in response to the stressors compared to non-test-anxious children.

Gazelle and Druhen (2009) examined HP and RSA in elementary school children who were identified as showing anxious solitary behavior. At baseline, they found that anxious solitary third graders unexpectedly evidenced longer HP (slower HR) compared to non-anxious solitary children and no differences on RSA were found between groups (Gazelle & Druhen, 2009). Additionally, Gazelle and Druhen (2009) found that in response to a social rejection stressor, anxious solitary children unexpectedly demonstrated longer HP as well as greater increases in RSA, rather than suppression of vagal activity which is what would be expected in anxious children. An additional study examined HR and social anxiety symptoms in adolescent males, although a stress task was not utilized in this study. Mezzacappa, Tremblay, Kindlon, Saul, Arseneault, Seguin et al. (1997) examined HR in relation to social anxiety symptoms in adolescent males in different bodily positions (i.e. supine and standing) and found that increased HR was associated with greater social anxiety symptoms in both bodily positions, as would be expected.

In summary, there are many inconsistencies in this literature, although studies examining anxiety symptoms rather than disorders tend to find more consistent evidence that increased HR and decreased HP tend to be associated with greater anxiety symptoms in children. RSA,
typically thought of as the best indicator of vagal nerve and PNS activity, has only been examined in three studies (Gazelle & Druhen, 2009; Monk et al., 2001; Scheeringa et al., 2004) and these studies found either non-significant effects or associations in directions that were opposite of what was expected. Of the studies that examined these relations at baseline, results have not been consistent, and additional research is needed to determine if anxious children demonstrate differences in ANS activity at baseline or only in response to stressors. Furthermore, additional research is needed to examine how HR and RSA may be similarly or differentially related to child anxiety.

**Emotion Factors and Anxiety**

In addition to parent-child relationships and biological factors that may contribute to anxiety in children, an increased emphasis has been placed on the role of emotion factors in recent years (Barlow, 2000). Emotion, or biologically adaptive abilities to quickly appraise one’s surroundings and react to either maintain or change the context (Cole, Martin, & Dennis, 2004), is an integral part of anxiety. Indeed, anxiety has been conceptualized as dysregulation of the emotional response system that involves several components, including an affective component, which results in distress or impairment (Barlow, 2000, 2002; Weems & Silverman, 2008). Therefore, emotion is a central feature of anxiety.

There is theoretical and empirical support for the relations between emotion factors and anxiety suggesting that difficulties with emotion have been linked to anxiety in children (Hannesdóttir & Ollendick, 2007; Jacob, Thomassin, Morelen, & Suveg 2011). However, there has generally been a focus in previous research on how the ability to modify emotions is related to anxiety, and less attention has been paid to other emotion competence skills. One way of broadening our understanding of the relationship between emotion factors and anxiety in
children is to examine specific skills of emotion competence. Saarni (1999) originally proposed eight skills of emotion competence which included awareness of one’s own emotions, the ability to discern and understand others’ emotions, the ability to use the vocabulary of emotion and expression, the capacity for empathic involvement, the ability to differentiate internal subjective emotional experience from external emotional expression, the capacity for adaptive coping with aversive emotions and distress circumstances, awareness of emotional communication within relationships, and the capacity for emotional self-efficacy. The current study will focus on emotion competence skills that involve children’s own emotions (e.g. recognition and understanding of others’ emotions will be excluded) and that have demonstrated theoretical and empirical associations with child anxiety in previous literature (Mathews, Koehn, & Kerns, 2015). Four domains of emotion competence are the focus of the current study including expression of emotion, awareness/understanding of one’s own emotions, acceptance of emotion, and emotion management.

Expression of emotion is conceptualized as the ability to externally communicate the internal experience of emotion. Difficulties in expressing emotion may impede a person’s ability to seek help from others to adaptively manage emotion and, thereby, may lead to development and maintenance of difficulties with anxiety (Southam-Gerow & Kendall, 2002). Empirical evidence supports that anxious children have more difficulties (i.e. are less likely to express their emotions and when they do, are less effective at emotion expression) in verbal, as well as physical, expression of emotions (Lahaye, Luminet, Van Broeck, Bodart, & Mikolajczak, 2010; Melfsen, Osterlow, & Florin, 2000; Penza-Clyve & Zeman, 2002; Rieffe, Oosterveld, Mieres, Terwogt, & Ly, 2008; Suveg, Sood, Comer, & Kendall, 2009b). However, there is some inconsistent evidence in that Melfsen et al. (2000) found that socially anxious children were
better at physically expressing disgust, anxiety, and sadness than non-anxious children. Only two studies (Lahaye et al., 2010; Rieffe et al., 2008) previously examined verbal expression of emotion in relation to anxiety symptoms, and they each used paper-and-pencil questionnaire assessments of verbal expression in relation to state anxiety or social anxiety symptoms. Few studies have examined observations of verbal emotional expression in relation to overall anxiety symptoms in children.

Emotion understanding is conceptualized as the ability to identify the internal experience of one emotion from another or to identify the internal experience of a mixture of emotions as well as the ability to understand causes of emotion (Mathews et al., 2015; Saarni, 1999). If children lack awareness of their emotions and/or do not understand their internal emotional experiences, they may be less likely to engage in adaptive emotion management which may lead to greater anxiety (Saarni, 1999). Lack of emotion understanding has been empirically linked to anxiety in children. Evidence suggests that less understanding (Brumariu, Kerns, & Seibert, 2012; Neumann, van Lier, Gratz, & Koot, 2010; Penza-Clyve & Zeman, 2002; Suveg, Hoffman, Zeman, & Thomassin, 2009a), knowledge (Southam-Gerow & Kendall, 2000) and labeling/differentiation of emotions (Mathews, Kerns, & Ciesla, 2014; Rieffe et al., 2008; Suveg et al., 2009b) is associated with greater anxiety, both overall symptoms/disorders and social anxiety symptoms in particular.

Nonacceptance of emotion has also been conceptually linked to anxiety. Nonacceptance refers to not accepting one’s own emotional experiences by trying to ignore, stifle, or change the emotional experiences or responding with fear, anger, or embarrassment to the experience of emotions (Gratz & Roemer, 2004; Mathews et al., 2015; Saarni, 1999). Nonacceptance of emotion may actually increase undesired emotion, rather than decrease it, and therefore may
contribute to anxiety in children (Campbell-Sills, Barlow, Brown, & Hofmann, 2006). There has been little research on how nonacceptance of emotions relates to anxiety in children, although the adult literature suggests that nonacceptance of emotions is associated with greater anxiety (i.e. Mennin, Holaway, Fresco, Moore, & Heimberg, 2007; Turk, Heimberg, Luterek, Mennin, & Fresco, 2005). One study found that nonacceptance of emotion was associated with greater anxiety symptoms in adolescence (Neumann et al., 2010). Additionally, in the child literature many studies have examined anxiety sensitivity, or the fear of physical symptoms often associated with anxiety (i.e. racing heart) and thoughts that these symptoms may be harmful to one’s well-being (Reiss & McNally, 1985). Anxiety sensitivity can be thought of as a form of nonacceptance of emotion (i.e. fear, anxiety). Greater anxiety sensitivity has consistently been linked to greater anxiety in children (see Noël & Francis, 2011 for a meta-analysis of the empirical literature). The meta-analysis demonstrated a small effect size for the relation between anxiety sensitivity and anxiety in childhood ($d = .26$) and a moderate effect size for adolescence ($d = .36$; Noël & Francis, 2011).

Lastly, the emotion competence skill of maladaptive emotion management has been theorized to contribute to anxiety in childhood. Emotion management is conceptualized as the ability to modify or maintain the intensity or duration of the internal experience of emotion (Thompson, 1994; Thompson, 2001). Thompson (2001) suggested that the inability to adequately adjust emotions to fit the situation (i.e. maladaptive emotion management) may serve to influence the development and maintenance of anxiety. Maladaptive emotion management has also been empirically linked to anxiety in children. Avoidance is a common behavioral component of anxiety that has often been investigated in relation to anxiety and may be a particularly important maladaptive emotion management strategy. Overall, the literature on
avoidance and anxiety in children suggests that greater use of avoidance is associated with greater overall anxiety (Carthy, Horesh, Apter, & Gross, 2010; Frank, Blount, & Brown, 1997; Lengua & Sandler, 1996; Lewis & Kliwar, 1996; Mathews et al., 2014; Sandler, Tein, & West, 1994; Spirito, Stark, & Tyc, 1994), although there are some inconsistent findings (Brumariu et al., 2012; Lopez & Little, 1996; O’Brien, Margolin, & John, 1995). Two of the studies that found inconsistent findings (Lopez & Little, 1996; O’Brien et al., 1995) focused on state and/or trait anxiety symptoms rather than overall anxiety symptoms.

In summary, much of the literature examining parent-child relationships, biological factors, emotion factors, and anxiety have examined these relationships separately. For example, the associations of parent-child attachment and parenting behaviors with anxiety have largely been examined separately and rarely have they been investigated in conjunction (Bosmans, Vandevivere, Dujardin, Kerns, & Braet, in press). Additionally, parent-child relationship factors and biological factors have infrequently been examined together in regards to how they influence anxiety in children. Lastly, emotion factors have only recently been integrated into examinations of etiological models of anxiety. It is important to investigate various etiological factors of anxiety in conjunction to obtain a better understanding of how these factors independently and jointly influence anxiety, which has not been done often in the past and has been a criticism of prior theoretical and empirical research of childhood anxiety (Manassis & Bradley, 1994).

**Emotion Factors as Potential Mediators of Relations between Parent-Child Relationships and Biological Factors with Anxiety**

Several multi-factor models of child anxiety have recently been put forth that include parent-child relationships, biological factors and emotion factors as contributors to child anxiety (Bosmans et al., in press; Brumariu & Kerns, 2010; Esbjørn, Bender, Reinholdt-Dunne, Munck,
The specific parent-child relationship factors that are emphasized as influencing child anxiety vary for each model. The model proposed by Jacob et al. (2011) focuses on parental emotion socialization practices (i.e. directly discussing or modeling emotion regulation strategies, managing children’s exposure to situations that may evoke emotions). Other models include parent-child attachment (Bosmans et al., in press; Brumariu & Kerns, 2010; Esbjørn et al., 2012; Thompson, 2001) and parenting behaviors (Bosmans et al., in press; Brumariu & Kerns, 2010; Esbjørn et al., 2012; Thompson, 2001).

Specific parenting behaviors that have been identified include overcontrol or overprotection (Bosmans et al., in press; Brumariu & Kerns, 2010), rejection (Bosmans et al., in press), modeling of anxious behavior (Bosmans et al., in press), not paying attention to children’s emotions, lack of understanding children’s emotions, and not providing appropriate emotional responses that mirror children’s emotions (Esbjørn et al., 2012). Further, each of these models suggests that parent-child relationship factors are directly associated with child anxiety and also indirectly associated via the mediating role of emotion factors.

In addition, all of these models of child anxiety suggest that emotion factors serve as mediators of the associations of parent-child relationships with the development of child anxiety, although the models vary regarding which aspects of emotion factors they consider to be relevant. The model proposed by Brumariu and Kerns (2010) suggests that emotion identification, emotion understanding, and coping (avoidance) -- in addition to maladaptive cognitions (i.e. control beliefs, attention bias) and self-concepts (i.e. lack of self-efficacy) -- mediate relations between parent-child relationship factors and child anxiety. Bosmans et al. (in press) proposed that emotion regulation (i.e. lack of emotion awareness, interpretation and attention biases, difficulties in modifying emotion) may mediate the relations between parent-
child relationship factors and child anxiety. Esbjørn et al.’s (2012) model suggests that parent-child relationship factors influence children’s emotion regulation skills (i.e. avoidance, safety behaviors, attention and interpretation biases, and anxious responses) which in turn influence the development of anxiety. Jacob et al. (2011) proposed that emotion regulation difficulties (i.e. dysregulated emotional expression, inhibition, and avoidance) mediate relations of parental emotion socialization and anxiety (although they do not include parent-child attachment as relevant). Thompson (2001) suggests that both parent-child attachment and parental emotion socialization practices influence children’s development of emotion competence (e.g. emotional construals, encoding of emotional information, self-efficacy) which influence the development of child anxiety.

In addition to parent-child relationship factors, several of these theoretical models also propose the influence of biological factors in the development of anxiety in childhood, although various models differ in the extent to which they integrate biological factors in the model. Biological factors, such as behavioral inhibition, can influence anxiety directly or indirectly through influence on children’s emotion regulation capacities (e.g. child with high behavioral inhibition may be more physiologically aroused which results in greater difficulties regulating emotions). Brumariu and Kerns (2010) included behavioral inhibition as an influence that may directly affect child anxiety. Bosmans et al. (in press) mention genetic influence through transmission of anxiety disorders from parents to children and the influence of behaviorally inhibited temperament on child anxiety and parenting behaviors, but they do not discuss biological factors in relation to child anxiety at length. Thompson (2001) also discusses various biological factors (i.e. development of the neuroendocrine and parasympathetic nervous systems, pre-frontal cortex functioning, behavioral inhibition) that may directly or indirectly influence
child anxiety. Esbjørn et al. (2012) theorized that there is a biological influence on child anxiety in that behaviorally inhibited temperament, which is genetically inherited from parents, is linked to anxiety. The authors (Esbjørn et al., 2012) review literature regarding heart rate and frontal lobe asymmetry as biological indicators of emotion regulation difficulties in relation to child anxiety, but do not explicitly integrate these biological aspects into their model. The model proposed by Jacob et al. (2011) suggests that abnormalities in various biological factors (i.e. vagal tone, reactive temperament, specific brain structures) may influence the development of anxiety.

Although each model of child anxiety includes some mention of biological factors, they vary regarding how emotion factors may explain the relations between biological factors and child anxiety. Bosmans et al. (in press) did not discuss how emotion regulation may influence the relation between biological factors and child anxiety. Brumariu and Kerns (2010) posit that the biological factors of negative emotionality or behavioral inhibition may influence the impact of the emotion factors on child anxiety, but they do not suggest that emotion factors mediate relations between biological factors and child anxiety. Three of the models of child anxiety include emotion factors as mediators between the relations of biological factors and child anxiety (Esbjørn et al., 2012; Jacob et al., 2011; Thompson, 2001). The model proposed by Jacob et al. (2011) most clearly discusses the relations between biological factors, emotion factors, and child anxiety suggesting that abnormalities in biological factors influence difficulties in emotion regulation which contribute to child anxiety. Thompson (2001) suggests that behaviorally inhibited temperament and other biological factors influence children’s physiological arousal resulting in greater difficulties regulating emotions which can contribute to anxiety. Esbjørn et al. (2012) proposed that genetic vulnerability expressed as behavioral inhibition influences
children’s emotion regulation skills which in turn contribute to the development of anxiety.

In summary, each of these models has unique aspects although they all emphasize the influence that parent-child relationships have on the development of emotion regulation skills and anxiety in children and each recognizes that biological factors have some bearing on these relations as well. The majority of these models recognize that these relations are all likely to be bidirectional, and that there is likely more than one pathway to the development of anxiety. They also suggest that the development of anxiety needs to be viewed in the broader context of children’s development, and child anxiety cannot be completely explained by the factors included in their models alone.

A review of the literature discussed above informed the development of the proposed model to be investigated in the current study which is shown in Figure 1.
Figure 1. Proposed model to be investigated in the current study.
All models of child anxiety suggest it is important to include parent-child relationship factors in the model, and there is a need for integration of parent-child attachment and parental emotion socialization behaviors into the same model. Additionally, there is evidence that examining specific parental behaviors may help to explain more about child anxiety than broad parenting factors (McLeod et al., 2007). Therefore, the proposed model includes three parent-child relationship factors that are theorized to directly influence anxiety: parent-child attachment security, non-accepting parental reactions to children’s negative emotions, and parental psychological control.

Additionally, biological factors are also indicated as important in the development of anxiety according to previous research, although these models do not often identify or include specific biological variables beyond behaviorally inhibited temperament. The proposed model will include the direct influences of heart rate (HR) and respiratory sinus arrhythmia (RSA) on anxiety in early adolescence. Review of the child literature on ANS activity and child anxiety indicated it is important to examine HR and heart rate variability (RSA is high frequency heart rate variability) in conjunction to examine potential differential patterns. It is also important to examine RSA in relation to anxiety, given that RSA is considered the best metric of PNS influence on cardiac activity and involves expression and regulation of emotions (Porges et al., 1994).

Furthermore, all of the models reviewed above emphasize emotional variables as potential mediators of relations between parent-child relationship factors with anxiety, and a few models also suggest emotional variables as mediators of the relations between biological factors and child anxiety. The proposed model includes specific emotion competence skills (lack of verbal emotional expression, lack of emotion understanding, nonacceptance of emotions,
maladaptive emotion management - avoidance), that focus on children’s own emotions and that have demonstrated theoretical and empirical associations with child anxiety in previous literature. These emotion competence skills are proposed as mediators of the relations between parent-child relationship factors as well as biological factors with anxiety symptoms. Thus, the current study will test the pathway from parent-child relationships to emotion factors to anxiety symptoms, and a similar pathway from biological factors to emotion factors to anxiety symptoms, while bidirectional effects may be found when examined across time.

Early adolescence is an important time in development to examine these relations. In regards to parent-child relationship factors, changes in the parent-child relationship are especially salient during the early adolescent developmental period. In addition, attachment security and anxiety have been found to be most strongly related during adolescence (Brumariu & Kerns, 2010; Colonessi et al., 2011). During the adolescent developmental period, there is a normative increase in negative emotion (Larson & Lampman-Petraitis, 1989) and how parents react to children’s expressions of negative emotions may be particularly important to examine in adolescence. Furthermore, physiological changes take place during adolescence which influence adolescents’ increased reactivity to stressful situations (Romeo, 2013), suggesting the increased importance of emotion competence in order to respond adaptively. Early adolescence is also an important time to examine development of emotional competencies. Adolescents develop greater understanding of how to modify the expression of emotion depending on the social context, more accurate appraisals of their own ability to manage emotions in stressful situations, and improved abilities to generate a variety of strategies for coping or solutions to problems (Saarni, 1999). Given the vast amount of changes that occur, the early adolescent developmental period can be a particularly emotionally distressing time for adolescents, and how they navigate emotions can
have important consequences on their mental health. Indeed, adolescents experience significant anxiety (Merikangas et al., 2010), and children with subclinical levels of anxiety symptoms as well as those who meet diagnostic criteria for an anxiety disorder experience significant impairment associated with anxiety (Cole et al., 1998; Grover et al., 2007; Merikangas et al., 2010).

For the models of child anxiety discussed above to be plausible, it is important to show that parent-child relationship factors and biological factors relate to the four emotion competence domains included in the model (i.e. emotional expression, emotional understanding, emotional acceptance, emotion management). Evidence for these associations is described briefly below.

**Parent-Child Relationship Factors and Emotion Competence.** Relationships with parents have been theorized as being particularly important for the development of emotion competence skills (Laible & Panfile, 2009; Saarni, 1999; Scharfe, 2000). Theories regarding the development of children’s emotion competence often implicate the role of parent-child attachment relationship. Thompson (2001) has argued that how responsive and sensitive parents are to children’s emotional expressions influence how well children are subsequently able to independently manage their emotions. Additionally, Saarni (1999) suggested that the secure base function of the attachment figure serves to encourage children’s exploration of a range of emotions, therefore contributing to the development of emotion competence. She suggested that children who are insecurely attached to caregivers learn over time that certain emotional expressions are not acceptable, and consequently learn that experiencing those particular emotions is also not acceptable (Saarni, 1999).

