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Parent Predictors of Infant Respiratory Sinus Arrhythmia

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PARENT PREDICTORS OF INFANT RESPIRATORY SINUS ARRTHYMIA

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I dedicate this thesis to my parents, Julie and Gustavo Soto, for their unwavering support and the push to chase my dreams.

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The development of emotion regulation skills is an imperative task early in development. Respiratory sinus arrhythmia (RSA), a physiological proxy of regulation, is indicative of one's regulatory capacity and can be predictive of behavior in later life (Graham, Ablow, & Measelle, 2010; Moore, 2010). Children begin regulating their emotions at a physiological level early in infancy. Infants who are able to properly suppress RSA have higher quality social interactions in childhood (Graziano, Keane, & Calkins, 2007). Previous work has suggested that parents play a role in predicting infant RSA (Conradt & Ablow, 2010). For example, parent marital satisfaction is known to impact infants' physiological regulation, such that infants whose parents are less satisfied with their marriages have a decreased ability to regulate physiologically (Moore et al., 2009; Porter, Wouden-Miller, Silva, & Porter, 2003). Previous research has found that parent personality impacts parenting strategies (Cummings & Davies, 1994; Prinzie, Stams, Deković, Reijntjes, & Belsky, 2009), however work examining how parent personality interacts with marital satisfaction to predict infant RSA is lacking. Moreover, the majority of previous work assessing the parent predictors of infant RSA focused on mothers (e.g., Moore et al., 2009). There are known differences in the way mothers and fathers interact with their infants, as well as differences in the way fathers and mothers respond to marital dissatisfaction (Forbes, Cohn, Allen, & Lewinsohn, 2004; Karney & Bradbury, 1995). The present study focused on examining how marital satisfaction and

parent personality predicts infant RSA with mothers and fathers. The current study involved 38 families (6-month old infants, mothers, and fathers). Parents completed questionnaires measuring marital satisfaction and personality. Mother-infant and father-infant dyads participated in a baseline and face-to-face play task (Still Face Paradigm; Tronick, Als, Adamson, Wise, & Brazelton, 1978), where infant physiological regulation was assessed. Results involving mothers did not yield significant findings predicting infant physiological regulation. For fathers, results indicated that parent personality and parent marital satisfaction predicted infant physiological regulation. The current study highlights the importance of examining the roles of both mothers and fathers predicting infant physiological regulation.

Introduction

Respiratory sinus arrhythmia (RSA), a physiological proxy of regulation, is indicative of one's regulatory capacity and can be predictive of behavior in later life (Graham et al., 2010; Moore, 2010). Infants who are able to suppress RSA have higher quality social interactions in childhood (Graziano, Keane, & Calkins, 2007). Previous work has suggested that parent factors play a role in predicting infant RSA (Conradt & Ablow, 2010). For example, parent marital satisfaction is known to impact infants' physiological regulation, such that infants whose parents are less satisfied with their marriages have a decreased ability to regulate physiologically (Moore et al., 2009; Porter et al., 2003). Even though work has examined how broad aspects of parenting have contributed to infant physiological regulation, studies examining individual differences in parents have not been performed. In other words, it is unclear how more specific aspects of parents, such as parent personality influences infant RSA suppression. It is possible that individual differences in parents might be a better indicator of infant regulation than these broad aspects. Previous research has found that parent personality impacts parenting strategies (Cummings & Davies, 1994; Prinzie et al., 2009). However work examining whether parent personality moderates the association between marital satisfaction and infant RSA is lacking.

Moreover, the majority of previous work that has assessed the parent predictors of infant RSA focused on mothers (e.g., Moore et al., 2009). There are known qualitative differences in the way mothers and fathers interact with their infants, as well as differences in the way they respond to marital dissatisfaction (Forbes et al., 2004; Karney & Bradbury, 1995). These differences might differentially predict infant RSA. The

current study examined how marital satisfaction and parent personality predicts infant RSA suppression with mothers and fathers.

Emotion Regulation

The underpinning of organized behavior is emotion regulation (Maccoby, 1980). There has been controversy in the field defining and measuring emotion regulation. Emotion regulation has often been poorly defined and the term has been applied to a variety of different constructs (Ekas, Braungart-Rieker, Lickenbrock, Zentall, & Maxwell, 2011; Thompson, 1994). Despite the disagreement in the field, there are several commonalities. It is recognized that emotional experience varies across individuals (Thompson, 1994). In addition, regulation does not only apply to negative emotions; positive emotions are regulated as well (Kopp & Neufeld, 2003).