There is empirical evidence linking parent-child attachment security to children’s skills of emotion competence. In regards to emotional expression, greater attachment security is linked
to less negative emotional expression (Smith, Calkins, & Keane, 2006) and greater positive emotional expression (Diener, Mangelsdorf, McHale, & Frosch, 2002) in infancy and to children’s use of emotion words and ability to label emotions in early childhood (Raikes & Thompson, 2008). Moreover, greater attachment security has also been linked with greater understanding of emotions in children (Brumariu et al., 2012; Laible & Thompson, 1998; Ontai & Thompson, 2002; Raikes & Thompson, 2006; Raikes & Thompson, 2008; Steele, Steele, Croft, & Fonagy, 1999; Thompson & Meyer, 2007). One study found that insecurely attached adolescents demonstrated greater anxiety sensitivity than securely attached adolescents (Weems, Berman, Silverman, & Rodriguez, 2002). Less attachment security has been linked to greater avoidance in one study (Waters, Virmani, Thompson, Meyer, Raikes, & Jochem, 2010) but not another (Brumariu et al., 2012). Moreover, greater attachment security has been linked with greater use of constructive coping in middle childhood (Contreras, Kerns, Weimer, Gentzler, & Tomich, 2000).

Parental emotion socialization behaviors are also conceptualized as important for the development of children’s emotion competence. Children learn to make sense of their internal experience of emotion through their social environment (Saarni, 1999), learning to attribute emotional experiences to external situations. Additionally, children’s evaluation and management of emotions are based on how their family and culture view and manage emotions (Eisenberg et al., 1998). Parents may directly (i.e. overt teaching about emotion, emotional discussion) or indirectly (i.e. parental reactions to children’s emotions, modeling) influence their children’s abilities to identify and respond to others’ emotions, express emotions, and regulate emotions (Denham, Mitchell-Copeland, Strandberg, Auerbach, & Blair, 1997; Eisenberg et al., 1998; Eisenberg, Fabes, Shepard, Guthrie, Murphy, & Reiser, 1999; Morris et al., 2007).
Eisenberg et al. (1998) suggested that children who experience their parents as not being accepting of their emotional expressions may learn that emotions are something to be negatively evaluated, and therefore, may become non-accepting of their own emotional experiences and may be less willing to express, try to understand, or even experience certain emotions. Additionally, Eisenberg, Fabes, and Murphy (1996) theorized that when parents respond in a non-supportive way to children’s negative emotional expressions, it is likely to increase and/or prolong the child’s negative emotions, resulting in emotion dysregulation.

Parental emotion socialization practices have been empirically linked to children’s emotion competence (Denham, 1997; Denham et al., 1997; Eisenberg et al., 1998; Morris et al., 2007; McDowell, Kim, O’Neil, & Parke, 2002). Parents’ non-accepting reactions to children’s emotions are more consistently linked to children’s emotion competence than are parents’ accepting reactions (Eisenberg et al., 1998). Specifically, non-accepting parental reactions (i.e. punitive and minimizing reactions) to children’s emotions are a direct mode of socialization that have been associated with less socioemotion competence in children (Jones, Eisenberg, Fabes, & MacKinnon, 2002), greater facial expression of negative emotions during infancy (Malatesta, Culver, Tesman, Shepard, Fogel, Reimers, et al., 1989), less facial emotional expression of both positive and negative emotions in young children (Fabes, Poulin, Eisenberg, & Madden-Derdich, 2002), and less emotion understanding in early childhood (Denham et al., 1997). No studies have examined how non-accepting parental reactions to children’s emotional expressions are related to children’s own nonacceptance of emotions, although it is clear that the two constructs are conceptually related. Furthermore, non-accepting parental reactions to children’s emotions have been linked to less adaptive regulation skills (Calkins, Smith, Gill, & Johnson, 1998; Eisenberg, Fabes, Carlo, & Karbon, 1992), greater use of avoidant coping by children (Eisenberg et al.,
greater negative emotional intensity and greater emotional reactivity in children (Fabes, Leonard, Kupanoff, & Martin, 2001).

In addition to parent-child attachment security and non-accepting parental reactions to children’s emotions, parental psychological control has also been conceptualized as a parent-child relationship factor that may influence the development of emotion competence in children. Parental psychological control is theorized to be related to children’s emotion competence in that the parental emotion socialization behaviors that are involved in psychological control impinge on children’s emotional development and often intrude upon children’s emotional experience and expression (Barber, 1996). Children’s emotional needs are not met when parents use psychological control, and the use of psychological control inhibits children’s exposure to experiences necessary for normative emotional development (Barber, 1996). Hence, it is likely that children subjected to parental psychological control evidence deficits in their emotion competence skills as a result of the disturbance to their emotional development.

Empirical evidence is also available for parental psychological control’s association with children’s emotion competence development. Aunola, Tolvanen, Viljaranta, and Nurmi (2013) examined parents’ use of psychological control on a daily basis for one week, and they found that greater use of self-reported parental psychological control predicted greater parent-reported negative emotional expression in first grade children the next day. Furthermore, McDowell and Parke (2000) found that greater parental attempts to control children’s emotions were related to children’s lack of emotional knowledge about display rules, socially appropriate ways to express emotion, and negative emotions in middle childhood. The link between parental psychological control and children’s acceptance of their own emotional experiences has not been examined. In regards to emotion management, parental psychological control has been positively associated
with adolescents’ greater use of avoidance in romantic relationships (Pittman, Kerpelman, Soto, & Adler-Baeder, 2012). In sum, there is emerging evidence regarding the impact that parental psychological control has on children and adolescents’ emotion competence skills. However, additional research is needed to examine these relations in different developmental periods, and the empirical association between parental psychological control and children’s acceptance of emotions is needed, as these constructs are conceptually related.

**Biological Factors and Emotion Competence.** In addition to the role that parent-child relationship factors serve in the development of emotion competence skills, various biological factors have been implicated in the development of emotion competence. The parasympathetic nervous system (PNS) component of the ANS may be particularly important for emotional processes, such as the expression, experience and regulation of emotion (Porges et al., 1994). A key component of the PNS is the vagus, which allows for rapid communication between the brain and other organs of the body, including the heart. One component of the vagal system, the nucleus ambiguous, also has connections with the right side of the larynx and affects vocal intonation and the communication of emotion (Porges et al., 1994), suggesting a close link between PNS activity and emotional processes.

Empirical evidence has linked ANS activity to emotional expression children. As theory would suggest, increased HR (Cole, Zahn-Waxler, Fox, Usher, & Welsh, 1996), less HRV (Cole et al., 1996; Field, Woodson, Greenberg, & Cohen, 1982), and lower vagal tone (Cole et al., 1996; Fox, 1989; Stifter, Fox, & Porges, 1989) have been associated with less facial expressivity in infants and preschoolers. One study found that greater HRV, while watching a distressing film, was associated with less verbal communication of distress and fewer facial expressions of distress in girls but not boys in middle childhood., a finding consistent with previous literature
suggesting that children with greater HRV were better able to regulate emotions and to respond to another’s distress with sympathy rather than with their own expression of distress (Fabes, Eisenberg, & Eisenbud, 1993). There are also contradictory findings where two studies did not find significant associations between heart rate and the number of facial emotions expressed (Florin, Freudenberg, & Hollaender, 1985) or consistency/intensity of observed facial expressions (Valiente, Eisenberg, Shepard, Fabes, Cumberland, Losoya, et al., 2004) in middle childhood. Indicators of PNS activity have not often been examined in relation to verbal expression of emotions, although there is reason to believe that PNS activity would be associated with verbal communication of emotions (Porges et al., 1994).

There is little known about the relation between how ANS activity is related to the understanding of emotion in children. Moreover, there is also little evidence for how indicators of ANS activity relate to nonacceptance of emotion. However, one study found that HR was not related to anxiety sensitivity (Leen-Feldner, Reardon, McKee, Feldner, Babson, & Zvolensky, 2006). In regards to emotion management, greater vagal tone has generally been related to more adaptive emotion management, including attention allocation (see Porges, 1992 for a review) and greater ability to self-soothe (Huffman, Bryan, del Carmen, Pedersen, Doussard-Roosevelt, & Porges, 1998) and regulate distress (Fox, 1989). Lower RSA was marginally associated with less self-regulation in children during early childhood (Hastings, Nuselovici, Utendale, Coutya, McShane, & Sullivan, 2008). When examining avoidance as a specific maladaptive emotion management strategy, there is less evidence available. Nugent, Christopher, and Delahanty (2006) found that HR, monitored during hospitalization after the experience of a traumatic event, was predictive of behavioral avoidance and emotional numbing in children (ages 8-18) at 6-week follow-up but not at 6-month follow-up. Additionally, another study examining infants found
that HR was not related to behavioral avoidance (Waters, Matas, & Sroufe, 1975).

**Emotion Factors as Mediators.** Emotion factors may mediate relations between parent-child relationships or biological factors and anxiety in children. Although few studies have empirically examined emotion variables as mediators of the relations between family or biological factors with anxiety, there is some supporting evidence. Bosquet and Egeland (2006) examined these relations longitudinally and found that insecure attachment history in infants negatively predicted emotion regulation abilities (negative reactivity, frustration tolerance, and optimal level of emotion management) in preschool children, which negatively predicted anxiety symptoms in school age children (Bosquet & Egeland, 2006). Brumariu and Kerns (2013) performed a similar study examining longitudinal associations of parent-child attachment in infancy, ability to manage emotions in middle childhood, and anxiety in early adolescence and found that ability to manage emotions mediated relations between parent-child attachment security in infancy and anxiety in early adolescence. They also examined temperament (negative emotionality and shyness) in early childhood and found that the ability to manage emotions mediated relations between negative emotionality in early childhood and anxiety in early adolescence (Brumariu & Kerns, 2013).

Additionally, Brumariu et al. (2012) examined mediating links of emotion factors (i.e. emotion awareness, interpretation biases, and coping strategies) between attachment categories and anxiety symptoms in the middle childhood developmental period. Children’s awareness of emotions mediated the link between secure attachment and anxiety symptoms, and children’s catastrophizing interpretation bias mediated the relations between disorganized attachment and anxiety symptoms. Shackman, Shackman, and Pollak (2007) found that threat-related attention bias mediated the relationship between physical abuse by mothers and children’s anxiety
symptoms in middle childhood. Furthermore, the relations of parental behaviors and cardiac activity with anxiety, as mediated by emotion competence skills, have not yet been tested, although it would be expected that emotion factors would mediate relations between biological factors and anxiety in children (Jacob et al., 2011; Thompson, 2001).

**Current Study**

The goal of the current study is to examine specific links between parent-child relationship factors, biological factors, emotion competence factors, and anxiety symptoms in early adolescence and to test mediating pathways of these relations (see Figure 1). Although early adolescence is an important developmental period to examine these relations, there is a general lack of empirical research examining these relations in adolescent samples. Youth in the developmental period of early adolescence (ages 11-14) and their mothers participated in the current study by completing various measures of the mother-child relationship, emotion competence skills, and total anxiety symptoms. They also participated in dyadic interaction tasks, during which they discussed various topics while their heart rates were continuously monitored. The current study aimed to address the following research questions.

**Research Questions and Hypotheses.** The first research question is whether parent-child relationship factors relate to total anxiety symptoms in early adolescence. It is expected that the well-established finding that less attachment security is associated with greater total anxiety symptoms (Brumariu & Kerns, 2010; Colonessi et al., 2011) will be replicated. It is also expected that greater non-accepting parental emotion socialization behaviors (Dadds et al., 1996; Hudson et al., 2008; Suveg et al., 2005 Suveg et al., 2008) and greater parental psychological control (Brumariu & Kerns, 2015; McShane & Hastings, 2009; Nanda et al., 2012; Settipani et al., 2013; Siqueland et al., 1996) will be associated with greater total anxiety symptoms.
Additionally, it is expected that these parent-child relationship factors will explain a significant portion of variance of anxiety symptoms in adolescents and that each parent-child relationship factor will uniquely account for variance in anxiety.

The second research question is whether biological factors are related to total anxiety symptoms in early adolescence. It is expected that more anxious children will demonstrate higher HR and lower RSA during the baseline period. Additionally, during the stressor (discussion of a time the child experienced an anxiety-provoking event) it is expected that increased HR and excessive suppression of RSA will be associated with greater anxiety symptoms (Biedel, 1988; Friedman, 2007; Matthews et al., 1986; Mezzacappa et al., 1997; Monk et al., 2001; Scheeringa et al., 2004; Weems et al., 2005). Additionally, it is expected that biological factors will explain a significant amount of variance of anxiety symptoms in adolescents. No specific hypotheses are proposed regarding unique contributions of each indicator of ANS activity in explaining variance of anxiety symptoms in adolescence.

The third research question is whether emotion factors are related to total anxiety symptoms in early adolescence. It is expected that less verbal emotional expression (Lahaye et al., 2010; Rieffe et al., 2008), less emotion understanding (Rieffe et al., 2008; Suveg et al., 2009b), greater nonacceptance of emotions (Carthy et al., 2010b; Penza-Clyve & Zeman, 2002; Rieffe et al., 2008; Suveg et al., 2009b), and greater use of maladaptive emotion management, specifically avoidance (Carthy et al., 2010b; Frank et al., 1997; Lengua & Sandler, 1996; Lewis & Kliewar, 1996; Sandler et al., 1994; Spirito et al., 1994) will be associated with greater anxiety symptoms. Moreover, it is expected that overall emotion competence factors will explain a significant portion of variance of anxiety symptoms in adolescents and that each emotion competence skill will explain unique variance in adolescents’ total anxiety symptoms.
The fourth research question is whether emotion factors mediate the relations of parent-child relationship factors and biological factors with anxiety (see Figure 1). It is expected that emotion competence skills will mediate the relations of attachment security, parental non-accepting reactions to adolescents’ negative emotions, and parental psychological control with total anxiety symptoms in adolescence (Bosquet & Egeland, 2006; Brumariu et al., 2012; Shackman et al., 2007; Thompson, 2001). It is also expected that emotion competence skills will mediate the relations of HR and RSA with total anxiety symptoms in adolescence (Esbjørn et al., 2012; Jacob et al., 2011; Thompson, 2001).
Method

Participants

Data collected for the current study were part of a larger research study on anxiety and depression among mothers and adolescents. Participants were recruited through several communities via various recruitment methods inviting mothers and adolescents in 7th or 8th grade to participate in a study on anxiety and depression. Invitation letters were sent home via adolescents’ schools, and advertisements were placed in local newspapers. Families who were interested contacted the research lab to learn more about the study and to sign up to participate. Inclusionary criteria were that the adolescent be between the ages of 11 and 14 and that they participate with their mother. The total sample included 103 adolescents and their mothers.

The sample for the current study included 90 adolescents (45 females and 45 males) and their mothers who returned for the second visit of the larger study and, thus, had complete data. Adolescents ranged in age from 11 to 14 years ($M = 13.42$ years, $SD = 8.63$ months). The sample was Caucasian (86.4%), African American (6.8%), Hispanic (2.9%), and Biracial or of other ethnic background (3.9%). Parents’ education level ranged from 10 to 20 years of formal education (mothers: $M = 14.32$, $SD = 2.05$; fathers: $M = 13.57$, $SD = 2.28$), and parents reported a range of hours worked outside of the home each week from zero to 72 hours (mothers: $M = 23.17$, $SD = 16.95$; fathers: $M = 40.53$, $SD = 13.24$). Fourteen adolescents (15.6%) who attended the second visit, and therefore completed a diagnostic interview, met diagnostic criteria for an anxiety disorder. Differences between non-completers (i.e. only completed Visit 1) and
completers of both visits were examined on measures completed at the first visit. Adolescents who dropped out of the study after the first visit and those who completed both visits did not differ on attachment security, $t(98) = 1.63, p = .13$ (non-completers: $M = 2.96, SD = .60$; completers: $M = 3.26, SD = .49$). Non-completers also did not differ from completers on total anxiety symptoms, $t(101) = .31, p = .76$ ($M = 25.62, SD = 17.58$ and $M = 24.06, SD = 12.56$, respectively).

**Procedure**

Mothers and adolescents completed two study visits at the research laboratory. Upon arrival at the initial visit, participants were provided with detailed verbal and written information regarding what study participation involved. Both mothers and adolescents provided their informed consent to participate before the study visit continued. Each of the two study visits were approximately two hours in length and included similar procedural formats. At each lab visit, mothers were interviewed by a trained graduate student while adolescents completed paper-and-pencil questionnaires, and vice versa where adolescents were interviewed separately by a graduate student while mothers completed their respective questionnaires. During the latter part of each study visit, the dyads completed various interaction tasks together. Pertinent to the current study is the dyadic interaction at the second in-lab visit. The dyadic interaction included various tasks. The two tasks relevant for the current study were a five-minute relaxation period during which mother-child dyads quietly listened to relaxing music as they sat on a couch (baseline) and a six-minute discussion of a recent event that was anxiety-provoking for the adolescent (stressor). A recent anxiety-provoking event discussion was utilized as the stressor task, so that each adolescent could choose something to discuss that was personally anxiety-provoking for them. The topics of the discussion were chosen by the adolescent, the mother, or
in collaboration between the two. Examples of discussion topics included performance situations (e.g. sports try-out, Boy Scout challenge) and family stressors (e.g. divorce/separation) among others. Mother-child dyads were asked to respond to the following questions: “What happened, that made your child feel anxious or nervous?;” “How were each of you feeling about the situation?;” “What, if anything, did each of you do?;” “What, if anything, would you each do differently if the situation happened again?”

Mothers and adolescents received a total of $100 and entry into a raffle for a free laptop if they completed all components of the study. Specifically, dyads received $40 after completion of the first visit and $60 after completion of the second visit. For each day that they completed daily diary assessments over a seven day period, which was completed between the two in-lab study visits, they received an entry into the raffle for a laptop.

Materials

A list of all constructs measured, assessment measures used, and reporters for each measure are provided in Table 1.
Table 1

*Constructs, Assessment Measures, and Reporters of Main Study Variables*

<table>
<thead>
<tr>
<th>Construct Assessed</th>
<th>Assessment Measure</th>
<th>Reporter</th>
</tr>
</thead>
<tbody>
<tr>
<td>Mother-child attachment security</td>
<td>Security Scale</td>
<td>Adolescent</td>
</tr>
<tr>
<td>Nonaccepting maternal reactions to children’s negative emotions</td>
<td>Coping with Children’s Negative Emotions Scale – minimizing and punitive subscales</td>
<td>Mother</td>
</tr>
<tr>
<td>Maternal psychological control</td>
<td>Psychological Control Scale-Youth Self-Report</td>
<td>Adolescent</td>
</tr>
<tr>
<td>Heart rate</td>
<td>UFI Biolog equipment</td>
<td>Physiological recording</td>
</tr>
<tr>
<td>Respiratory Sinus Arrhythmia</td>
<td>UFI Biolog equipment</td>
<td>Physiological recording</td>
</tr>
<tr>
<td>Verbal emotional expression</td>
<td>Parent-Child Affect Communication Task – occurrence of emotion words</td>
<td>Observational coder</td>
</tr>
<tr>
<td>Lack of emotion understanding</td>
<td>Difficulties in Emotion Regulation Scale – Clarity subscale</td>
<td>Adolescent</td>
</tr>
<tr>
<td>Nonacceptance of emotions</td>
<td>Difficulties in Emotion Regulation Scale – Nonacceptance of emotions subscale</td>
<td>Adolescent</td>
</tr>
<tr>
<td>Avoidance</td>
<td>Observational coding system for disengagement</td>
<td>Observational coder</td>
</tr>
<tr>
<td>Anxiety symptoms</td>
<td>Screen for Child Anxiety Related Disorders – total symptoms score</td>
<td>Adolescent</td>
</tr>
</tbody>
</table>

**Parent-Child Relationship Factors**

*Mother-child attachment security*. Adolescents completed a revised version of the Security Scale (Kerns, Klepac, & Cole, 1996; Appendix A) to assess their attachment security with their mothers. The Security Scale included 21 items such as “some kids worry that their
mom does not really love them but others kids are really sure that their mom loves them” and “some kids find it easy to trust their mom but other kids are not sure if they can trust their mom.” For each item, adolescents first decided if they were more like the first kid or the second kid described, and then they decided if that statement was “really true” or “sort of true” for them. Each item yielded a score from one to four. A mean of all item scores was calculated so that higher scores indicated greater attachment security. Fifteen items (1, 2, 3, 4, 6, 7, 9, 10, 12, 13, 15, 16, 18, 19, 21) from the original Security Scale were utilized for the current study. Items used are bolded in Appendix A. Several items (1, 3, 4, 12, 13, 18, 21) were reverse-scored. The scale yielded good internal consistency in the current study ($\alpha = .88$). Data from the Security Scale were available for 99 participants and missing for four participants. One participant refused to complete the measure, two participants completed the measure incorrectly and could not be scored, and one participant’s data was excluded due to evidence that they did not take answering the study questionnaires seriously.

The Security Scale has demonstrated good internal consistency in prior research with middle childhood (.63-.88) and adolescent (.79-.87) samples (i.e. Kerns et al., 1996; Kerns, Aspelmeier, Gentzler & Grabill, 2001; Van Ryzin & Leve, 2012) and also yielded adequate test-retest reliability (Kerns et al., 1996). Moreover, the Security Scale has demonstrated adequate convergent validity. It has shown expected associations with constructs measured concurrently such as self-esteem, peer acceptance (Kerns et al., 1996), and social competence as well as longitudinal associations with an adult attachment measure (Van Ryzin & Leve, 2012). The Security Scale has also shown some discriminant validity in non-significant associations with constructs that would not be expected to relate to attachment, such as athletic ability and grade point average (Kerns et al., 1996).
Nonaccepting maternal reactions to children’s negative emotions. Mothers completed the Coping with Children’s Negative Emotions Scale (CCNES; Fabes, Eisenberg, & Bernzweig, 1990; Appendix B) for which they indicated the likelihood of certain reactions to children’s expressions of negative emotions. The measure included 10 hypothetical situations such as “If my child is afraid of injections and becomes anxious while waiting his/her turn to get a shot, I would.” After each hypothetical situation, mothers rated the likelihood that they would react in six different ways on a 1 (very unlikely) to 7 (very likely) Likert scale. The Coping with Children’s Negative Emotions Scale was developed with and is typically used in younger populations. For the current study, the language of some items was modified to be developmentally appropriate for an early adolescent sample. For example, an original item was phrased, “If my child receives an undesirable birthday gift from a friend and looks obviously disappointed, even annoyed, after opening it in the presence of the friend, I would…,” and it was modified to say “If my child receives a low grade on an important test at school and looks obviously disappointed, I would…” to be more developmentally appropriate.

Two mean-based subscales, punitive and minimizing reactions, were included in the current study as indicators of mothers’ non-accepting emotion socialization behaviors. The punitive reactions to children’s negative emotions subscale, which focuses on parents’ use of punishment in response to children’s negative emotions, included 10 items, such as “Tell him/her to shape up or he/she won’t be allowed to do something he/she likes to do (e.g. watch TV),” (α = .72). Items from this subscale are bolded in Appendix B. The minimizing reactions to children’s negative emotions subscale, which focuses on parents’ reactions that down-play the seriousness of children’s emotions or the situation that upsets them, included 10 items, such as “Tell my child not to make a big deal out of missing the party,” (α = .80). This subscale’s items are
italicized in Appendix B. The punitive and minimizing subscales were aggregated to form an indicator of non-accepting maternal reactions to adolescents’ negative emotions. This decision was based on findings from prior research (Fabes et al., 2002) suggesting these two subscales may actually be assessing the same construct, and because in this data set the two subscales were moderately correlated ($r = .61, p < .001$). The aggregated scale yielded high internal consistency ($\alpha = .85$). Data from the CCNES were available for 90 participants and missing for 13 participants (due to not completing the second visit, at which time this measure was completed).

The CCNES subscales yielded adequate internal consistency (ranging from .69 to .86) in prior research (Eisenberg et al., 1996; Eisenberg et al., 1999; Fabes et al., 2002). Adequate test-retest reliability has also been demonstrated for the CCNES (Fabes et al., 2002). Moreover, the CCNES has shown adequate validity by relating with similar measures of parenting behavior (Fabes et al., 2002) as well as theoretically related constructs, such as social competence (Eisenberg et al., 1996) and emotion competence (Fabes et al., 2002).

**Maternal psychological control.** Adolescents completed a revised version of the Child Report of Parental Behavior Inventory (CRPBI; Schaefer, 1965; revised items by Barber, 1996; Appendix C). Relevant for the current study is the Psychological Control Scale-Youth Self-Report (PCS-YSR; Barber, 1996). This subscale is based on a factor analysis of items from the original CRPBI psychological control subscale and other items written by Barber (1996) to best capture the construct of psychological control. The PCS-YSR contains three items from the original CRPBI and five items written by Barber (1996). The 8-items (2, 4, 5, 8, 10, 11, 14, 16) of the psychological control subscale were rated on a scale from 0 (not like her) to 2 (a lot like her) by adolescents and included items such as, “My mother always tries to change how I feel or think about things.” Items from this subscale are bolded in Appendix C. Higher scores indicate
greater maternal psychological control perceived by adolescents. The subscale was mean-based and yielded adequate reliability ($\alpha = .74$). Data from the PCS-YSR were available for 90 participants and missing for 13 participants (due to not completing the second visit).

The PCS-YR has demonstrated reliability and validity. It has yielded adequate internal consistency in U. S. samples (.80-.83; Barber, 1996; Barber, Stolz, & Olsen, 2005) and low to adequate internal consistency in cross-cultural samples (.52-.83; Barber et al., 2005). The psychological control scale has also demonstrated significant test-retest reliability estimates over a two-year period (.20-.31; Barber et al., 2005). There is also evidence available for the validity of the psychological control scale as it has shown evidence of relating in expected ways to similar constructs of parenting, such as parental support and behavioral control (Barber, 1996; Barber et al., 2005) and to depression and delinquency outcomes (Barber, 1996; Barber et al., 2005).

**Biological Factors**

*Heart rate (HR) and respiratory sinus arrhythmia (RSA).* Adolescents’ heart rate was assessed using UFI Biolog equipment. The UFI Biolog is a portable physiological data recorder that monitors and records moment to moment changes in physiological activity. The current study used the 3991 UFI Biolog model. Adolescents wore the UFI Biolog heart rate and respiration monitors during the 45-minute interaction with their mothers at the second in-lab visit (see above for description of interaction tasks). The adolescents’ heart rate was continuously recorded as they sat in an upright position on a couch and conversed with their mothers. The data were then downloaded from the UFI 3991 Biolog to a computer in the lab. Research from the child literature suggests that heart rate data is often examined from both baseline and stressor tasks (see literature reviewed above). Therefore, heart rate data from the baseline five-minute
relaxation task and the stressor task of a six-minute discussion of a recent anxiety-provoking event will be utilized for analyses for the current study. Heart rate data were only available for adolescents who completed the second study visit.

Kubios HRV heart rate variability analysis software was utilized to visually inspect the heart rate data, filter the data, remove artifacts, and generate psychophysiological metrics, including HR and RSA. The frequency-domain methods for analyzing heart rate data was used, which aggregates heart rate variability across time and is able to separate high and low frequency bands, which is important for distinguishing between SNS and PNS influences on cardiovascular activity (Berntson et al., 2007). Kubios HRV uses a power spectrum density estimate to separate high (.15 - .40 Hz) and low (.04 - .15 Hz) frequencies of heart rate variability. Of interest for the current study is HR, which is thought to be influenced by both the SNS and PNS, and high frequency heart rate variability (or RSA), which is thought to be primarily influenced by the PNS and is considered to be a good indicator of vagal activity. Estimates of HR and RSA were generated for the baseline task as well as the anxiety-provoking event discussion task by Kubios HRV using Fourier transformation methods. Due to developmental considerations, the high frequency range was adjusted from the default of .15 - .40 Hz to .20 – 1.00 to accurately capture the high frequency heart rate variability of adolescents between the ages of 11 and 14 (Wallis, Healy, Undy, & Maconochie, 2005; Zisner & Beauchaine, in press). If at least 70% of the HR data for a given participant and task passed visual inspection and did not include artifacts, the data were analyzed, and the adolescent’s HR and RSA were estimated for that particular task. If data for a task contained more than 30% of data that was not usable due to artifacts, the data were excluded. Based on preliminary visual screening of the data, it was expected that at least 75% of participants would have usable data.
The majority of heart rate data files were cleaned using a medium filter in Kubios HRV heart rate variability analysis software. A strong filter was needed to clean up artifacts from five data files from the baseline period and 12 data files from the stressor task. One of the UFI 3991 Biolog devices began to malfunction towards the end of the study. The data yielded from that device included a greater number of artifacts and in some cases the data were not usable. Data from the five-minute relaxation task (baseline) were available for 67 participants and were unavailable for 36 participants. Missing data were a result of participants not returning for the second visit of the study (\( N = 13 \)), experimenter error (\( N = 2 \)), and equipment malfunction (\( N = 21 \)). For the stressor task, data were available for 70 participants but missing for 33 participants. Data were missing from this task as a result of participants not returning for the second visit of the study (\( N = 13 \)), experimenter error (\( N = 2 \)), and equipment malfunction (\( N = 18 \)). T-tests comparing those who had heart rate data available and those who did not showed there were no significant differences between those individuals on the main study variables.

**Emotion Factors**

**Verbal emotional expression.** Adolescents’ use of verbal emotional expression was coded from the dyadic conversation of a recent anxiety-provoking event for the adolescent (Appendix D) using the Parent-Child Affect Communication Task (PACT; Zahn-Waxler, Ridgeway, Denham, Usher, & Cole, 1993) observational coding system for occurrence of emotion words (Appendix E). Discussions of a recent anxiety-provoking event were transcribed, and transcriptions were coded for occurrence of emotion words. Adolescents’ utterances of positive emotion words (i.e. happy, love) and references to behavioral expressions of positive emotion (i.e. hug, kiss) were tallied. Adolescents’ use of negative emotion words (i.e. sad, scared) and references to behavioral expressions of negative emotion (i.e. cry, yell) were also
tallied. Two coders were trained to use the occurrence of emotion words coding from the PACT observational coding system. Coders first practiced coding the occurrence of emotion words using training transcripts from another study until they demonstrated adequate reliability (i.e. intra-class correlation > .70). Then, coders independently rated the anxiety-provoking discussion transcripts. Verbal expression of emotion scores were reviewed between the coders weekly, and inter-rater reliability was also assessed weekly to monitor coder drift. The positive and negative emotion words were summed to yield a total number of emotion words verbally expressed by adolescents. Differences between the two coders were discussed until a consensus was reached, and the consensus was used as the final score. Higher scores indicated more emotion words verbally expressed. 82% of the transcripts were coded by both coders to establish reliability. Data from the verbal emotional expression coding system were available for 89 participants and missing for 14 participants. Data were missing as a result of participants not completing the second study visit (N = 13) and due to experimenter error (N = 1). The coding yielded good inter-rater agreement (intra-class correlation = .87).

The occurrence of emotion words scale has yielded adequate reliability in prior research (% coder agreement has ranged from 91-95%; Denham et al., 1997; Howe & Rinaldi, 2004). Additionally, this observational coding of verbal emotional expression has also demonstrated validity, relating in expected ways with children’s emotion knowledge (Denham et al., 1997) and perspective-taking abilities (Howe & Rinaldi, 2004).

**Lack of emotional understanding.** Adolescents completed the 36-item version of the Difficulties in Emotion Regulation Scale (DERS; Gratz & Roemer, 2004; Appendix F) at the second in-lab visit. Items were rated on a 1 (almost never) to 5 (almost always) Likert scale with higher scores indicating greater difficulties with emotion regulation. The lack of emotional
clarity subscale was used as an indicator of lack of emotional understanding. This subscale is conceptualized as a reflection of the ability to know and be clear about internal emotional states (Gratz & Roemer, 2004) and included items such as “I have no idea how I am feeling” and “I know exactly how I am feeling” (reverse-scored). The subscale included five items (1-reversed, 4, 5, 7-reversed, 9), which were summed, and yielded adequate reliability ($\alpha = .63$). Items from this subscale are bolded in Appendix F. Higher scores indicate greater difficulties with emotion understanding. Data from the lack of emotion understanding scale were available for 90 participants. Data were missing from 13 participants as a result of not returning for the second study visit.

The DERS was originally developed for use with adults, however recent work has utilized the DERS in adolescent samples and has found it to yield adequate reliability and validity (Neumann et al., 2010; Vasilev, Crowell, Beauchaine, Mead, & Gatzke-Kopp, 2009; Weinberg & Klonsky, 2009). Specifically, the lack of emotional clarity subscale has also yielded good internal consistency (i.e. $\alpha = .72 - .84$; Gratz & Roemer, 2004; Neumann et al., 2010; Vasilev et al., 2009; Weinberg & Klonsky, 2009) and test-retest reliability ($\alpha = .80$, Gratz & Roemer, 2004). Validity has also been demonstrated where lack of emotional clarity has been associated in expected ways with other constructs that would be expected to relate including interpersonal difficulties, internalizing symptoms, externalizing symptoms, substance use, eating disorder symptoms, and suicidal ideation in adolescence (Neumann et al., 2010; Vasilev et al., 2009; Weinberg & Klonsky, 2009).

Nonacceptance of emotions. The nonacceptance of emotions subscale from the DERS was utilized as an indicator of nonacceptance of emotions. This subscale is conceptualized as secondary negative reactions to the experience of emotions and included six items (11, 12, 21,
such as “When I’m upset, I become angry with myself for feeling that way” and “When I’m upset, I feel ashamed with myself for feeling that way.” Items were summed and the scale yielded adequate reliability (α = .85). Items from this subscale are italicized in Appendix F. Higher scores indicate greater nonacceptance of emotions. Data from the nonacceptance of emotion scale were available for 90 participants. Data were missing as a result of 13 participants not returning for the second study visit.

The nonacceptance subscale of the DERS has demonstrated adequate internal consistency in previous research ranging from .72 to .87 (Gratz & Roemer, 2004; Neumann et al., 2010; Vasilev et al., 2009; Weinberg & Klonsky, 2009) and has also shown adequate test-retest reliability (r = .69; Gratz & Roemer, 2004). Validity of the nonacceptance subscale has also been demonstrated through relations with theoretically related constructs such as interpersonal difficulties, self-harm behavior, internalizing and externalizing symptoms, eating disorder symptoms, substance use, and suicidal ideation (Gratz & Roemer, 2004; Neumann et al., 2010; Vasilev et al., 2009; Weinberg & Klonsky, 2009).

**Maladaptive emotion management (avoidance).** The use of avoidance, a maladaptive emotion management strategy, was coded from the mother-adolescent discussion of a recent anxiety-provoking event at the second lab visit (Appendix D) using an observational coding system (Appendix G). This coding system was used in a previous study (Siener & Kerns, 2012) and was a modification of a scale originally developed by Gini, Oppenhiem, and Haimovich (2001). The behavioral coding focuses on the adolescents’ level of engagement in the emotionally-laden conversation with their mother and is scored on a 1(Lack of interest: Disengaged) to 5 (High and genuine interest: Engaged and enthusiastic) scale. Adolescents who scored low on engagement exhibited high levels of disengagement and withdrawal and low
levels of interest in the discussion of an anxiety-provoking event. Adolescents who scored high on engagement demonstrated high levels of interest and curiosity during discussion of the anxiety-provoking event with mothers and low levels of boredom. The level of adolescents’ engagement was used as an indicator of their low avoidance during the discussion of an anxiety-provoking event with mothers. Each mother-adolescent interaction was rated by two independent coders. Coders first practiced coding training videos from another study until they demonstrated adequate reliability (i.e. intra-class correlation > .70). Then, mother-adolescent interactions were coded independently by each rater. Engagement ratings were reviewed between the coders weekly. Any ratings that differed by one point or greater were discussed, and the raters decided on a consensus rating. The coders’ individual ratings were averaged to form an aggregated rating of engagement for each adolescent. Inter-rater agreement for the engagement scale was adequate (intra-class correlation = .76). Data from the avoidance/disengagement scale (maladaptive emotion management) were available for 89 participants and missing for 14 participants. Data were missing as a result of participants not completing the second study visit (N = 13) and due to experimenter error (N = 1). Scores were transformed so that higher values indicated greater avoidance/disengagement.

The original version of the scale (Gini, Oppenheim, & Sagi-Schwartz, 2007) has demonstrated adequate inter-rater reliability (intra-class correlation > .75), and the revised scale used for the current study has also demonstrated adequate inter-rater reliability (intra-class correlation = .93) in prior research (Siener & Kerns, 2012). The observational coding system has also demonstrated adequate validity relating in hypothesized directions with parent-child attachment classifications (Gini et al., 2007).

**Adolescent Anxiety Symptoms.** Adolescents completed the 41-item version of the
Screen for Anxiety Related Emotional Disorders (SCARED; Birmaher, Brent, Chiappetta, Bridge, Monga, & Baugher, 1999; Birmaher, Khetarpal, Brent, Cully, Balach, Kaufman et al., 1997; Appendix H) to assess anxiety symptoms. The SCARED consists of items that assess somatic/panic (“When I get frightened, I feel like throwing up”), generalized (“I worry about what is going to happen in the future”), separation (“I have nightmares about something bad happening to my parents”), social (“I feel nervous with people I don’t know well”), and school (“I get stomachaches at school”) anxiety symptoms and were rated on a 0 (not true or hardly ever true) to 2 (true or often true) scale. Scores from all items were summed to form an indicator of total anxiety symptoms ($\alpha = .84$), and higher scores indicate greater anxiety symptoms. In this sample, 46% of adolescents scored in the clinical range of total anxiety symptoms ($\geq 25$) indicating significantly variability of anxiety symptoms. Anxiety symptoms data were available for 102 participants. One participant’s data was excluded due to evidence that they did not take answering the study questionnaires seriously.