According to Thompson (1994) "emotion regulation consists of the extrinsic and intrinsic processes responsible for monitoring, evaluating, and modifying emotional reactions, especially their intensive and temporal features, to accomplish one's goals" (pp. 27-28). Thus, the process of emotion regulation is dynamic, consisting of appraising and reactive elements (Calkins & Hill, 2007; Cole, Martin, & Dennis, 2004). Individuals attempt to exert control over their experience of emotions by altering the type of emotion experienced or length or intensity of the experienced emotion (Cole et al., 2004). Emotion regulation allows one to cope with high levels of pleasurable or distressing stimuli (Kopp 1982; Kopp & Neufeld, 2003).

From a developmental perspective, emotion regulation begins to manifest during the first year of life through parent-infant social interactions (Kopp, 1982). Emotion regulation aids in interactions with caregivers during early development and later on with

peers (Kopp & Neufeld, 2003). Infants learn early social skills through the process of modifying their emotional arousal during interactions with caregivers (Kopp & Neufeld, 2003). Infants use cues from the environment and their caregivers for guidance on how to react to stimuli (Moore & Calkins, 2004). As infants age, they shift to more intrinsic processes as they develop into children.

The ability to properly regulate one's emotions is associated with better developmental outcomes (Cole et al., 2004; Kopp, 1982). Infants who are better at regulating their emotions are more likely to have higher quality social interactions later in life (Calkins & Hill, 2007; Kopp & Neufeld, 2003). They are more equipped to deal with behavioral demands in school and peer relationships (Calkins & Hill, 2007). On the other hand, those who are incapable of properly regulating their emotions in infancy are more likely to have behavioral problems later in life (Calkins & Hill, 2007). For example, Calkins and Dedmon (2000) found that toddlers who were classified as being high risk for externalizing disorders displayed more dysregulated behavior in the face of challenging tasks. They were less able to focus on the tasks at hand and responded with greater negative affect than toddlers classified as low risk. This suggests that deficits in emotion regulation are hard to overcome later in development and it is important to identify sources of regulation difficulties so that interventions could happen earlier.

Before infants can begin to solely use intrinsic processes to regulate their emotions, they are reliant on extrinsic processes, mainly their caregivers to help them regulate their emotions (Calkins & Hill, 2007; Thompson, 1994). A young infant might become distressed and seek their caregivers to aid in lowering emotional arousal (Kopp & Neufeld, 2003). Due to this early reliance, caregivers have a great influence on the

development of the skills related to emotion regulation. Caregivers' strategies, either positive or negative, in an attempt to help their infants regulate emotions may be used later in life by the child (Calkins & Hill, 2007). For example, parents may attempt to distract or soothe the infant through vocalization or touch (Crockenberg & Leerkes, 2004), which is known to decrease infant negative affect (Jahromi, Putnam, & Stifter, 2004).

However, parents can negatively impact emotion regulation as well. Negative parenting strategies, such as authoritarian, permissive, and neglectful parenting (Aunola, Stattin, Nurmi, 2000), have been associated with poor emotion regulation in children (Morris, Silk, Steinberg, Myers, & Robinson, 2007). Authoritarian parents are controlling and demanding of their children, but are low in warmth and sensitivity to the child's needs. In turn, permissive parents are high in warmth, but are low in parental control. Although high expectations are not placed on the child, the child is allowed to retain a sense of autonomy that is not reflected in the authoritarian parenting style. Neglectful parents are neither controlling nor sensitive to a child's needs, and are not involved with the child (Aunola et al., 2000). Children of parents who employ negative strategies are more likely to have difficulties with physiological regulation as well as school adjustment problems (Calkins, Smith, Gill, & Johnson, 1998; NICHD Early Child Care Research Network, 2004). Therefore, it is important to examine parents' impact on emotion regulation in children.

In addition to extrinsic processes, emotion regulation consists of intrinsic processes (Kopp, 1982; Thompson, 1994). Infants possess rudimentary intrinsic emotion regulation abilities. For example, infants might shift their attention away from aversive

stimuli (Crockenberg & Leerkes, 2004), or engage in self-soothing behaviors (e.g., thumb-sucking; Moore & Calkins, 2004). As infants age, they begin to simultaneously process their environment and learn how to adapt to it (Kopp & Neufeld, 2003).