The SCARED is a reliable and valid measurement of anxiety symptoms in child and adolescent populations. The SCARED total anxiety symptoms scale has demonstrated good internal consistency ($\alpha = .90 - .93$; Birmaher et al., 1997; Birmaher et al., 1999; Hale, Raaijmakers, Muris, & Meeus, 2005; Haley, Puskar, & Terhorst, 2011) and test-retest reliability ($r = .70 - .86$; Haley et al., 2011; Birmaher et al., 1997). It has also been shown to be a valid measurement tool. Construct validity of the SCARED has been demonstrated in expected associations with a similar measure of anxiety symptoms in children (Muris, Schmidt, & Merckelbach, 2000). The SCARED total anxiety symptoms scale has demonstrated discriminant validity by discriminating between anxious children compared to children without any psychiatric diagnoses, those with depression, and children with disruptive behavior disorders.
(Birmaher et al., 1997; Birmaher et al., 1999).
Results

Data Analysis Plan

Study analyses were conducted using SPSS 22. The descriptive statistics of all study variables were examined, including means, standard deviations, kurtosis and skew values, and visual examination of histogram and Q-Q plots. Several analyses were conducted to determine if demographic variables (gender, age of adolescents, ethnicity of adolescents, and years of maternal and paternal education) were associated with the main study variables. Correlations between age of adolescents and years of parental education with the main study variables were used to determine if there were any significant associations. Differences between genders and ethnicities (Caucasian compared to non-Caucasian participants) on the main study variables were examined using t-tests. Correlations between the main study variables were also examined to determine how highly related they were to each other.

Correlations and regressions were used to test the first three research questions. Correlations of mother-child attachment security, non-accepting maternal reactions to adolescents’ negative emotions, and maternal psychological control with adolescents’ total anxiety symptoms were first examined. A regression analysis was utilized to examine the overall contribution of all mother-child relationship factors in explaining variance in adolescents’ anxiety symptoms as well as the unique contribution of each mother-child relationship factor. Next, correlations of adolescents’ HR and RSA at baseline and during the anxiety-provoking discussion with adolescents’ self-reported total anxiety symptoms were inspected. All analyses with HR and RSA from the anxiety-provoking discussion task controlled for baseline HR or
RSA, as recommended, to control for baseline individual differences (Zisner & Beauchaine, in press). A regression analysis was also performed to examine the overall contribution of HR and RSA at baseline and during the anxiety-provoking event and the unique contribution of each variable in explaining variance in adolescents’ anxiety symptoms. Lastly, correlations of verbal expression of emotion, lack of understanding of emotions, nonacceptance of emotion, and avoidance with adolescents’ total anxiety symptoms were also investigated. The overall contribution of all emotion competence factors and the unique contribution of each emotion competence skill towards explaining the variance in adolescents’ anxiety symptoms were examined utilizing a regression analysis.

Multiple mediation with bootstrapping was employed to investigate the fourth research question of whether emotion factors mediate the relations of mother-child relationship factors or biological factors with anxiety in early adolescence. Multiple mediation is a statistical analysis technique that allows several indirect effects between a predictor variable and an outcome variable to be tested at once (Preacher & Hayes, 2008). Specific indirect effects (the unique indirect effect of only one mediator in a set between a predictor and an outcome variable) as well as the total indirect effect (the sum of all specific indirect effects between a predictor and an outcome variable) can be examined. Multiple mediation analysis with bootstrapping was used (which does not assume multivariate normality) given the relatively small sample size of the current study. Bootstrapping is an analytic technique in which samples are repeatedly taken from a data set in order to repeatedly estimate the indirect effects (Preacher & Hayes, 2008). The number of resamplings for a given analysis can be specified, and confidence intervals for indirect effects are based on all of the sampling estimates of the study sample (Preacher & Hayes, 2008). A macro to run multiple mediation analyses with bootstrapping in SPSS is provided by Preacher.
and Hayes (2008) and was used for the current study. The macro automatically provides 95% confidence intervals for the multiple mediation analyses. For the current study, 5000 resamplings was specified based on the recommendation put forth by Hayes (2009). The 95% bias corrected confidence intervals were examined, and if they did not contain a zero value, it was concluded that a particular emotion competence skill mediated relations to anxiety symptoms (Hayes, 2009; Preacher & Hayes, 2008).

Seven multiple mediation analyses using bootstrapping were planned. However, multiple mediation analyses were conducted only if the mother-child relationship factors or biological factors were significantly correlated with the emotion competence factors. Each analysis included one predictor variable (e.g., mother-child attachment security, nonaccepting maternal reactions to children’s negative emotions, maternal psychological control, HR baseline, HR stressor, RSA baseline, RSA stressor), the four emotion competence variables as mediators, and adolescents’ anxiety symptoms as the dependent variable. Analyses with HR or RSA from the anxiety-provoking discussion task were planned to control for HR or RSA, respectively, from the baseline period. The overall indirect effect of all four emotion competence variables were examined for each analysis as well as the specific indirect effects of each emotion competence variable in mediating relations between the predictors and adolescents’ anxiety. There were no hypotheses regarding whether specific indirect effects of different emotion competence variables (i.e. verbal emotional expression, avoidance, etc.) between the predictor variables and anxiety would differ in magnitude, and therefore statistical comparisons between specific indirect effects were not examined.

**Missing data.** In addition to utilizing SPSS 22 to run statistical analyses, the MPlus program was also used to address missing data by imputing data using multiple data imputation.
All analyses were run in both SPSS 22 using the original data set and in MPlus using the imputed data set. Results yielded by the two statistical programs were compared. There were no differences in significance between the two sets of analyses. Results from the SPSS analyses are reported.

**Preliminary Analyses**

Descriptive data for the main study variables are presented in Table 2. Several aspects of the descriptive data were of note. On average, adolescents did not rate their mothers as being very psychologically controlling, and therefore, this variable had a limited range for the entire sample. As would be expected, adolescents demonstrated higher average HR and lower average RSA during the stressor task (anxiety-provoking discussion with their mothers) compared to the baseline period, indicating greater cardiac activity during the stressor task. T-tests indicated the increase in adolescents’ HR and decrease in RSA from the baseline period to the stressor task were both significant changes, $t(66) = 5.71, p < .001$ and $t(66) = 5.25, p < .001$, respectively. Periods of rest are typically accompanied by slower HR and higher RSA, whereas stressor periods are accompanied by higher HR and lower RSA (indicating an increase in sympathetic nervous system activity and decrease in parasympathetic nervous system activity), and therefore this pattern of change across tasks is what would be expected. Adolescents were not very verbally expressive of their emotions; on average adolescents used less than five emotion words during the 6-minute discussion of an anxiety-provoking event. Additionally, the mean for total anxiety symptoms was just below the clinical cut off for the SCARED screener ($≥ 25$) indicating the overall sample of adolescents endorsed a substantial number of anxiety symptoms with 46% of adolescents yielding a score of 25 or greater. The kurtosis and skew values and histogram and Q-Q plots for each variable were also examined, and all variables approximated a normal
distribution. Therefore, no data transformations were needed, and untransformed data were used for analyses.

Correlations and t-tests were utilized to examine associations between demographic variables (gender, age of adolescents, ethnicity of adolescents, and years of maternal and paternal education) and the main study variables, and several effects were significant. There were no gender differences on any of the study variables. Younger adolescents reported greater anxiety symptoms \((r = -.21, p = .04)\) and also evidenced marginally higher baseline heart rates \((r = -.24, p = .05)\). Comparisons between Caucasian and non-Caucasian adolescents revealed that Caucasian adolescents \((M = 2.86, SD = .78)\) evidenced greater avoidance during conversations with their mothers in comparison to non-Caucasian adolescents \((M = 2.27, SD = .90)\), \(t(87) = 2.30, p = .02\). Mothers with more years of education had adolescents who reported greater mother-child attachment security \((r = .29, p = .004)\) and showed less avoidance during the anxiety-provoking discussion \((r = -.23, p = .04)\). Fathers with more years of education also had adolescents who reported greater mother-child attachment security \((r = .24, p = .02)\), evidenced higher RSA at baseline \((r = .28, p = .03)\), and marginally lower heart rates at baseline \((r = -.24, p = .06)\). Subsequent analyses were run with and without controlling for demographic variables (age and ethnicity of adolescents, maternal and paternal level of education).
Table 2

Descriptive Statistics of Main Study Variables

<table>
<thead>
<tr>
<th></th>
<th>N</th>
<th>M</th>
<th>SD</th>
<th>Min.</th>
<th>Max.</th>
<th>Max. possible range</th>
<th>Reliability</th>
</tr>
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<tbody>
<tr>
<td>Mother-child attachment security</td>
<td>99</td>
<td>3.22</td>
<td>.51</td>
<td>1.80</td>
<td>3.87</td>
<td>1 - 4</td>
<td>.88</td>
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<tr>
<td>Nonaccepting maternal reactions to children’s negative emotions</td>
<td>90</td>
<td>2.31</td>
<td>.77</td>
<td>1.00</td>
<td>4.65</td>
<td>1 - 7</td>
<td>.85</td>
</tr>
<tr>
<td>Maternal psychological control</td>
<td>90</td>
<td>.41</td>
<td>.35</td>
<td>.00</td>
<td>1.75</td>
<td>0 - 2</td>
<td>.74</td>
</tr>
<tr>
<td>HR baseline</td>
<td>67</td>
<td>78.63</td>
<td>11.94</td>
<td>46.61</td>
<td>111.66</td>
<td>-</td>
<td>-</td>
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<tr>
<td>HR stressor</td>
<td>70</td>
<td>84.47</td>
<td>14.79</td>
<td>48.06</td>
<td>137.80</td>
<td>-</td>
<td>-</td>
</tr>
<tr>
<td>RSA baseline</td>
<td>67</td>
<td>42.26</td>
<td>18.11</td>
<td>6.20</td>
<td>85.30</td>
<td>-</td>
<td>-</td>
</tr>
<tr>
<td>RSA stressor</td>
<td>70</td>
<td>29.19</td>
<td>13.71</td>
<td>7.80</td>
<td>71.80</td>
<td>-</td>
<td>-</td>
</tr>
<tr>
<td>Verbal emotional expression</td>
<td>89</td>
<td>4.93</td>
<td>4.09</td>
<td>.00</td>
<td>23.00</td>
<td>0 – no upper limit</td>
<td>.87</td>
</tr>
<tr>
<td>Lack of emotional understanding</td>
<td>90</td>
<td>9.73</td>
<td>3.24</td>
<td>5.00</td>
<td>18.00</td>
<td>0 – 25</td>
<td>.63</td>
</tr>
<tr>
<td>Nonacceptance of emotions</td>
<td>90</td>
<td>9.95</td>
<td>4.55</td>
<td>5.00</td>
<td>24.00</td>
<td>0 - 30</td>
<td>.85</td>
</tr>
<tr>
<td>Avoidance</td>
<td>89</td>
<td>2.80</td>
<td>.81</td>
<td>1.00</td>
<td>4.50</td>
<td>1 - 5</td>
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<td>13.19</td>
<td>3.00</td>
<td>60.00</td>
<td>0 - 76</td>
<td>.84</td>
</tr>
</tbody>
</table>

Correlations between all predictor variables were examined to determine how highly they are related to each other and bivariate and partial correlations are displayed in Table 3. As expected, there were associations between mother-child relationship variables. Adolescents who reported greater attachment security with mothers reported that their mothers were less psychologically controlling. Although these two mother-child relationship measures were related, they were not redundant with each other. Mothers who rated themselves as having greater non-accepting reactions to children’s negative emotions were rated by their adolescents
as being more psychologically controlling as well. However, non-accepting maternal reactions to children’s negative emotions were not related to mother-child attachment security.

HR and RSA were negatively correlated at both the baseline and stressor periods, as would be theoretically expected. Adolescents whose mothers were less accepting of their emotional expressions evidenced greater HR during the anxiety-provoking discussion (after controlling for the demographic variables), as has been shown in previous work with younger children (Bell & Belsky, 2008). However, adolescents with greater attachment security with their mothers demonstrated greater decreases in RSA from baseline to the stressor task. This finding is somewhat unexpected, as large reductions in RSA from baseline to reactivity to a stressor are often associated with maladaptive outcomes (Beauchaine, 2001; Vasilev et al., 2009).

There were also some significant associations among the emotion competence variables. Adolescents who evidenced a lack of emotion understanding reported greater nonacceptance of emotions. The two variables, both subscales from the DERS measure, were highly related but were not redundant with one another. Additionally, adolescents who were more verbally expressive of emotion demonstrated less avoidance during the anxiety-provoking discussion with their mothers. These two variables showed a small to medium association with each other and were therefore not redundant.

As would be expected, adolescents who reported less attachment security with their mothers and more psychological control by their mothers also reported less emotion understanding and greater nonacceptance of emotions, supporting theories that posit children’s emotional development is impacted by the mother-child relationship. Unexpectedly, the biological factors, HR and RSA during both the baseline and stressor periods, were not significantly associated with the adolescents’ emotion competence factors. Therefore, subsequent
mediation analyses were not conducted to test whether the emotion competence factors mediated relations between the biological factors and adolescents’ anxiety symptoms.
Table 3

*Correlation Matrix of All Predictor Variables*

<table>
<thead>
<tr>
<th></th>
<th>1</th>
<th>2</th>
<th>3</th>
<th>4</th>
<th>5</th>
<th>6</th>
<th>7</th>
<th>8</th>
<th>9</th>
<th>10</th>
<th>11</th>
</tr>
</thead>
<tbody>
<tr>
<td>1. Mother-child attachment security</td>
<td>-</td>
<td>1.17</td>
<td>2.39**</td>
<td>2.24*</td>
<td>2.11</td>
<td>2.10</td>
<td>2.08</td>
<td>2.32**</td>
<td>2.13</td>
<td>2.12</td>
<td>2.10</td>
</tr>
<tr>
<td>2. Nonaccepting maternal reactions to children’s negative emotions</td>
<td>1.17</td>
<td>-</td>
<td>2.17</td>
<td>2.24*</td>
<td>2.11</td>
<td>2.10</td>
<td>2.08</td>
<td>2.32**</td>
<td>2.13</td>
<td>2.12</td>
<td>2.10</td>
</tr>
<tr>
<td>3. Maternal psychological control</td>
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<td>2.17</td>
<td>-</td>
<td>2.39**</td>
<td>2.24*</td>
<td>2.11</td>
<td>2.10</td>
<td>2.08</td>
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<td>2.02</td>
<td>2.08</td>
<td>2.32**</td>
<td>2.13</td>
<td>2.12</td>
<td>2.10</td>
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<tr>
<td>5. HR stressor</td>
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<td>-</td>
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<td>2.10</td>
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<td>6. RSA baseline</td>
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<td>-</td>
<td>2.32**</td>
<td>2.13</td>
<td>2.12</td>
<td>2.10</td>
</tr>
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<td>7. RSA stressor</td>
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<td>(.03)</td>
<td>(- .18)</td>
<td>(- .30*)</td>
<td>(.21)</td>
<td></td>
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<tr>
<td></td>
<td>(- .02)</td>
<td>(- .10)</td>
<td>(.02)</td>
<td>(- .01)</td>
<td>(- .07)</td>
<td>(.07)</td>
<td>(- .21)</td>
<td></td>
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<td>9. Lack of emotional understanding</td>
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<tr>
<td></td>
<td>(- .29*)</td>
<td>(.24)</td>
<td>(.25)</td>
<td>(.03)</td>
<td>(- .17)</td>
<td>(- .08)</td>
<td>(.12)</td>
<td>(- .13)</td>
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<tr>
<td>10. Nonacceptance of emotions</td>
<td></td>
<td></td>
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<td></td>
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<td></td>
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<td>- .24*</td>
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<td></td>
<td></td>
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</tr>
<tr>
<td></td>
<td>(- .35**)</td>
<td>(.24)</td>
<td>(.43**)</td>
<td>(.13)</td>
<td>(- .21)</td>
<td>(.14)</td>
<td>(.12)</td>
<td>(- .09)</td>
<td>(.52**)</td>
<td></td>
<td></td>
</tr>
<tr>
<td>11. Avoidance</td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
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<td>- .20</td>
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<td></td>
</tr>
<tr>
<td></td>
<td>(- .08)</td>
<td>(.22)</td>
<td>(.04)</td>
<td>(.04)</td>
<td>(- .09)</td>
<td>(- .14)</td>
<td>(.13)</td>
<td>(- .26)</td>
<td>(.06)</td>
<td>(.11)</td>
<td></td>
</tr>
</tbody>
</table>

Note. Partial correlations (controlling for adolescents’ age and ethnicity as well as parental level of education) are reported in parentheses. Correlations between HR stressor and other variables are also controlling for HR baseline. Correlations between RSA stressor and other variables are also controlling for RSA baseline.  
* p < .05. ** p < .01.
Research Question Analyses

Research question 1: Are mother-child relationship factors related to total anxiety symptoms in early adolescence? It was expected that less attachment security, greater non-accepting parental emotion socialization behaviors, and greater psychological control would be associated with greater total anxiety symptoms. Correlation analyses (bivariate and partial) were utilized to examine associations between mother-child relationship factors and anxiety symptoms and are displayed in Table 4.
### Table 4

**Associations Between all Predictor Variables and Total Anxiety Symptoms**

<table>
<thead>
<tr>
<th>Predictor Variable</th>
<th>Anxiety Symptoms</th>
</tr>
</thead>
<tbody>
<tr>
<td>Mother-child attachment security</td>
<td>-.28** (-.35**)</td>
</tr>
<tr>
<td>Nonaccepting maternal reactions to children’s negative emotions</td>
<td>.08 (.06)</td>
</tr>
<tr>
<td>Maternal psychological control</td>
<td>.34** (.27)</td>
</tr>
<tr>
<td>HR baseline</td>
<td>.11 (.13)</td>
</tr>
<tr>
<td>HR stressor</td>
<td>-.10 (-.08)</td>
</tr>
<tr>
<td>RSA baseline</td>
<td>.27* (.28*)</td>
</tr>
<tr>
<td>RSA stressor</td>
<td>.01 (-.07)</td>
</tr>
<tr>
<td>Verbal emotional expression</td>
<td>.08 (-.03)</td>
</tr>
<tr>
<td>Lack of emotional understanding</td>
<td>.38** (.35**)</td>
</tr>
<tr>
<td>Nonacceptance of emotions</td>
<td>.40** (.47**)</td>
</tr>
<tr>
<td>Avoidance</td>
<td>-.14 (-.02)</td>
</tr>
</tbody>
</table>

*Note: Bivariate and partial correlations between predictor variables and anxiety symptoms are displayed. Partial correlations represent associations controlling for adolescents’ age and ethnicity as well as parental level of education. The correlation between HR stressor and anxiety symptoms is controlling for HR baseline. The correlation for RSA stressor and anxiety symptoms is controlling for RSA baseline. * p < .05. ** p < .01.*

As predicted, adolescents who reported less secure attachment relationships with their mothers and greater use of psychological control by mothers also reported greater total anxiety symptoms. However, the association between parental psychological control and anxiety
symptoms was only marginally significant after controlling for demographic variables. Non-accepting parental reactions to adolescents’ expressions of negative emotions were unexpectedly not associated with adolescents’ anxiety symptoms.