Regulation shifts to additional intrinsic processes as children develop (Kopp, 1982). For example, as infants become more mobile they can move away from unpleasant stimuli (Crockenberg & Leerkes, 2004). They are better able to deal with frustration. For example, instead of becoming angry that another child is using a preferred toy, they might choose to use another toy (Calkins & Hill, 2007). Therefore, children are better able to self-regulate as they age (Kopp & Neufeld, 2003). However, self-regulation not only consists of cognitive and behavioral components, but biological processes as well.

Respiratory Sinus Arrhythmia

One specific example of an intrinsic, emotion regulation process is respiratory sinus arrhythmia (RSA), which is a biological measure of physiological regulation. RSA is the variability in heart rate in response to respiration (Berntson, Cacioppo, & Quigley, 1993), and is a measure of the parasympathetic nervous system response in relation to emotion regulation (Ham & Tronick, 2006). The parasympathetic nervous system is associated with growth and homeostasis (Porges, Doussard-Roosevelt, Portales, & Greenspan, 1996). A decrease in parasympathetic response allows for active coping in response to stress provoking situations (Moore & Calkins, 2004).

RSA can be examined through two different measurements: baseline RSA and RSA suppression. Baseline RSA can be indicative of the capacity to regulate emotions (Graham et al., 2010) and is obtained during exposure to a neutral stimulus. For example,

studies have had caregivers hold the infant in their lap quietly (Porter et al., 2003) or show the infant a Baby Einstein video while collecting baseline physiology (Graham et al., 2010). Higher baseline RSA is associated with better neurological control over the regulation of emotion and physiological processes (Moore, 2010). In fact, higher baseline RSA has been associated with better developmental outcomes than lower baseline RSA, such as higher levels of prosocial behavior and better social standing with peers (Beauchaine, Gatzke-Kopp, & Mead, 2007; Graziano et al., 2007; Moore, 2010).

RSA suppression can be obtained during a variety of tasks, some of which are stressful for the infant (Moore & Calkins, 2004). RSA suppression is a decrease in vagal tone from an individual's baseline RSA (Calkins & Keane, 2004). RSA suppression is indicative of the ability to respond to stress, and is related to behaviors in young children where active regulation of their emotions is required (Calkins & Keane, 2004). For example, an infant may shift his/her attention away from a stressful stimulus or engage in self-soothing behaviors to regulate his/her emotions (Crockenberg & Leerkes, 2004; Moore & Calkins, 2004). Several studies have found that RSA suppression is related to infants' behavioral attempts to regulate emotions (Calkins et al., 2007), greater attention control (Propper & Moore, 2006), and the ability to self-soothe (Moore & Calkins, 2004). The current study examined infants' RSA suppression during a mild, stress-inducing situation (e.g., the Still Face Paradigm; Tronick et al., 1978).

Research has also shown that it is important to consider the context in which RSA is measured (Brooker & Buss, 2010; Calkins & Keane, 2004). There is large variability in the types of tasks that are typically used to measure RSA (Calkins & Keane, 2004). For example, RSA can be acquired while the infant is faced with a task that elicits a specific

emotional response, such as fear (e.g. a fearful, Novel Unpredictable Robotic Toy Task; Graham et al., 2010), or a more general response in children, such as attention (e.g., the Continuous Performance Task; Suess, Porges, & Plude, 1994) or negative affect/distress (e.g. the Still Face Paradigm; Tronick et al., 1978). If RSA is examined across these various contexts (e.g., ignoring context), it might appear to be similar (Calkins & Keane, 2004). For example, RSA suppression measured during a frustration task has appeared similar to RSA suppression measured during a fear task (Calkins, Blandon, Williford, & Keane, 2007).

On the other hand, some tasks might be more taxing than others, which can elicit very different levels of physiological response (Calkins & Keane, 2004). For example, an attention task (e.g., Continuous Performance Task; Suess et al., 1994), may elicit a greater physiological response level compared to a fear inducing task (e.g., Novel Unpredictable Robotic Toy Task; Graham et al., 2010.) Therefore, both the context and intensity of the task needs to be considered when measuring RSA. For this thesis, the Still-Face Paradigm (Tronick et al., 1978), which is a task that typically invokes a mild level of negative affect or distress in infants, will be used to acquire RSA. The Still-Face Paradigm was chosen over other tasks because this task is known to be a more global measure of negative affectivity in comparison to other tasks that might measure specific emotions.

Individual differences in RSA are correlated not only with positive outcomes, but also clinical and behavioral diagnoses as well (Porges et al., 1996). Infants' inability to suppress RSA in response to stress places them at higher risk for behavioral problems (i.e., aggression and anxiety) during childhood and adolescence as well as clinical

disorders (i.e., affect disorders) later in life (Beauchaine et al., 2007). For example, Porges and colleagues (1996) found that less RSA suppression in infants at 9 months of age was associated with more behavior problems, including aggressive behavior and social withdrawal, at 3 years of age. Even though an infant's ability to suppress RSA provides a preview for his/her future behavior, additional factors may impact his/her ability to suppress RSA.

In sum, an infant's ability to regulate his/her emotions is impacted by extrinsic processes, such as parents. The early home environment that is provided by parents has an influence on the acquisition of self-regulation skills as well as their effectiveness (Calkins & Keane, 2004; Morris et al., 2007). However, it is unclear how individual differences in parents impact infant intrinsic, emotion regulation abilities, specifically RSA suppression (Conradt & Ablow, 2010). The current study aimed to address this gap in the literature by exploring how specific parent factors, namely parent marital satisfaction and personality, relate to infant RSA suppression during a mild distressing task (e.g., the Still-Face Paradigm, Tronick et al., 1978).

Parent Marital Satisfaction

Parent marital satisfaction plays a role in the development of infant emotion regulation within the context of the parent-child relationship, both directly and indirectly (Cummings & Davies, 2002; Ham & Tronick, 2006). The parent's ability to handle marital discord is associated with better child functioning (Howes & Markman, 1989). Children of parents who are less satisfied in the marriage and/or have an inability to resolve marital conflict have an elevated risk for poorer developmental outcomes that are specific to emotion dysregulation (Cummings & Davies, 2002; Fisherman & Meyers,

2000; Howes & Markman, 1989), such as internalizing disorders (i.e., anxiety, depression; Cummings & Davies, 2002; Wang & Crane, 2001), externalizing disorders (i.e., conduct disorder; Cummings & Davies, 2002), and difficulties in school (Jaycox & Repetti, 1993, as cited in Fishman & Meyers, 2000). In addition, children of parents who were less satisfied in their marriages were considered to be less social and displayed more negative affect than children from more satisfactory marriages (Fishman & Meyers, 2000).

Indirect Effects of Marital Satisfaction. Marital satisfaction might also indirectly affect child outcomes through parenting behaviors. Negative feelings toward the marital relationship may spill over into the parent-child relationship (Coiro & Emery 1998) and cause the parent to be less sensitive and/or able to attend to their infant's needs (Coiro & Emery 1998). In addition, differences in parenting in more versus less satisfactory marriages might explain why some children develop positive versus negative developmental outcomes. When marriage quality is high, parents tend to engage in more sensitive parenting (Barnett, Deng, Mills-Koonce, Willoughby, & Cox, 2008). However, when marriage quality is low, parents might engage in negative parenting strategies (Corio & Emery, 1998). For example, parents who are less satisfied in the marriage can withdraw from the child, which might increase the likelihood of neglectful (Aunola et al., 2000) and less sensitive parenting (Belsky, Youngblade, Rovine, & Volling, 1991). In sum, children are highly sensitive to marital interactions (Cummings & Davies, 2002) and are at heightened risk for poor developmental outcomes if their parents have low quality marital interactions. Thus, it is important to assess how parent marital satisfaction, both directly and indirectly, influence infant physiological regulation.

Changes in Marital Satisfaction. It is important to note that a fluctuation in the overall level of marital satisfaction is normal (Cummings & Davies, 2002), and this fluctuation might be influenced by many factors of the couple. Typically there is a decrease in overall marital satisfaction after the birth of a child due to the transition to parenthood (Lawrence, Rothman, Cobb, Rothman, & Bradbury, 2008), and this dip dissipates as the child grows up (Moore, 2010). Parental division of childcare mediates this dip in marital satisfaction (Belsky, Lange, & Huston, 1986). Greater level of agreement between spouses on parenting techniques, support, is associated with increased marital satisfaction (Belsky et al., 1986; Crockenberg & McClusky, 1986), whereas disagreement on parenting techniques is associated with decreased marital satisfaction (Feldman, 2000). Although the slope of the decrease in marital satisfaction is minimal, this does not imply it is benign. This slight, temporary decrease in satisfaction can still increase a child's risk for poorer developmental outcomes (Cummings & Davies, 2002).