A regression analysis was utilized to examine the overall contribution of all mother-child relationship factors in explaining variance in adolescents’ anxiety symptoms as well as the unique contribution of each mother-child relationship factor. As hypothesized, regression analyses revealed the three mother-child relationship factors accounted for a significant amount of variance (13%) of adolescents’ total anxiety symptoms, after controlling for demographic variables (see Table 5). Contrary to prediction, none of the mother-child relationship factors were unique predictors of adolescents’ anxiety symptoms (attachment security: $\beta = -.23, p = .09$; non-accepting parental reactions: $\beta = -.02, p = .84$; psychological control: $\beta = .21, p = .09$). Standardized regression coefficients are reported.
Table 5

Mother-Child Relationship Predictors of Total Anxiety Symptoms

<table>
<thead>
<tr>
<th>Variable</th>
<th>Model 1 B</th>
<th>Model 2 B</th>
</tr>
</thead>
<tbody>
<tr>
<td>Constant</td>
<td></td>
<td></td>
</tr>
<tr>
<td>Age</td>
<td>-.20</td>
<td>-.23*</td>
</tr>
<tr>
<td>Ethnicity</td>
<td>-.04</td>
<td>.01</td>
</tr>
<tr>
<td>Maternal education</td>
<td>-.02</td>
<td>.04</td>
</tr>
<tr>
<td>Paternal education</td>
<td>.03</td>
<td>.04</td>
</tr>
<tr>
<td>Mother-child attachment security</td>
<td></td>
<td>-.23</td>
</tr>
<tr>
<td>Nonaccepting maternal reactions to children’s</td>
<td></td>
<td>-.02</td>
</tr>
<tr>
<td>negative emotions</td>
<td></td>
<td></td>
</tr>
<tr>
<td>Maternal psychological control</td>
<td>.21</td>
<td></td>
</tr>
<tr>
<td>$R^2$</td>
<td>.04</td>
<td>.42</td>
</tr>
<tr>
<td>$F$</td>
<td>.87</td>
<td>2.25*</td>
</tr>
<tr>
<td>$\Delta R^2$</td>
<td></td>
<td>.13</td>
</tr>
<tr>
<td>$\Delta F$</td>
<td></td>
<td>3.94*</td>
</tr>
</tbody>
</table>

*Note. Standardized regression coefficients are displayed.

*p < .05.

Research question 2: Are biological factors related to total anxiety symptoms in early adolescence? It was predicted that higher HR and lower RSA would be associated with greater total anxiety symptoms. To examine the associations between biological factors and total anxiety symptoms correlation analyses (bivariate and partial) were conducted and results are reported in Table 4. Contrary to hypothesis, adolescents who evidenced higher RSA during the baseline period reported greater anxiety symptoms. Also contrary to expectation, HR at baseline
and HR and RSA during the stressor period were not significantly associated with anxiety symptoms.

Regression analysis was conducted to determine the variance accounted for in adolescents’ anxiety symptoms by the biological factors and the unique effect of each biological factor controlling for all others. Contrary to hypotheses, regression analyses revealed the biological factors accounted for a small amount of variance (12%) of adolescents’ total anxiety symptoms, after controlling for demographic variables, that was not statistically significant (see Table 6). Although the biological factors accounted for a similar amount of variance of anxiety symptoms as the parent-child relationship factors, the analysis included fewer participants and had less statistical power. However, baseline RSA was a significant unique predictor of adolescents’ anxiety symptoms but in the opposite direction of expectation (β = .37, p = .01). The other indicators of cardiac activity were not unique predictors of adolescents’ anxiety symptoms (baseline HR: β = .38, p = .13; stressor HR: β = -.23, p = .34; stressor RSA: β = -.05, p = .73). Although there was a substantial amount of missing heart rate data, it is unlikely that a lack of statistical power would explain the non-significant findings. Analyses were conducted with the original data set and with a data set that included imputed data for all missing values, and non-significant results were found with both data sets.
Table 6

*Biological Predictors of Total Anxiety Symptoms*

<table>
<thead>
<tr>
<th>Variable</th>
<th>Model 1 B</th>
<th>Model 2 B</th>
</tr>
</thead>
<tbody>
<tr>
<td>Constant</td>
<td></td>
<td></td>
</tr>
<tr>
<td>Age</td>
<td>-.26</td>
<td>-.19</td>
</tr>
<tr>
<td>Ethnicity</td>
<td>.08</td>
<td>.14</td>
</tr>
<tr>
<td>Maternal education</td>
<td>-.02</td>
<td>-.04</td>
</tr>
<tr>
<td>Paternal education</td>
<td>.11</td>
<td>.08</td>
</tr>
<tr>
<td>HR baseline</td>
<td></td>
<td>.38</td>
</tr>
<tr>
<td>HR stressor</td>
<td></td>
<td>-.23</td>
</tr>
<tr>
<td>RSA baseline</td>
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<td>.37*</td>
</tr>
<tr>
<td>RSA stressor</td>
<td></td>
<td>-.05</td>
</tr>
<tr>
<td>$R^2$</td>
<td>.09</td>
<td>.20</td>
</tr>
<tr>
<td>$F$</td>
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<td>$\Delta R^2$</td>
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<td>.12</td>
</tr>
<tr>
<td>$\Delta F$</td>
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<td>1.91</td>
</tr>
</tbody>
</table>

*Note.* Standardized regression coefficients are displayed.

*p < .05.

**Research question 3:** Are emotion factors related to total anxiety symptoms in early adolescence? Less verbal emotional expression, less emotion understanding, greater nonacceptance of emotions, and greater avoidance during the discussion of an anxiety-provoking event were predicted to be associated with greater total anxiety symptoms. It was expected that a significant amount of variance of adolescents’ anxiety symptoms would be accounted for by all emotion competence skills and that each specific emotion competence skill would explain a
unique portion of variance.

Correlation analyses were conducted to examine associations between emotion factors and anxiety symptoms, and results are displayed in Table 4. As predicted, less emotional understanding and greater nonacceptance of emotions were associated with greater total anxiety symptoms. Unexpectedly, verbal expression of emotion and avoidance during the anxiety-provoking discussion with mothers were not related to anxiety symptoms.

Another regression analysis was conducted to determine the amount of variance in adolescents’ anxiety symptoms that was accounted for by the emotion competence factors and to examine unique effects of each emotion competence factors on anxiety symptoms. In line with hypotheses, regression analyses revealed the emotion factors accounted for a significant amount of variance (23%) of adolescents’ total anxiety symptoms, after controlling for demographic variables (see Table 7). As hypothesized, nonacceptance of emotion was a significant unique predictor of anxiety symptoms ($\beta = .39, p = .002$). However, contrary to prediction, the other emotion factors were not unique predictors of adolescents’ anxiety symptoms (verbal expression of emotion: $\beta = .05, p = .63$; lack of emotion understanding: $\beta = .14, p = .25$; avoidance: $\beta = -.13, p = .24$).
Table 7

*Emotion Competence Predictors of Total Anxiety Symptoms*

<table>
<thead>
<tr>
<th>Variable</th>
<th>Model 1 $B$</th>
<th>Model 2 $B$</th>
</tr>
</thead>
<tbody>
<tr>
<td>Constant</td>
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<tr>
<td>Age</td>
<td>-.20</td>
<td>-.20</td>
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<tr>
<td>Ethnicity</td>
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<td>-.004</td>
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<tr>
<td>Maternal education</td>
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<td>-.18</td>
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<td>.05</td>
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<tr>
<td>Verbal emotional expression</td>
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<tr>
<td>Lack of emotion understanding</td>
<td>.14</td>
<td></td>
</tr>
<tr>
<td>Nonacceptance of emotions</td>
<td>.39**</td>
<td></td>
</tr>
<tr>
<td>Avoidance</td>
<td>-.13</td>
<td></td>
</tr>
<tr>
<td>$R^2$</td>
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<td>$F$</td>
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<tr>
<td>$\Delta R^2$</td>
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<td>$\Delta F$</td>
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</tbody>
</table>

*Note.* Standardized regression coefficients are displayed.

*p < .05, **p < .001.*
Research question 4: Do emotion factors mediate the relations of mother-child relationships and biological factors with anxiety in early adolescence? The emotion competence variables were hypothesized to mediate relations of mother-child relationship factors and biological factors with adolescents’ total anxiety symptoms. However, given that biological factors were not significantly correlated with the emotion competence factors, mediation analyses were not conducted for the biological factors, emotion competence factors, and anxiety. Three multiple mediation analyses were conducted using bootstrapping to evaluate whether the four emotion competence factors mediate relations of the mother-child relationship factors with adolescents’ total anxiety symptoms. The total indirect effect (of all emotion competence factors) and specific indirect effects (the unique indirect effect of a single emotion competence factors while controlling for the other three emotion competence factors) were examined for each mediation analysis. Results of the multiple mediation analyses are presented in Table 8.
Table 8

 Bootstrapping Indirect Effects of Mother-Child Factors on Adolescents' Total Anxiety Symptoms through Emotion Competence Factors

<table>
<thead>
<tr>
<th></th>
<th>BC 95% CI</th>
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</thead>
<tbody>
<tr>
<td></td>
<td>Lower</td>
<td>Upper</td>
<td></td>
</tr>
<tr>
<td>Mother-child attachment security</td>
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</tr>
<tr>
<td>Total</td>
<td>-8.97</td>
<td>-1.19</td>
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<tr>
<td>Verbal emotional expression</td>
<td>-2.58</td>
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<tr>
<td>Lack of emotional understanding</td>
<td>-3.86</td>
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<tr>
<td>Nonacceptance of emotions</td>
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<td>Avoidance</td>
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<tr>
<td>Nonaccepting maternal reactions</td>
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<tr>
<td>Total</td>
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<td>3.30</td>
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<tr>
<td>Verbal emotional expression</td>
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</tr>
<tr>
<td>Lack of emotional understanding</td>
<td>-.17</td>
<td>1.58</td>
<td></td>
</tr>
<tr>
<td>Nonacceptance of emotions</td>
<td>-.08</td>
<td>3.25</td>
<td></td>
</tr>
<tr>
<td>Avoidance</td>
<td>-1.31</td>
<td>.09</td>
<td></td>
</tr>
<tr>
<td>Maternal psychological control</td>
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<td></td>
<td></td>
</tr>
<tr>
<td>Total</td>
<td>2.00</td>
<td>15.64</td>
<td></td>
</tr>
<tr>
<td>Verbal emotional expression</td>
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<td>2.51</td>
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</tr>
<tr>
<td>Lack of emotional understanding</td>
<td>-1.57</td>
<td>5.65</td>
<td></td>
</tr>
<tr>
<td>Nonacceptance of emotions</td>
<td>.95</td>
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</tr>
<tr>
<td>Avoidance</td>
<td>-.45</td>
<td>2.50</td>
<td></td>
</tr>
</tbody>
</table>

Note. All multiple mediation analyses controlled for adolescents' age and ethnicity as well as parental levels of education. Bolded values indicate significant indirect effects. BC 95% CI = bias corrected 95% confidence intervals.

As predicted, for mother-child attachment security the total indirect effect of all emotion
competence skills was significant, indicating that emotion competence mediated relations between mother-child attachment security and adolescents’ anxiety symptoms. When controlling for all other emotion competence variables, adolescents’ nonacceptance of emotion was the only significant specific indirect mediator of the association between attachment security and anxiety symptoms. Verbal expression of emotion, lack of emotion understanding, and avoidance during the anxiety-provoking discussion were not unique mediators of the association between mother-child attachment security and anxiety symptoms.

Contrary to hypotheses, emotion competence did not mediate the association between nonaccepting parental reactions to children’s negative emotions and anxiety symptoms. Neither the total indirect effect nor the specific indirect effects of the emotion competence factors were significant.

As hypothesized, the emotion competence variables mediated relations between parental psychological control and adolescents’ anxiety symptoms. Adolescents’ nonacceptance of emotion yielded the only significant specific indirect effect. The relation between parental psychological control and anxiety symptoms were not uniquely mediated by verbal expression of emotion, lack of emotion understanding, or avoidance during the anxiety-provoking discussion. See Figure 2 for an illustration of significant mediation pathways.
Figure 2. Illustration of significant mediation pathways (significant specific indirect effect underlined).
Discussion

Summary of Study Findings

The current study found support for the first research question, in that adolescents with less secure attachment relationships with their mothers and more psychologically controlling mothers reported greater total anxiety symptoms. However, nonaccepting parental reactions to children’s negative emotional expressions were not related to adolescents’ anxiety symptoms. Additionally, mother-child relationship factors accounted for a significant amount of variance in adolescents’ anxiety symptoms. Tests of the second research question, of whether biological factors are related to adolescent’s anxiety symptoms, revealed that adolescents who evidenced higher RSA during the baseline period reported greater anxiety symptoms. This effect was in the opposite direction of what would be theoretically expected. Also contrary to hypotheses, the other indicators of cardiac activity were not associated with anxiety symptoms, and the biological factors did not account for a significant amount of variance in adolescents’ anxiety symptoms. In regards to the third research question, analyses from the current study indicated that adolescents with less emotional understanding and greater nonacceptance of emotions reported greater anxiety symptoms. Verbal expression of emotion and avoidance during the anxiety-provoking discussion with mothers were not associated with adolescents’ anxiety symptoms. Overall, the emotion competence factors accounted for a significant amount of variance in anxiety symptoms, and nonacceptance of emotion was a significant unique predictor of adolescents’ anxiety symptoms.

For the mediation analyses that were conducted to test the fourth research question, the
association between mother-child attachment security and adolescents’ anxiety symptoms was mediated by the emotion competence factors, and adolescents’ nonacceptance of emotion remained a significant unique mediator when controlling for all other emotion competence mediators. The same was found for parental psychological control and anxiety symptoms, where the four emotion competence factors significantly mediated the relations and nonacceptance of emotion remained a significant unique mediator when controlling for the other emotion competence factors. Emotion competence did not mediate relations of nonaccepting parental reactions to children’s negative emotions with adolescents’ total anxiety symptoms. Overall, results from the current study indicate that mother-child relationship factors and emotion competence factors are particularly important for anxiety symptoms in early adolescence. Additionally, the current study provides evidence that emotion competence factors mediate relations between mother-child relationship factors and adolescents’ anxiety symptoms, and that adolescents’ nonacceptance of emotions may be particularly important in the development and maintenance of anxiety symptoms.

**Parent-Child Relationship Factors and Anxiety**

Parent-child relationship factors have been theorized as important factors that are related to the development and maintenance of anxiety in childhood and adolescence (Ginsburg et al., 2004; Laible & Panfile, 2009; McLeod et al., 2007), and the current study’s findings are consistent with these ideas. Parent-child attachment insecurity, subdimensions of parental rejection, and subdimensions of parental control have been identified as factors that may be particularly important for anxiety in childhood and adolescence (Bosmans et al., in press; McLeod et al., 2007). Findings from the current study provide evidence for direct links between mother-child relationship factors and anxiety and indicate that mother-child relationship factors
account for a significant amount of variance in adolescents’ total anxiety symptoms.

There is a substantial literature demonstrating a consistent link between less parent-child attachment security and greater anxiety in childhood and adolescence (Brumariu & Kerns, 2010; Colonessi et al., 2011), which the current study findings support. Additionally, less attachment security was also associated with less emotion understanding and greater nonacceptance of emotions in adolescents. This finding is consistent with literature which posits that parent-child attachment relationships are an important context for the development of children’s emotion competence (Eisenberg et al., 1998; Saarni, 1999; Thompson, 2001). Parents who are responsive to their children’s emotions and encourage children to explore a range of emotions may promote healthy emotion competence skills in children (Saarni, 1999; Thompson, 2001).

The current study examined both mother-child attachment security as well as specific parental behaviors, which are parent-child relationship factors that have not often been investigated together in previous literature (Bosmans et al., in press), and therefore extends the literature on parent-child relationships and anxiety in childhood and adolescence. Mother-child attachment security and maternal psychological control were moderately related and demonstrated similar effect sizes with emotion competence factors and adolescents’ anxiety symptoms. When examining the regression analysis where the mother-child relationship factors predicted adolescent’s anxiety symptoms, the mother-child relationship factors accounted for a significant amount of variance in anxiety but none of the individual mother-child relationship factors yielded a unique significant effect on adolescents’ anxiety symptoms when controlling for all other mother-child relationship factors and demographic variables. Given that both attachment security and maternal psychological control were significantly correlated with anxiety but not uniquely related in the regression analysis, it may be that what is common to
these two variables may be important for adolescent’s anxiety symptoms.

Psychological control, a specific subdimension of parental control, may prevent children from experiencing situations and emotions for themselves and therefore limit their potential to develop emotion competence skills and feel competent in their own ability to manage anxious emotions (Chorpita & Barlow, 1998; Rapee, 1997; Wood et al., 2003). The current study adds to a somewhat limited literature on the association between parental psychological control and children’s anxiety (Brumariu & Kerns, 2015; Nanda et al., 2012; Siqueland et al., 1996) and provides evidence that greater maternal psychological control is associated with greater total anxiety symptoms in early adolescence. Additionally, greater maternal psychological control was associated with less emotion understanding and greater nonacceptance of emotion in adolescents. Although on average only low levels of maternal psychological control were reported in the current study’s sample, significant associations emerged suggesting the importance of parental psychological control for the development of emotion competence and anxiety in children and adolescents. Future research may benefit from examining how decreasing parental psychological control (i.e. training parents to allow children to express their feelings rather than controlling their children’s emotions) may be important for increasing emotion competence and decreasing adolescents’ anxiety symptoms in anxiety prevention and treatment programs, similar to the study by Settipani et al. (2013; see Introduction).

In addition to mother-child attachment security and maternal psychological control, the current study also investigated non-accepting maternal reactions to children’s negatives emotions, a specific subdimension of parental rejection. However, unlike mother-child attachment security and psychological control, the current study yielded limited findings for mother-reported non-accepting maternal reactions. Non-accepting maternal reactions were
associated with greater maternal psychological control, as would be theoretically expected. However, no other significant associations emerged between non-accepting maternal reactions and adolescents’ emotion competence skills or total anxiety symptoms.

McLeod et al. (2007) conducted a meta-analysis and found a small effect size for parental rejection and anxiety compared to a medium effect size for the relation between parental control and anxiety. It is possible that parental control, including psychological control, has a greater impact than subdimensions of parental rejection, such as nonaccepting reactions to children’s emotions, on the development of anxiety in childhood and adolescence, which may help explain the lack of findings for nonaccepting maternal reactions to children’s expression of emotions in the current study. Additionally, there is some evidence that the relation between specific parental behaviors and anxiety is stronger in younger children than in adolescents (Bosmans, Braet, Beyers, Van Leeuwen, & Van Vlierberghe, 2011; Creswell, Murray, Stacey, & Cooper, 2011), and therefore, this developmental consideration might help explain why the current study did not find a direct link between nonaccepting maternal reactions to children’s expression of emotion and anxiety symptoms in early adolescence. It may be that parents’ nonaccepting reactions to their children’s emotional expressions have a direct impact on children’s anxiety and/or emotion competence development at younger ages.

Methodological issues may also help explain the lack of findings for nonaccepting maternal reactions in the current study. The majority of research examining parents’ nonaccepting reactions to children’s emotional expression has focused on the developmental periods of early and middle childhood (Eisenberg et al., 1998) and little work has been done in the adolescent period (Klimes-Dougan, Brand, Zahn-Waxler, Usher, Hastings, Kendziora, & Garside, 2007). Two relevant issues include the conceptualization of what these rejecting
parental behaviors would look like in the parent-adolescent relationship compared to earlier development and also the best way to quantitatively measure these parental behaviors during the adolescent period. It is possible that the Coping with Children’s Negative Emotions Scale, originally developed with young children, does not accurately capture parents’ nonaccepting reactions to adolescents’ emotional expressions as well as it does with younger children. Most of the questions gave examples of children’s emotional expressions that would be very evident to parents. However, adolescents become more skilled at concealing their emotions, and therefore, adolescents’ emotional expressions may be less obvious than during childhood (Saarni, 1999). Additionally, it is possible that similar parenting behaviors across development have a different impact at different ages. For example, negative maternal reactions to adolescents’ emotional expressions may have more impact than in earlier years due to changes in cognitive development. Adolescents’ increased ability for abstract thinking and an increased focus on the self during adolescence may make adolescents more likely to internalize negative parental reactions to their emotional expressions. Alternatively, it is also plausible that what is most important in the development of anxiety is adolescents’ perspectives of parental reactions to their emotions, whereas the current study assessed parent report of their own nonaccepting reactions. Future research may benefit from examining how parents react to adolescents’ subtle expressions of emotion and utilizing multiple informants to assess parental rejection behaviors to get a more accurate picture of how parents react to their adolescents’ emotional expressions.

Of note, the mother-child relationship factors were not significantly related to the emotion competence skills of verbal expression of emotion or avoidance. This finding was quite unexpected, as theory suggests that the parent-child relationship is particularly important for emotional development and associations between parent-child relationships and emotional
competence skills would be expected (Laible & Panfile, 2009; Saarni, 1999; Scharfe, 2000; Thompson, 2001). Empirical evidence also supports the associations between parent-child relationship factors and verbal emotional expression (e.g. Fabes et al., 2002; McDowell & Parke, 2000; Raikes & Thompson, 2008) and avoidance (e.g. Eisenberg et al., 1992; Eisenberg et al., 1996; Pittman et al., 2012; Waters et al., 2010). In the current study, verbal emotional expression and avoidance were variables based on observational coding of adolescents’ discussions with their mothers about an event that was anxiety-provoking for adolescents; therefore, they are emotion competence skills that are particularly relevant to the mother-child relationship but were also assessed within a specific context. It is possible that if these emotion competence skills were assessed within a different context (i.e. discussion of a parent-child conflict) that elicited different responses from both the parents and the adolescents, the results may have yielded significant effects.

**Biological Factors and Anxiety**

Individuals who are genetically predisposed to anxiety may show an exaggerated physiological response to potentially threatening or anxiety-provoking situation (Friedman, 2007; Weems & Stickle, 2005), and it is generally expected that greater HR and lower RSA (at baseline and excessive suppression of RSA during a stressor) are associated with greater levels of anxiety (Beauchaine, Gatzke-Kopp, & Mead, 2007; Bernston et al., 2007; Porges et al., 1994; Zisner & Beauchaine, in press). However, these associations were not found in the current study and little support was provided for the hypotheses related to the second research question of whether these biological factors were related to anxiety in early adolescence. Only one significant association with adolescents’ anxiety symptoms was found, where greater RSA during the baseline relaxation period was associated with greater total anxiety symptoms, and
this association was in the opposite direction of expectation. Furthermore, the biological factors did not account for a significant amount of variance of adolescents’ anxiety symptoms. Although the biological factors were not associated with anxiety symptoms in ways that would be expected, there was evidence that adolescents physiologically responded to the baseline and stressor tasks in ways that would be predicted. On average, adolescents evidenced increased HR and decreased RSA during the stressor task (the discussion of an anxiety-provoking event with mothers) compared to the baseline relaxation period, as would be theoretically expected (Bernston et al., 2007).

Additionally, adolescents with mothers reporting greater nonacceptance of emotion showed greater HR after discussing a recent anxiety-provoking event with mothers. This finding, although not related to the main hypotheses of the current study, is consistent with theory and research on associations between parenting behaviors and children’s cardiovascular functioning which suggests that more negative, less supportive parenting behaviors are associated with increased physiological reactivity to stress in children (Bell & Belsky, 2007; Meaney, 2001). Furthermore, greater decreases in adolescents’ RSA from the baseline period to the anxiety-provoking discussion were associated with greater mother-child attachment security in the current study. Although decreases in RSA from baseline to stressor are normative and allow for an individual to respond to a stressful situation, excessive suppression of RSA in response to a stressor is associated with maladaptive outcomes (Zisner & Beauchaine, in press). Therefore, the finding from the current study that greater suppression of RSA during a stressor was associated with greater attachment security, an adaptive outcome, was unexpected.

There is limited empirical research examining the association between RSA (and other cardiac activity indicators) and attachment security in adolescence to help explain this
unexpected finding. Diamond, Fagundes, and Butterworth (2011) found non-significant associations between adolescents’ RSA and attachment insecurity. Beijersbergen, Bakermans-Kranenburg, van IJzendoorn, and Juffer (2008) examined heart rate variability (RMSSD) reactivity as well as heart rate (IBI) reactivity in association with different attachment styles during adolescence. They found non-significant differences between attachment styles on heart rate variability (RMSS) reactivity in adolescents while completing the Adult Attachment Interview. In regards to heart rate (IBI) reactivity, they found that adolescents with dismissing attachment styles evidenced less heart rate reactivity during an attachment interview but greater heart rate reactivity during a mother-adolescent conflict interaction ask than those with a secure attachment style. Given the mixed empirical findings and limited available research on the association between attachment and RSA in adolescence, it is unclear why this finding emerged in the current study. The current study examined overall level of attachment security but did not examine specific types of attachment insecurity; distinguishing forms of parent-child attachment insecurity and examining associations with RSA may help to further illuminate these relations.

The PNS component of the ANS may be particularly important for emotional processes, including the expression, experience, and regulation of emotion (Porges et al., 1994), and empirical evidence supports that measures of cardiac activity have been linked to emotion competence skills (i.e. emotional expression, emotion management). However, the current study found only non-significant associations among the indicators of cardiac activity and the emotion competence skills. The current study is the first to examine associations among HR and RSA with the emotion competence skills of emotion understanding and acceptance of emotion, and therefore, adds to the empirical literature in this respect.

Developmental considerations and methodological issues may help understanding of the
many non-significant associations with HR and RSA from the current study. It may be that the longitudinal change in RSA across development, rather than RSA at one time point, may be more informative in understanding associations with emotion competence and the physiological underpinnings of the development and maintenance of anxiety in adolescence. Vasilev et al. (2009) found that a lack of increase in RSA across a three year period during early adolescence predicted more difficulties with emotion regulation in adolescence. Future research may benefit from examining trajectories of change in RSA across development in relation to emotion competence factors and anxiety in adolescence.

The lack of support for hypotheses regarding HR and RSA in the current study, in addition to the inconsistencies in the literature on cardiac activity and anxiety in youth, suggest a need for rigorous theory-driven methodology to help clarify the association between cardiac activity, emotion competence, and anxiety in childhood and adolescence. A chapter recently written by Zisner & Beauchaine (in press) provides clear guidelines and recommendations for conducting research using psychophysiological measures in developmental research. They suggested that developmental research utilizing measures of psychophysiology be theory-driven, use appropriate stimulus conditions that are related to and informed by the research question, utilize a 10-20 minute resting baseline to obtain accurate measurements of resting states, limit participants’ movement during data collection as much as possible, consider normative developmental trajectories and adjust research methodology accordingly, and control for respiration when examining RSA (Grossman, 1992; Zisner & Beauchaine, in press).

The current study utilized theory-driven research questions and methodology, used an appropriate stressor task (i.e. discussion with mothers of a recent anxiety-provoking event for adolescents) related to the construct of interest (i.e. anxiety in adolescence) and research
questions, attempted to limit participants’ movement during data collection, and adjusted the high frequency band of heart rate variability for developmental age of the study participants based on normative heart rate activity. However, the baseline period used in the current study was only five minutes long, and therefore may not have provided an accurate depiction of adolescents’ true resting states. Additionally, adolescents’ respiration rates were not controlled for in the current study, and therefore, measurements of RSA may have been impacted. Each of these methodological issues may help to explain the non-significant findings and the unexpected findings from the current study that greater RSA during the baseline relaxation period was associated with greater total anxiety symptoms and that greater decreases in RSA from baseline to the stressor task were associated with greater mother-child attachment security.

A review of the literature for the current study on HR and RSA with anxiety in youth showed that overall the majority of studies used theory-driven methodology and stimulus conditions that were appropriate to the research question. However, approximately half of studies used a baseline period that was between 10 and 20 minutes, with some using baseline periods as short as 30 seconds. Additionally, only half of the studies attempted to limit participants’ movement during data collection or addressed how movement may have affected the data. A review of the limited studies that examined RSA in relation to anxiety revealed that the high frequency range of heart rate variability was generally adjusted for the participants’ developmental age. However, only one study controlled for respiration rates when examining RSA. Given the variability in methods utilized to examine the association between cardiac activity and anxiety in youth, future research would benefit from more standardized methodology and following the recommendations put forth by Zisner and Beauchaine (in press).

**Emotion Factors and Anxiety**
In addition to parent-child relationship and biological factors, emotion factors have been increasingly identified as etiological factors in the development and maintenance of anxiety in youth (Barlow, 2000; Weems & Silverman, 2008). The current study focused on four domains of emotion competence including expression of emotion, understanding of one’s own emotions, acceptance of emotion, and the specific emotion management strategy of avoidance. Difficulties expressing emotions and understanding one’s own emotions may impede an individual’s ability to adaptively manage emotions and thereby impact the development and maintenance of anxiety in youth (Mathews et al., 2014; Saarni, 1999; Southam-Gerow & Kendall, 2002).

Nonacceptance of emotions may actually increase the undesired emotion, and therefore difficulty with this emotion competence skill may also contribute to anxiety in youth (Campbell-Sills et al., 2006). Avoidance, a maladaptive emotion management strategy, may result in an inability to adjust emotions to fit the context and thus lead to problematic levels of anxiety (Thompson, 2001). The current study hypothesized that less verbal expression of emotion, less emotion understanding, greater nonacceptance of emotion, and greater use of avoidance would be associated with greater anxiety symptoms in early adolescence and that these emotion competence factors would account for a significant amount of variance in anxiety symptoms. Hypotheses were partially supported in that the current study found that less emotional understanding and greater nonacceptance of emotions were associated with greater total anxiety symptoms. Additionally, the emotion competence factors accounted for a significant amount of variance of adolescents’ total anxiety symptoms, and nonacceptance of emotion was identified as a unique predictor of anxiety symptoms.

These findings add to existing literature which supports the associations of lack of emotion understanding (e.g. Brumariu et al., 2012) and nonacceptance of emotion (e.g. Neumann
et al., 2010; Noël & Francis, 2011) with greater anxiety in childhood and adolescence. There is substantial evidence that youth who have less understanding of their own emotions or have difficulty labeling their internal experience of emotion are also more anxious. However, there is limited evidence for the association between nonacceptance of emotion (specifically negative secondary reactions to the experience of emotions) and anxiety in youth, with the exception of one study (Neumann et al., 2010) which assessed these relations in a sample of adolescents (ages 11-17) and found a moderate effect size. Like the current study, Neumann et al. (2010) utilized the Difficulties in Emotion Regulation Scale (Gratz & Roemer, 2004) to assess nonacceptance of emotion and the Screen for Anxiety Related Emotional Disorders (Birmaher et al., 1999) to assess anxiety symptoms. Both of these measures are based on adolescents’ self-reports, and therefore the associations found could be inflated by shared method variance. Future research would likely benefit from utilizing other assessment methods (i.e. observational measures of nonacceptance, diagnostic interviews to assess anxiety) in the future to replicate findings that greater nonacceptance of emotions is associated with greater anxiety symptoms in adolescence.

Contrary to expectation, the prediction that less verbal expression of emotion and greater avoidance during the anxiety-provoking discussion with mothers would be related to greater anxiety symptoms in adolescence was not supported. Prior work examining associations between expression of emotion and anxiety in youth has often focused on physical expression of emotion (i.e. how effective are anxious children at facially expressing specific emotions; e.g. Melfsen et al., 2000), and those studies that have investigated verbal expression of emotion have utilized questionnaire measures to assess children’s use of verbal emotional expression (Lahaye et al., 2010; Rieffe et al., 2008). Self-report questionnaires of verbal emotional expression may be subject to recall bias, and therefore, observations of verbal expression of emotion may provide a
more valid assessment. The current study utilized observational coding to assess adolescents’ use of verbal emotional expression during discussions with their mothers of a recent anxiety-provoking event, and therefore extends the literature on verbal expression of emotion and anxiety. However, the observational coding focused on the number of emotion words used by adolescents during the discussion which may not provide an accurate measurement of adolescents’ verbal emotional expression skills. Indeed, adolescents used only approximately five emotion words on average during a six-minute emotionally-laden conversation with mothers in the current study. Other studies examining associations between verbal expression of emotion words and anxiety in children also found non-significant results (Brumariu & Kerns, in press; Suveg et al. 2005). Brumariu & Kerns (in press) suggested the number of emotion words verbalized may be less important than how emotion words are used in the context of discussion with parents. Future research may benefit from utilizing experience sampling methodology to assess verbal emotion expression several times a day across various contexts (i.e. family, friends, home, school) to get a more ecologically valid assessment of adolescents’ use of verbal emotional expression. Alternatively, facial emotion expressions could also be coded to examine physical emotion expression as it relates to anxiety.

The current study’s finding that adolescents’ avoidance (a specific maladaptive emotion management strategy) during the discussion with mothers of an anxiety-provoking event was not associated with adolescents’ anxiety symptoms was also contrary to prediction. Existing empirical evidence supports that greater use of avoidance is associated with greater anxiety (e.g. Carthy et al., 2010; Mathews et al., 2014), although there are some inconsistent findings in the literature as well (e.g. Brumariu et al., 2012). During the mother-adolescent interaction in the current study, some adolescents had difficulty choosing a recent anxiety-provoking event and
reported they could not remember a time they felt anxious. Therefore, the discussion with mothers may not have been anxiety-provoking for all adolescents in the current study, and thus what was coded as avoidance of the topic may have instead reflected a child’s lack of interest in the task. Future research may benefit from assessing avoidance in the laboratory by utilizing a task that induces anxiety in all participants such as the Trier Social Stress Test for Children (Buske-Kirschbaum, Jobst, Wustmans, Kirschbaum, Rauh, & Hellhammer, 1997). This type of task would also allow assessment of real-time use of avoidance as adolescents attempt to manage emotions in the moment, rather than during a discussion of anxiety that was experienced in the past. Alternatively, future research may also utilize assessments of adolescents’ avoidance through the use of experience sampling methodology to get a more accurate picture of adolescents’ use of avoidance in response to daily stressors with family and friends. Social interactions with peers may be particularly anxiety-provoking during the adolescent developmental period (Anderson & Hope, 2009; Hofmann, Albano, Heimberg, Tracey, Chorpita, & Barlow, 1999), and therefore these situations may be especially rich contexts in which to assess adolescents’ use of avoidance to manage their emotional experiences.

**Emotion Factors as Mediators of Relations between Mother-Child Relationships and Biological Factors with Anxiety**

As discussed above, mother-child relationship factors, biological factors, and emotion factors are theorized to contribute to the development of anxiety in childhood and adolescence. Several etiological models of anxiety in youth have been proposed which suggest that emotion factors mediate relations between mother-child factors (i.e. attachment, specific parental behaviors) and anxiety (Bosmans et al., in press; Brumariu & Kerns, 2010; Esbjørn et al., 2012; Jacob et al., 2011; Thompson, 2001). Additionally, several of these models suggest that emotion
factors mediate relations of biological factors and anxiety in youth as well (Esbjørn et al., 2012; Jacob et al., 2011; Thompson, 2011), while others suggest that biological factors may moderate relations of mother-child relationship factors, emotion factors, and anxiety (Brumariu & Kerns, 2010). Examining how biological factors moderate these relations may be an important avenue for future research.

The current study proposed a model where mother-child relationship factors (mother-child attachment security, non-accepting parental reactions to children’s negative emotions, and parental psychological control) and biological factors (HR, RSA) are directly related to anxiety symptoms in adolescence but also mediated by emotion factors (lack of verbal emotional expression, lack of emotion understanding, nonacceptance of emotions, maladaptive emotion management – avoidance). Tests of the fourth research question – whether emotion factors mediated relations of mother-child relationships with anxiety – revealed that the associations of mother-child attachment security and parental psychological control with adolescents’ anxiety symptoms were mediated by the emotion factors. Additionally, adolescents’ nonacceptance of emotions was found to be a unique mediator of both of these relations.

These findings add to the existing evidence that the link between attachment security and anxiety is mediated by emotion factors (Bosquet & Egeland, 2006; Brumariu et al., 2012; Brumariu & Kerns, 2013). Additionally, the current study adds to the literature by examining mediating mechanisms of the link between specific parental behaviors of rejection and control and anxiety. A meta-analysis by McLeod et al. (2007) suggested parental behaviors of rejection and control may be particularly important to anxiety in youth; the current study is among the first to examine what might explain the link between specific parental behaviors of rejection and control with anxiety. To date, there are limited studies that have examined these relations in
youth (i.e. Luebbe, Bump, Fussner, & Rulon, 2013; Shackman et al., 2007). Luebbe et al. (2013) recently examined relations of parental psychological control with anxiety in adolescence and found that adolescents’ dysregulated negative emotion mediated relations between adolescents’ perceptions of maternal psychological control and anxiety symptoms in adolescence. Shackman et al. (2007) examined associations between parental physical abuse, children’s attention bias, and children’s anxiety symptoms and found that children’s attention bias towards threat mediated relations between parental physical abuse and children’s anxiety symptoms. The current study adds to the literature on both parent-child attachment security and specific parental behaviors with anxiety by showing that emotion competence factors, as a set, mediate relations between maternal psychological control and adolescents’ anxiety symptoms and also demonstrates that adolescents’ nonacceptance of emotion was a unique mediator of these associations.

The mediation results from the current study suggest that nonacceptance of emotion may be a particularly important emotion factor in explaining associations between mother-child relationship factors and adolescents’ anxiety symptoms. The parent-child relationship is the primary context in which children’s emotional development occurs (Eisenberg et al., 1998), and parents influence children’s abilities to identify, evaluate, express, and manage emotions in various ways (Denham et al., 1997; Eisenberg et al., 1998; Eisenberg et al., 1999; Morris et al., 2007). Children may learn to evaluate and manage emotions in a certain way based on how their family views and manages emotions (Eisenberg et al., 1998; Thompson, 2001). Additional research is needed to replicate this finding using multi-method measures to assess mother-child, emotion, and anxiety constructs and to investigate the longitudinal associations between these constructs.

Contrary to expectation, the associations of non-accepting parental reactions to children’s
negative emotions with anxiety symptoms were not mediated by the emotion competence factors. There is limited empirical research examining emotion factors as mediators of the associations between nonaccepting parental reactions to children’s negative emotions, HR, and RSA with anxiety, although there are several theoretical models which have been proposed that suggest these links may help explain the development and maintenance of anxiety in childhood and adolescence. Some of the methodological issues discussed above may help to explain the lack of significant mediation findings in the current study.