The current study focuses on marital satisfaction when infants are 6-months of age, which is during the time when parents might have a decrease in marital satisfaction during this transition to parenthood. Younger children are more vulnerable to the effects of marital dissatisfaction (Erel & Burman, 1995 as cited in Fishman & Meyers, 2000). They are dependent on their parents for all of their physical and psychological needs, including emotion regulation (Kopp & Neufeld, 2003). Infants whose regulatory needs are not being met can become over reliant on internal mechanisms, which tax their ability to effectively regulate their emotional arousal in the future (Gottman & Katz, 1989). This could have a negative impact on infants' physiological regulation (e.g., RSA; Moore, 2010). The infant might go on to model their emotion regulation strategies after the less

effective strategies used by their parents, leading to emotion dysregulation later in life (Calkins & Hill, 2007). Emotion dysregulation, even in infancy, is associated with behavioral problems later in development and is found to be associated with less effective physiological regulation (Calkins et al., 2007). For example, adaptive emotion regulation is associated with a decreased risk for behavioral problems later in development (Calkins et al., 2007). Therefore, its important to examine the impact of marital satisfaction on infants, because dips in satisfaction are likely to occur while children are younger and the effects of increased marital dissatisfaction can be severe.

Marital Satisfaction and Infant RSA. Parent marital satisfaction and level of marital discord has been found to influence infants' physiological regulation, such as infant RSA (e.g. Gottman & Katz, 1989; Moore, 2010; Porter et al., 2003). Exposure to parent marital discord leads to ineffective physiological regulation in children (Propper & Moore, 2006). Infants of parents who are low in marital satisfaction have more difficulties with physiological regulation and emotion regulation (e.g., Moore, 2010; Porter et al., 2003). Marital conflict can impact infant RSA as well. Infants who are exposed to marital conflict have lower baseline RSA and a lower level of RSA suppression during stress inducing tasks (Moore, 2010). For example, infants exposed to higher levels of marital conflict have been shown to display less emotion regulation as assessed by the Bayley Scales of Infant Development (Porter et al., 2003). However, better physiological regulation can serve as a buffer from negative parental factors (e.g. low marital satisfaction, high marital conflict) (Gottman & Katz, 1989; Propper & Moore, 2006). Thus, RSA (baseline or suppression) can serve as a protective factor against the negative effects of marital dissatisfaction. Therefore, the current study

evaluated the association between parent marital satisfaction and infant RSA (baseline and suppression).

Mothers Versus Fathers Responses to Marital Satisfaction and Dissatisfaction. Mothers and fathers may react similarly when marital satisfaction is high, and differently when marital satisfaction is low. When marital satisfaction is high, mothers and fathers engage in more sensitive parenting (Barnett et al., 2008). However, there are many differences between mothers and fathers in how they respond to the transition to parenthood (Feldman, 2000; Karney & Bradbury, 1995). For example, mothers have been known to report a steeper decline in marital satisfaction in response to parenthood than fathers (Feldman, 2000). When marital satisfaction is low, mothers are better than fathers at differentiating between their role as a spouse and parent, which means that they do not let the poor marriage affect their parent-child interactions (Belsky, Youngblade, Rovine, & Volling, 1991; Coiro & Emery, 1998). In addition, mothers who are less satisfied in the marital relationship may restrict paternal involvement via maternal gatekeeping (Corio & Emery, 1998; DeLuccie, 1995; McBride et al., 2005). Maternal gatekeeping has been defined as the reluctance of the mother to relinquish child-rearing responsibilities to the father (Allen & Hawkins, 1999). Gatekeeping may occur in an effort to protect the child from negative paternal interactions (Belsky, Youngblade, Rovine, & Volling; 1991). Fathers, however, are more susceptible to spill-over effects from the marital relationship to the parent-child relationship (Coiro & Emery 1998; Howes & Markman, 1989). This explains why fathers have a tendency to withdraw from the marriage and children in response to marital discord (Howes & Markman, 1989; Parke & Tinsley, 1987).

The differences between mothers and fathers in response to marital dissatisfaction may differentially predict infant RSA suppression, such that the ability to suppress RSA might be diminished when interacting with mothers as opposed to fathers. Mothers are typically the primary caregivers (Forbes et al., 2004). Therefore, the infant might be accustomed to mothers responding to their emotional needs. Additionally, infants may be more prone to RSA augmentation with mothers, if marital dissatisfaction is high and the infant is accustomed to that parent responding to their needs. Infants might experience a minimal change in RSA when interacting with fathers; especially if the infant is used to social withdrawal from the father. However, the reverse could be true; infants may be more likely to engage in RSA suppression with fathers and less likely with mothers. Therefore, the current study assessed differences in infants' RSA suppression with both mothers and fathers to evaluate if there were differences in RSA suppression depending on the parent.