There are likely other plausible models to explain the development of anxiety in adolescence than the one proposed in the current study, and future research will benefit from testing alternative models (Mueller, 1997). It is likely that the associations among mother-child relationship factors, biological factors, emotion factors, and anxiety are bidirectional as well. As found in previous research (Nelemans, Hale, Branje, Hawk, & Meeus, 2014), it is possible that mother-child relationship factors and biological factors influence the development of emotion competence factors. However, it is just as plausible that across development, children’s emotion competence skills impact their relationships with parents as well as their own physiology and that interactions between these factors impact the development and maintenance of anxiety. Future studies may benefit from examining the relation between parent-child relationship factors, biological factors, and emotion competence factors with children’s anxiety symptoms longitudinally to examine whether direct effects are stronger at different ages, if the effects of parent-child relationship and biological factors on adolescents’ anxiety are mediated through emotion competence development across time, and if there are bidirectional relationships between parent-child relationship factors, biological factors, emotion competence skills, and anxiety symptoms.
Additionally, consistent with the ideas of equifinality and multifinality (Cicchetti & Rogosch, 1996) in developmental psychopathology research, it is likely that the proposed model in the current study may not be specific to anxiety in adolescence and that these factors could lead to other psychological outcomes, such as depression. Additionally, it is also likely that there are different factors/etiological models that would also explain development of anxiety in adolescence. There are various other factors that have been implicated in the development and maintenance of anxiety in prior theories that could also be tested in etiological models of anxiety. For example, other parent-child relationship factors (e.g. modeling, parental anxiety; Bosmans et al. in press), biological factors (e.g. temperament/behavioral inhibition; Bosmans et al., in press; Brumariu & Kerns, 2010; Esbjørn et al., 2012; Thompson, 2001), and emotion factors (e.g. maladaptive cognitions, emotion self-efficacy; Bosmans et al., in press; Brumariu & Kerns, 2010; Esbjørn et al., 2012; Thompson, 2001) could be tested in future studies. Additionally, adolescent characteristics (e.g. pubertal development), peer factors, and environmental factors (e.g. experiential opportunities to develop emotion competence skills; conditioning events) have also been hypothesized as important contributing factors. One criticism of the research on anxiety in childhood and adolescence has been that the impact of individual etiological factors on anxiety has often been examined in isolation, and there is a need to examine various etiological factors jointly to determine how their unique or combined effects influence anxiety (Manassis & Bradley, 1994). Future research will benefit from continued integration of various etiological factors into tests of models that may help increase our understanding of the development and maintenance of anxiety.

**Clinical Applications, Study Limitations, and Directions for Future Research**

The current study’s findings may help to inform clinical work with anxious youth.
Researchers have debated whether parental involvement in treatment for anxiety in youth increases effectiveness of treatment. Previous work has highlighted the importance of incorporating parents in treatment for anxiety in children and adolescents (Kendall, 1994; Barrett, Dadds, & Rapee, 1996), and several of the empirically supported treatments for anxiety (e.g. Coping Cat, Fun FRIENDS) include parental involvement. However, a recent meta-analytic review found that parental involvement in treatment for childhood anxiety yielded a similar effect size (medium) compared to treatments for anxiety that did not include parental involvement and suggested the impact of parental involvement on treatment outcomes may depend on other factors such as type of anxiety and developmental age of the child (Reynolds, Wilson, Austin, & Hooper, 2012). The current study highlights the important role that mother-child relationships play in relation to anxiety in early adolescence and provides ideas for how parental involvement in treatment might be tailored to meet children’s treatment needs. Barrett and colleagues (Barrett, Farrell, Dadds, & Boulter, 2005; Barrett, Healy-Farrell, & March, 2004; Pahl & Barrett, 2007) developed the Fun FRIENDS programs which focus on providing treatment for anxiety that incorporates the entire family. In these programs, the bidirectional interactions between parents and children are a focus and all family members learn skills to address cognitive, physiological, and learning processes that may impact children’s anxiety (Pahl & Barrett, 2010). The current study suggests that in addition to teaching parents positive coping skills in anxiety treatment programs, it may also be useful to work with parents on increasing their availability and responsiveness to their children to increase attachment security and on decreasing parents’ use of psychologically controlling behaviors. Future research may benefit from investigating whether improving these parental behaviors increases the beneficial effects of including parents in treatment for anxiety in adolescence.
Additionally, the findings from the current study highlight the importance of incorporating emotion competence skill development into treatment for anxiety in youth. The Coping Cat program (Kendall, 1990) and C.A.T. Project (Kendall, Choudhury, Hudson, & Webb, 2002) are cognitive-behavioral therapies for anxiety in childhood and adolescence, and although the main focus of treatment is to increase use of adaptive cognitions and behaviors, there is also some emphasis on building emotion competence skills. For example, the programs incorporate emotion recognition (i.e. recognizing physical symptoms that accompany emotions), emotion understanding (i.e. labeling different emotions), and emotion modification skills (i.e. relaxation techniques, challenging distorted cognitions, problem-solving techniques) as well as emotion self-efficacy skills. Additionally, emotion-focused cognitive behavior therapy (Suveg, Kendall, Comer, & Robin, 2006) has been developed in more recent years which places increased emphasis on building skills of emotion understanding and regulation of all emotions (not just anxiety, as is the focus in other programs). The current study’s findings highlight the important role that nonacceptance of emotions may play in anxiety in youth, and many of the treatment programs for anxiety in childhood and adolescence do not emphasize acceptance of emotions. Treatments for anxiety in youth may benefit from placing increased emphasis on the development of acceptance of emotion in children and adolescence, such as is done in mindfulness-based treatments (Greco & Hayes, 2008).

Although the current study had several strengths and contributes substantially to the literature, there are also various limitations that should be noted. One major limitation of the current study is the reliance on concurrent, rather than longitudinal, data. Without longitudinal data, the current study cannot address questions of directionality, causality, or how the change in these constructs over time may influence anxiety. Future studies will benefit from examining
associations between mother-child relationships, biological factors, and emotion competence factors with anxiety across development to more thoroughly understand the directionality of these relations. Additionally, interactions between parent and child factors may be more important than direct associations between either of these factors in predicting child anxiety (Creswell et al., 2011; Murray et al., 2009), and therefore, it will be important for future research to examine the interplay between mother-child relation factors, biological factors, and emotion factors across time to better understand the development and maintenance of anxiety.

Furthermore, although the study incorporated multiple methods of assessment (i.e., mother and child self-reports, physiological measurements, and observational coding), the significant main study findings were primarily from the self-report of adolescents. It is possible that the shared method variance inflated associations among mother-child relationship factors, emotion competence factors, and adolescents’ anxiety symptoms. Alternatively, it is possible that children’s perceptions of relationships with parents and emotion competence skills are especially important to the development and maintenance of anxiety. Future research will benefit from utilizing multi-method assessments to replicate the current study’s findings. Additionally, there were also certain methodological weaknesses in the collection of the heart rate data. The current study utilized a five-minute long baseline period, which may not have provided sufficient time for the adolescents to adjust to their surroundings and completely relax (Zisner & Beauchaine, in press). It is possible that the RSA measurement from the baseline period did not provide a precise measurement of adolescents’ resting RSA. Additionally, although the current study adjusted the high frequency heart rate (RSA) range for the developmental age of the study participants, respiration was not controlled for in analyses with RSA. Zisner and Beauchaine (in press) recommend that respiration should always be controlled for when examining RSA, and
therefore, future research should follow all guidelines put forth for collection psychophysiological data.

Lastly, the sample in the current study included primarily Caucasian adolescents. Past research has found that mother-child relationship factors may impact anxiety in childhood and adolescence differently across ethnicities (Creveling, Varela, Weems, & Corey, 2010; Hill & Bush, 2001). For example, maternal control is more strongly associated with negative outcomes for European American children than for African American children (Creveling et al., 2010). Given the predominantly Caucasian sample used in the current study, the findings may not generalize to adolescents who are not Caucasian. Future research would benefit from testing the associations of mother-child relationship factors, biological factors, and emotion competence factors with anxiety in childhood and adolescence for different ethnic populations.

Conclusion

In sum, the current study investigated the associations of mother-child relationship factors, biological factors, and emotion competence factors with anxiety symptoms in early adolescence. The study integrated several etiological factors that have been studied independently in past research in relation to anxiety in youth and also tested mediating pathways. Findings from the current study demonstrated that mother-child relationship factors and emotion competence factors are important factors that contribute to anxiety symptoms in early adolescence. Furthermore, the current study yielded evidence that emotion competence factors mediate associations between mother-child relationship factors and adolescents’ anxiety symptoms, and that nonacceptance of emotions is an especially important factor that may contribute to the development and maintenance of anxiety symptoms. Findings from the current study have implications for anxiety interventions, in that specific parent-child relationship factors
(e.g. psychological control) and emotion competence skills (e.g. nonacceptance of emotion) may be targeted to enhance the effectiveness of intervention. Additionally, the current study discussed various ideas for future research including application of standardized methodology when assessing heart rate variables, examination of the role of nonacceptance of emotion in the development and maintenance of anxiety, and utilization of longitudinal data to examine directionality of associations
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Appendix A

Security Scale

Instructions to Child:

This questionnaire asks about what you are like with your mother – like how you act and feel around her. Before we get to those questions, let’s try a practice question. Each question talks about two kinds of kids, and we want to know which kids are most like you. Decide first whether you are more like the kids on the left side or more like the kids on the right side, then decide whether that is sort of true for you, or really true for you, and circle that phrase. For each question you will only circle one answer.

Practice Question:

Some kids would rather play sports  BUT  Other kids would rather watch T.V in their spare time.

Really true  Sort of  Really true
for me  true for me  for me

Now we are going to ask you question about you and your mom, or whoever you think of as your “mom.”

I am filling this out about my (circle one):  mother  step-mother  grandmother
other:_______________
1. Some kids find it easy to trust their mom
   Other kids are not sure if they can trust their mom.
   Really true \hspace{1cm} Sort of for me
   Sort of \hspace{1cm} Really true true for me

2. Some kids feel like their mom butts in a lot when they are trying to do things
   Other kids feel like their mom lets them do things on their own.
   Really true \hspace{1cm} Sort of for me
   Sort of \hspace{1cm} Really true true for me

3. Some kids find it easy to count on their mom for help
   Other kids think it’s hard to count on their mom.
   Really true \hspace{1cm} Sort of for me
   Sort of \hspace{1cm} Really true true for me

4. Some kids think their mom spends enough time with them
   Other kids think their mom does not spend enough time with them.
   Really true \hspace{1cm} Sort of for me
   Sort of \hspace{1cm} Really true true for me

5. Some kids feel more confident trying new things after talking to
   Other kids do not feel more confident trying new things after
their mom about it \hfill talking to their mom about it.

<table>
<thead>
<tr>
<th>Really true</th>
<th>Sort of</th>
<th>Really true</th>
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<tbody>
<tr>
<td>for me</td>
<td>true for me</td>
<td>for me</td>
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</table>

6. Some kids do not really like telling their mom what they are thinking or feeling \hfill Other kids do like telling their mom what they are thinking or feeling. BUT

<table>
<thead>
<tr>
<th>Really true</th>
<th>Sort of</th>
<th>Really true</th>
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<tbody>
<tr>
<td>for me</td>
<td>true for me</td>
<td>for me</td>
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</table>

7. Some kids do not really need their mom for much \hfill Other kids need their mom for a lot of things. BUT

<table>
<thead>
<tr>
<th>Really true</th>
<th>Sort of</th>
<th>Really true</th>
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<tbody>
<tr>
<td>for me</td>
<td>true for me</td>
<td>for me</td>
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</table>

8. Some kids are sure their mom wants to hear what they think, even when they disagree with their mom. \hfill Other kids are not sure if their mom wants to hear what they think. BUT

<table>
<thead>
<tr>
<th>Really true</th>
<th>Sort of</th>
<th>Really true</th>
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<tbody>
<tr>
<td>for me</td>
<td>true for me</td>
<td>for me</td>
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</table>

9. Some kids wish they were closer to their mom \hfill Other kids are happy with how close they are to their mom. BUT

<table>
<thead>
<tr>
<th>Really true</th>
<th>Sort of</th>
<th>Really true</th>
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<tr>
<td>for me</td>
<td>true for me</td>
<td>for me</td>
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</table>
10. Some kids worry that their mom does not really love them 
   Other kids are really sure that their mom loves them.

11. Some kids do not feel like their mom encourages them when they try new things 
   Other kids do feel like their mom encourages them when they try new things.

12. Some kids feel like their mom really understands them 
   Other kids feel like their mom does not really understand them.

13. Some kids are really sure their mom would not leave them 
   Other kids sometimes wonder if their mom might leave them.
<p>| | | | | |</p>
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<tbody>
<tr>
<td>14.</td>
<td>Some kids feel like their mom lets them decide enough things by themselves</td>
<td>BUT</td>
<td>Other kids feel like their mom does not let them make enough decisions by themselves.</td>
<td></td>
</tr>
<tr>
<td></td>
<td>Really true</td>
<td>Sort of</td>
<td>Sort of</td>
<td>Really true</td>
</tr>
<tr>
<td></td>
<td>for me</td>
<td>true for me</td>
<td>true for me</td>
<td>for me</td>
</tr>
<tr>
<td>15.</td>
<td>Some kids worry that their mom might not be there when they need her</td>
<td>BUT</td>
<td>Other kids are sure their mom will be there when they need her.</td>
<td></td>
</tr>
<tr>
<td></td>
<td>Really true</td>
<td>Sort of</td>
<td>Sort of</td>
<td>Really true</td>
</tr>
<tr>
<td></td>
<td>for me</td>
<td>true for me</td>
<td>true for me</td>
<td>for me</td>
</tr>
<tr>
<td>16.</td>
<td>Some kids think their mom does not listen to them</td>
<td>BUT</td>
<td>Other kids do think their mom listens to them.</td>
<td></td>
</tr>
<tr>
<td></td>
<td>Really true</td>
<td>Sort of</td>
<td>Sort of</td>
<td>Really true</td>
</tr>
<tr>
<td></td>
<td>for me</td>
<td>true for me</td>
<td>true for me</td>
<td>for me</td>
</tr>
<tr>
<td>17.</td>
<td>Some kids think their mom encourages them to be themselves</td>
<td>BUT</td>
<td>Other kids do not think their mom encourages them to be themselves.</td>
<td></td>
</tr>
<tr>
<td></td>
<td>Really true</td>
<td>Sort of</td>
<td>Sort of</td>
<td>Really true</td>
</tr>
</tbody>
</table>
18. Some kids go to their mom when they are upset  
Other kids do not go to their mom when they are upset.

Really true  Sort of  
for me  true for me  

19. Some kids wish their mom would help them more with their problems  
Other kids think their mom helps them enough.

Really true  Sort of  
for me  true for me  

20. Some kids are really sure their mom is proud of them  
Other kids are not sure if their mom is proud of them.

Really true  Sort of  
for me  true for me  

21. Some kids feel better when their mom is around  
Other kids do not feel better when their mom is around.

Really true  Sort of  
for me  true for me  

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Appendix B

Coping with Children’s Negative Emotions

**Parent Attitude/Behavior Questionnaire**

Instructions: In the following items, please indicate on a scale from 1 (very unlikely) to 7 (very likely) the likelihood that you would respond in the ways listed for each item. Please read each item carefully and respond as honestly and sincerely as you can. For each response, please circle a number from 1-7.

<table>
<thead>
<tr>
<th>1</th>
<th>2</th>
<th>3</th>
<th>4</th>
<th>5</th>
<th>6</th>
<th>7</th>
</tr>
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<tbody>
<tr>
<td><strong>Very Unlikely</strong></td>
<td><strong>Somewhat Likely</strong></td>
<td><strong>Very Likely</strong></td>
<td></td>
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</table>

1. If my child becomes disappointed or upset because he/she cannot go to a friend’s party, I would:
   a. **Send my child to his/her room to calm down**
   b. Feel uneasy or uncomfortable
   c. Help my child think about ways that he/she can still be with friends (e.g. invite some friends over another time)
   d. **Tell my child not to make a big deal out of missing the party**
   e. Allow my child to express his/her feelings
   f. Soothe my child and do something fun with him/her to make him/her feel better about missing the party

2. If my child breaks an expensive electronic item (i.e. IPod, Playstation, computer, etc.) and then gets sad or upset, I would:
   a. Remain calm and not let myself get anxious
   b. Show my child I understand how he/she is feeling and comfort him/her
   c. **Tell my child that he/she is over-reacting**
   d. Help my child figure out how to get the electronic fixed or replaced
   e. Tell my child its ok to be upset
   f. **Tell my child to stop being upset or he/she won’t be allowed to use his/her electronic again any time soon**

3. If my child loses some prized possession and gets upset, I would:
   a. Become upset or anxious
   b. **Tell my child that he/she blowing things out of proportion**
   c. Help my child think of places he/she hasn’t looked yet
   d. Be available for my child to talk to and to provide comfort
   e. Tell him/her it’s completely understandable that he/she is upset
   f. **Tell him/her that’s what happens when you’re not careful**
4. If my child is afraid of injections and becomes anxious while waiting his/her turn to get a shot, I would:
   a. **Tell him/her to shape up or he/she won’t be allowed to do something he/she likes to do (e.g. watch TV)** 1 2 3 4 5 6 7
   b. Tell my child it's ok to be afraid or anxious 1 2 3 4 5 6 7
   c. **Tell my child not to make a big deal of the shot** 1 2 3 4 5 6 7
   d. Feel embarrassed or upset by my child’s fearful reaction 1 2 3 4 5 6 7
   e. Comfort him/her before and after the shot 1 2 3 4 5 6 7
   f. Talk to my child about ways to make it hurt less (e.g. relaxing so it won’t hurt or taking deep breaths) 1 2 3 4 5 6 7

5. If my child is participating in an activity with his/her friends and makes a mistake and looks embarrassed, I would:
   a. Be available if my child wanted to talk about it or needed comfort 1 2 3 4 5 6 7
   b. **Tell my child that he/she is over-reacting** 1 2 3 4 5 6 7
   c. Feel uncomfortable and embarrassed myself 1 2 3 4 5 6 7
   d. **Tell my child to straighten up or he/she won’t be allowed to spend time with friends again anytime soon** 1 2 3 4 5 6 7
   e. Allow my child to express feelings of embarrassment 1 2 3 4 5 6 7
   f. Help my child identify ways to handle embarrassing situations 1 2 3 4 5 6 7

6. If my child is about to appear in a recital or sports activity and becomes visibly nervous about people watching him/her, I would:
   a. Help my child think of things that he/she could do to get ready for his/her turn (e.g. to do some warm-ups and not to look at the audience) 1 2 3 4 5 6 7
   b. Be there to help soothe my child’s nerves 1 2 3 4 5 6 7
   c. Remain calm and not get nervous myself 1 2 3 4 5 6 7
   d. **Tell my child that he/she is being a baby about it** 1 2 3 4 5 6 7
   e. **Tell my child that if he/she doesn’t calm down he/she won’t be allowed to do anything fun when we get home** 1 2 3 4 5 6 7
   f. Tell him/her it’s ok to feel nervous 1 2 3 4 5 6 7

7. If my child receives a low grade on an important test at school and looks obviously disappointed, I would:
   a. Allow my child to express his/her disappointment 1 2 3 4 5 6 7
   b. Help my child think of better studying and test-taking strategies 1 2 3 4 5 6 7
   c. NOT feel anxious or uncertain 1 2 3 4 5 6 7
   d. **Tell my child that he/she is over-reacting** 1 2 3 4 5 6 7
   e. **Scold my child for not trying/studying harder** 1 2 3 4 5 6 7
   f. Be available to listen to how my child feels and remind him/her of other things they’ve done well in the past 1 2 3 4 5 6 7

8. If my child is frightened and can’t go to sleep after watching a scary movie, I would:
a. Listen as my child talks about what scared him/her 1 2 3 4 5 6 7
b. Get upset or feel unsettled by my child’s distress 1 2 3 4 5 6 7
c. Tell my child to stop being a baby about it 1 2 3 4 5 6 7
d. Help my child think of something to do so that he/she can get to sleep (e.g. leave the lights on) 1 2 3 4 5 6 7
e. Tell him/her to go to bed or he/she won’t be allowed to watch anymore movies 1 2 3 4 5 6 7
f. Do something to soothe my child (e.g. talk about a happy memory or listen to calming music) 1 2 3 4 5 6 7

9. If my child is at a social event and appears sad or anxious because other kids exclude him/her from the group, I would:

a. NOT get upset myself 1 2 3 4 5 6 7
b. Tell my child that if he/she gets upset and “makes a scene” then we’ll have to go home right away 1 2 3 4 5 6 7
c. Tell my child it’s ok to feel sad or anxious 1 2 3 4 5 6 7
d. Let me child know I am available if he/she wants to talk or that we can go home soon if he/she is uncomfortable 1 2 3 4 5 6 7
e. Help my child think of ways to approach the other kids 1 2 3 4 5 6 7
f. Tell my child it really isn’t a big deal 1 2 3 4 5 6 7

10. If my child is insulted or called names by other kids, and my child becomes visibly distressed, I would:

a. Tell me child not to make a big deal out of it 1 2 3 4 5 6 7
b. Feel distressed myself 1 2 3 4 5 6 7
c. Tell my child to calm down or she/he won’t be allowed to hang out with friends again anytime soon 1 2 3 4 5 6 7
d. Help my child think of constructive things to do when other children tease him/her (e.g. find other things to do) 1 2 3 4 5 6 7
e. Comfort him/her and point out that sometimes kids say mean things that aren’t true 1 2 3 4 5 6 7
f. Listen as he/she talked about how it hurts to be teased 1 2 3 4 5 6 7
Appendix C

CRPBI-Child

The next set of questions is about your mother. Please indicate how much each statement is like your mother or how much she knows about your activities.

1. My mother is a person who makes me feel better after talking over my worries with her.
   - Not Like Her
   - Somewhat Like Her
   - A Lot Like Her

2. My mother changes the subject whenever I have something to say to her.
   - Not Like Her
   - Somewhat Like Her
   - A Lot Like Her

3. My mother smiles at me very often.
   - Not Like Her
   - Somewhat Like Her
   - A Lot Like Her

4. My mother always tries to change how I feel or think about things.
   - Not Like Her
   - Somewhat Like Her
   - A Lot Like Her

5. My mother often interrupts me.
   - Not Like Her
   - Somewhat Like Her
   - A Lot Like Her

6. My mother is able to make me feel better when I am upset.
   - Not Like Her
   - Somewhat Like Her
   - A Lot Like Her

7. My mother enjoys doing things with me.
   - Not Like Her
   - Somewhat Like Her
   - A Lot Like Her

8. My mother blames me for other family members’ problems.
   - Not Like Her
   - Somewhat Like Her
   - A Lot Like Her

9. My mother cheers me up when I am sad.
   - Not Like Her
   - Somewhat Like Her
   - A Lot Like Her

10. My mother brings up my past mistakes when she criticizes me.
    - Not Like Her
    - Somewhat Like Her
    - A Lot Like Her

11. My mother is less friendly with me if I do not see things her way.
    - Not Like Her
    - Somewhat Like Her
    - A Lot Like Her

12. My mother gives me a lot of care and attention.
    - Not Like Her
    - Somewhat Like Her
    - A Lot Like Her
13. My mother makes me feel like the most important person in her life.

   Not Like Her   Somewhat Like Her   A Lot Like Her

14. My mother avoids looking at me when I have disappointed her.

   Not Like Her   Somewhat Like Her   A Lot Like Her

15. My mother believes in showing her love for me.

   Not Like Her   Somewhat Like Her   A Lot Like Her

16. If I have hurt my mother’s feelings, she stops talking to me until I please her again.

   Not Like Her   Somewhat Like Her   A Lot Like Her

17. My mother often praises me.

   Not Like Her   Somewhat Like Her   A Lot Like Her

18. My mother is easy to talk to.

   Not Like Her   Somewhat Like Her   A Lot Like Her

19. My mother would like to be able to tell me what to do all the time.

   Not Like Her   Somewhat Like Her   A Lot Like Her

20. How much does your mother REALLY know who your friends are?

   Does Not Know   Knows a Little   Knows a Lot

21. How much does your mother REALLY know where you go at night?

   Does Not Know   Knows a Little   Knows a Lot

22. How much does your mother REALLY know how you spend your money?

   Does Not Know   Knows a Little   Knows a Lot

23. How much does your mother REALLY know what you do with your free time?

   Does Not Know   Knows a Little   Knows a Lot

24. How much does your mother REALLY know where you are most days after school?

   Does Not Know   Knows a Little   Knows a Lot
Appendix D

Instructions for the dyadic anxiety-provoking discussion at Visit 2

Please think of a recent time when your child felt anxious or nervous about something. We’d like the two of you to discuss the situation by answering the questions listed below. You will be given 6 minutes to discuss these questions. The experimenter will come back into the room after 6 minutes has passed.

1. What happened, that made your child feel anxious or nervous?
2. How were each of you feeling about the situation?
3. What, if anything, did you each of you do?
4. What, if anything, would you each do differently if the situation happened again?
Appendix E

PARENT-CHILD AFFECT COMMUNICATION TASK (PACT)

OCCURRENCE OF EMOTION WORDS

These are words that refer to discrete emotions (e.g., sad) as well as behavioral expressions of emotion (e.g., cry) or more complex emotional state (e.g., “poor” to denote one’s empathy).

- Do not include moral words such as bad, mean, or nasty
- Do code all occurrences, even when a word is repeated continually

1. Emotion Categories

Positive (+)
- Definition: happiness, smiling, love, proud
- Do NOT code following words: favorite, nicknames, sharing, hope, special, fun, funny, nice
- Do NOT code “like/love” when referring to food or colors or can be translated automatically to “want”
- Do code “like/love” if it can be replaced with “enjoy” or is about a relationship or a thing or activity they feel special about
- Do code “care” only when it means “I care about you”
- Do code behavioral expression words such as “hug” and “kiss”

Negative (-)
- Definition: sadness, crying, fear, disgust, anger, distress, sorry, hurt (as in feelings), missing, upset
- Do NOT code “want” (when referring to an internal state) or “bored”
- Do code behavioral expression words such as “hit”, “yell” and “growl”

*** You need to consider context in which some emotion terms (e.g., “surprised” “shocked”) are used to code positive or negative valence.
*** Behavioral expression has to be associated with emotion (e.g. Do code angry “yelling”, but do NOT code when “yelling” is replaced with “calling out”).

Comments and Questions should be referred to Dr. Susanne Denham at sdenham@gmu.edu.
### DERS

Please indicate how often the following statements apply to you by filling in the appropriate numbered bubble from the scale below

<table>
<thead>
<tr>
<th>Statement</th>
<th>1</th>
<th>2</th>
<th>3</th>
<th>4</th>
<th>5</th>
</tr>
</thead>
<tbody>
<tr>
<td>1. I am clear about my feelings.</td>
<td></td>
<td></td>
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<tr>
<td>2. I pay attention to how I feel.</td>
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<tr>
<td>3. I experience my emotions as overwhelming and out of control.</td>
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<tr>
<td>4. I have no idea how I am feeling.</td>
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<tr>
<td>5. I have difficulty making sense out of my feelings.</td>
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<tr>
<td>6. I am attentive to my feelings.</td>
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<td></td>
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<tr>
<td>7. I know exactly how I am feeling.</td>
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<tr>
<td>8. I care about what I am feeling.</td>
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<tr>
<td>9. I am confused about how I feel.</td>
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<tr>
<td>10. When I’m upset, I acknowledge my emotions.</td>
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</tr>
</tbody>
</table>

1 = Almost never (0-10%)
2 = Sometimes (11-35%)
3 = About half the time (36-65%)
4 = Most of the time (66-90%)
5 = Almost always (91-100%)
<table>
<thead>
<tr>
<th></th>
<th>Question</th>
<th>1</th>
<th>2</th>
<th>3</th>
<th>4</th>
<th>5</th>
</tr>
</thead>
<tbody>
<tr>
<td>11.</td>
<td>When I’m upset, I become angry with myself for feeling that way.</td>
<td>1</td>
<td>2</td>
<td>3</td>
<td>4</td>
<td>5</td>
</tr>
<tr>
<td>12.</td>
<td>When I’m upset, I become embarrassed for feeling that way.</td>
<td>1</td>
<td>2</td>
<td>3</td>
<td>4</td>
<td>5</td>
</tr>
<tr>
<td>13.</td>
<td>When I’m upset, I have difficulty getting work done.</td>
<td>1</td>
<td>2</td>
<td>3</td>
<td>4</td>
<td>5</td>
</tr>
<tr>
<td>14.</td>
<td>When I’m upset, I become out of control</td>
<td>1</td>
<td>2</td>
<td>3</td>
<td>4</td>
<td>5</td>
</tr>
<tr>
<td>15.</td>
<td>When I’m upset, I believe that I will remain that way for a long time.</td>
<td>1</td>
<td>2</td>
<td>3</td>
<td>4</td>
<td>5</td>
</tr>
<tr>
<td>16.</td>
<td>When I’m upset, I believe that I’ll end up feeling very depressed.</td>
<td>1</td>
<td>2</td>
<td>3</td>
<td>4</td>
<td>5</td>
</tr>
<tr>
<td>17.</td>
<td>When I’m upset, I believe that my feelings are valid and important.</td>
<td>1</td>
<td>2</td>
<td>3</td>
<td>4</td>
<td>5</td>
</tr>
<tr>
<td>18.</td>
<td>When I’m upset, I have difficulty focusing on other things.</td>
<td>1</td>
<td>2</td>
<td>3</td>
<td>4</td>
<td>5</td>
</tr>
<tr>
<td>19.</td>
<td>When I’m upset, I feel out of control.</td>
<td>1</td>
<td>2</td>
<td>3</td>
<td>4</td>
<td>5</td>
</tr>
<tr>
<td>20.</td>
<td>When I’m upset, I can still get things done.</td>
<td>1</td>
<td>2</td>
<td>3</td>
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</tr>
<tr>
<td>21.</td>
<td>When I’m upset, I feel ashamed with myself for feeling that way.</td>
<td>1</td>
<td>2</td>
<td>3</td>
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<tr>
<td>22.</td>
<td>When I’m upset, I know that I can find a way to eventually feel better.</td>
<td>1</td>
<td>2</td>
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</tr>
<tr>
<td>23.</td>
<td>When I’m upset, I feel like I am weak.</td>
<td>1</td>
<td>2</td>
<td>3</td>
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<tr>
<td>24.</td>
<td>When I’m upset, I feel like I can remain in control of my behaviors.</td>
<td>1</td>
<td>2</td>
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<tr>
<td>25.</td>
<td>When I’m upset, I feel guilty for feeling that way.</td>
<td>1</td>
<td>2</td>
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<tr>
<td>26.</td>
<td>When I’m upset, I have difficulty concentrating.</td>
<td>1</td>
<td>2</td>
<td>3</td>
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</tr>
<tr>
<td>27.</td>
<td>When I’m upset, I have difficulty controlling my behaviors.</td>
<td>1</td>
<td>2</td>
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<td>5</td>
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<tr>
<td>28.</td>
<td>When I’m upset, I believe that there is nothing I can do to</td>
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<tr>
<td></td>
<td>Almost never</td>
<td>Sometimes</td>
<td>About half the time</td>
<td>Most of the time</td>
<td>Almost Always</td>
<td></td>
</tr>
<tr>
<td>29. When I’m upset, I become irritated with myself for feeling that way.</td>
<td>1</td>
<td>2</td>
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<td>5</td>
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<tr>
<td>30. When I’m upset, I start to feel very bad about myself.</td>
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<td>2</td>
<td>3</td>
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</tr>
<tr>
<td>31. When I’m upset, I believe that wallowing in it is all I can do.</td>
<td>1</td>
<td>2</td>
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<td>5</td>
<td></td>
</tr>
<tr>
<td>32. When I’m upset, I lose control over my behaviors.</td>
<td>1</td>
<td>2</td>
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<td>5</td>
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</tr>
<tr>
<td>33. When I’m upset, I have difficulty thinking about anything else.</td>
<td>1</td>
<td>2</td>
<td>3</td>
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<td>5</td>
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<tr>
<td>34. When I’m upset, I take time to figure out what I’m really feeling.</td>
<td>1</td>
<td>2</td>
<td>3</td>
<td>4</td>
<td>5</td>
<td></td>
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<tr>
<td>35. When I’m upset, it takes me a long time to feel better.</td>
<td>1</td>
<td>2</td>
<td>3</td>
<td>4</td>
<td>5</td>
<td></td>
</tr>
<tr>
<td>36. When I’m upset, my emotions feel overwhelming.</td>
<td>1</td>
<td>2</td>
<td>3</td>
<td>4</td>
<td>5</td>
<td></td>
</tr>
</tbody>
</table>
Appendix G

Observational coding system of avoidance

**Engagement:**

5. **High and Genuine Interest: Engaged and Enthusiastic.**
   The child is focused on the mother, showing high interest and curiosity in what she says and does throughout the discussion. The child is very attentive and responsive to what the mother says and does, and follows her ideas and thoughts. The child is responsive to the mother's initiations and invitations for cooperation in the task. Assigning this score to the child implies that there were no signs of boredom or disengagement in the child’s interaction with the mother. Also note that if there is one instance in which the child flattens an idea proposed by the mother, his/her score should be lowered to 4.

4. **Interest: Engaged.**
   Generally, the child is focused and concentrated on the mother, attentive to what she has to say, and responsive to questions. However the intensity of the interest and curiosity he/she displays to the mother's contributions to the conversation and the positive/enthusiastic quality are lower compared to the score of 5. Although the child is engaged and interested in the mother, and responsive to the mother, the child might flatten a little from time to time an idea raised by the mother.

3. **Flat Interest: Attentive.**
   Child is attentive to the mother and displays some interest in the mother, but the positive quality is clearly lacking here. The child does not show an authentic interest in the mother’s contributions to the discussion or in responding to the mother’s questions. Nevertheless, the child is not altogether indifferent, or detached, or bored, or non-attentive to the mother's contributions and questions. Some children may show low to moderate levels of rejection, or anger, or dissatisfaction.

2. **Low Interest: Distracted.**
   Child is not really following the mother's ideas, and there may be long periods of time, or many incidents of shorter duration, in which the child seems detached from the situation OR occupied/busy with other things (checking the time, fidgeting, etc.), OR bored, OR indifferent, OR asking the mother questions as if in order to fulfill his/her obligation. When the mother replies or asks questions of the child, the child does not pay attention to her or respond appropriately.

1. **Lack of Interest: Disengaged.**
   The child is not interested in the mother and in what she has to say. The child is withdrawn and looks detached and disengaged from the mother. The child hardly ever responds to questions that the mother asks. Generally, his/her lack of interest in the mother is clear. The child may seem withdrawn, distracted, disengaged, detached and bored.
Appendix H

Screen for Anxiety Related Emotional Disorders

My feelings

Below is a list of items that describe how children may think or feel in some situations. For each item listed, please think about what you thought or did in the last three months, then rate how true the statement is for you, using the following scale:

0---------------------------------------------------------------1--------------------------------------------------------------2
not true or hardly ever true sometimes true true or often true

1. When I feel frightened, it is hard to breathe. 0 1 2
2. I get headaches when I am at school. 0 1 2
3. I don’t like to be with people I don’t know well. 0 1 2
4. I get scared if I sleep away from home. 0 1 2
5. I worry about other people liking me. 0 1 2
6. When I get frightened, I feel like passing out. 0 1 2
7. I am nervous. 0 1 2
8. I follow my mother or father wherever they go 0 1 2
9. People tell me I look nervous. 0 1 2
10. I feel nervous with people I don’t know well. 0 1 2
11. I get stomachaches at school. 0 1 2
12. When I get frightened, I feel like I am going crazy. 0 1 2
13. I worry about sleeping alone. 0 1 2
14. I worry about being as good as other kids. 0 1 2
15. When I get frightened, I feel like things are not real. 0 1 2
<p>| | | | |</p>
<table>
<thead>
<tr>
<th></th>
<th></th>
<th></th>
<th></th>
</tr>
</thead>
<tbody>
<tr>
<td>16.</td>
<td>I have nightmares about something bad happening to my parents.</td>
<td>0</td>
<td>1</td>
</tr>
<tr>
<td>17.</td>
<td>I worry about going to school.</td>
<td>0</td>
<td>1</td>
</tr>
<tr>
<td>18.</td>
<td>When I get frightened, my heart beats fast.</td>
<td>0</td>
<td>1</td>
</tr>
<tr>
<td>19.</td>
<td>I get shaky.</td>
<td>0</td>
<td>1</td>
</tr>
<tr>
<td>20.</td>
<td>I have nightmares about something bad happening to me.</td>
<td>0</td>
<td>1</td>
</tr>
<tr>
<td>21.</td>
<td>I worry about things working out for me.</td>
<td>0</td>
<td>1</td>
</tr>
<tr>
<td>22.</td>
<td>When I get frightened, I sweat a lot.</td>
<td>0</td>
<td>1</td>
</tr>
<tr>
<td>23.</td>
<td>I am a worrier.</td>
<td>0</td>
<td>1</td>
</tr>
<tr>
<td>24.</td>
<td>I get really frightened for no reason at all.</td>
<td>0</td>
<td>1</td>
</tr>
<tr>
<td>25.</td>
<td>I am afraid to be alone in the house.</td>
<td>0</td>
<td>1</td>
</tr>
<tr>
<td>26.</td>
<td>It is hard for me to talk with people I don’t know well.</td>
<td>0</td>
<td>1</td>
</tr>
<tr>
<td>27.</td>
<td>When I get frightened, I feel like I am choking.</td>
<td>0</td>
<td>1</td>
</tr>
<tr>
<td>28.</td>
<td>People tell me that I worry too much.</td>
<td>0</td>
<td>1</td>
</tr>
<tr>
<td>29.</td>
<td>I don’t like to be away from my family.</td>
<td>0</td>
<td>1</td>
</tr>
<tr>
<td>30.</td>
<td>I am afraid of having anxiety (or panic) attacks.</td>
<td>0</td>
<td>1</td>
</tr>
<tr>
<td>31.</td>
<td>I worry that something bad might happen to my parents.</td>
<td>0</td>
<td>1</td>
</tr>
<tr>
<td>32.</td>
<td>I feel shy with people I don’t know well.</td>
<td>0</td>
<td>1</td>
</tr>
<tr>
<td>33.</td>
<td>I worry about what is going to happen in the future.</td>
<td>0</td>
<td>1</td>
</tr>
<tr>
<td>34.</td>
<td>When I get frightened, I feel like throwing up.</td>
<td>0</td>
<td>1</td>
</tr>
<tr>
<td>35.</td>
<td>I worry about how well I do things.</td>
<td>0</td>
<td>1</td>
</tr>
<tr>
<td>36.</td>
<td>I am scared to go to school.</td>
<td>0</td>
<td>1</td>
</tr>
<tr>
<td>37.</td>
<td>I worry about things that have already happened.</td>
<td>0</td>
<td>1</td>
</tr>
<tr>
<td>38.</td>
<td>When I get frightened, I feel dizzy.</td>
<td>0</td>
<td>1</td>
</tr>
</tbody>
</table>

39. I feel nervous when I am with other children or adults and I have to do something while they watch me (for example: read aloud, speak, play a game, play a sport).
40. I feel nervous about going to parties, dances, or any place where there will be people that I don’t know well. 0 1 2

41. I am shy. 0 1 2