Parent Personality

Personality has been defined as a set of psychological characteristics that causes an individual to act uniquely and consistently (Schofield et al., 2012; Prinzie et al. 2009). Personality is viewed as a static trait that remains stable over time (Rothbart, Ahadi, & Evans 2000), and influences how people think, feel, and interact with each other (Achtergarde et al., 2015). For example, a parent's personality can affect the marital relationship (Karney & Bradbury, 1995) as well as the relationship with his/her child (Shiota & Levenson, 2007). More specifically, negative personality traits, such as high neuroticism have been found to negatively impact the marital relationship, such that high neuroticism lowers marital satisfaction (O'Rourke et al., 2010). Previous literature on the

linkages between parent personality and the parent-child relationship has focused on personality through the filter of psychopathology. For example, it is well understood how parent depression, or high neuroticism, affects parenting by causing mothers to be less sensitive to their infants (Belsky, Crnic, & Woodworth, 1995; Kochanska, Clark & Goldman, 1997). However, it is less understood how typical personality traits impact parent-child relationships and developmental outcomes (Kochanska, Friesenborg, Lange, & Martel, 2004). The current study aimed to extend the literature on parent personality through examining personality in a community sample.

Assessing Personality. There are several questionnaires used to assess personality, including the Myers Briggs Type Indicator (Myers & Briggs, 1976), Minnesota Multiphasic Personality Inventory (Ben-Porath & Tellegen, 2011), the Five Factor Model (McCrae & Costa, 1987), and the Behavioral Inhibition System/Behavioral Activation System (BIS/BAS) questionnaire (Carver & White, 1991).

The bulk of the literature on the impact of parent personality through parenting has utilized the Five Factor Model of Personality (Prinzie et al., 2009). Mothers high on neuroticism display less positive affect when interacting with their infants, whereas openness in fathers is important for the display of positive affect (Kochanska et al., 2004). Low levels of agreeableness have been associated with lower levels of positive affect during mother-infant interactions (Prinzie et al., 2009). Additionally, mothers low on Agreeableness have been found to be more forceful with children and display less warmth (Prinzie et al., 2009) whereas those high on Agreeableness may be more likely to make positive attributions about their children (Prinzie et al., 2009). Mothers high on Conscientiousness engage in more tracking of the infant, while this was associated with

Extraversion in fathers (Kochanska et al., 2004). Tracking behaviors, or child monitoring behaviors, in parents have been associated with responsiveness and sensitive parenting (Kochanska et al., 2004). Parent personality has also been found to predict positive parenting; parents who possess positive traits (e.g., low neuroticism, high agreeableness, and high conscientiousness) engage in more positive parenting behaviors (Schofield et al., 2012). Agreeableness, extraversion and openness were associated with high levels of parental warmth and behavioral control, whereas openness and agreeableness were related to autonomy support (Prinzie et al., 2009). Thus, personality can differentially impact the mother-child relationship and father-child relationship (Werneck, Eder, Yanagida, & Rollett, 2014).

Although the Five Factor Model of personality is a common model of personality and is widely used (McCrae & Costa, 2004), there have been issues reported with the internal validity of the measure (Egan, Deary, & Austin, 2000; Parker & Stumpf, 1998). For example, studies have reported that there are a number of items that inconsistently load onto the overall constructs of openness and extraversion (Egan et al., 2000; Parker & Stumpf, 1998). Additionally, mixed findings have been reported with the Five Factor Model, specifically extraversion, with regards to parenting behaviors (Kochanska et al., 2004). For example, some studies have reported that parents high on extraversion are supportive, attentive parents (Losoya, Callor, Rowe, & Goldsmith 1997). However, other studies have found parents high on extraversion to be insensitive and force their agendas on their children (Clark et al., 2000). These inconsistent findings stress the importance of examining personality more globally.

Carver and White's (1994) BIS/BAS inventory is a global measure of personality. The Behavioral Inhibition System (BIS) is associated with behavioral inhibition in an effort to avoid negative outcomes (Carver & White, 1994). BIS is associated with negative affect as well as increased sensitivity to anxiety (Carver & White, 1994). The Behavioral Activation System (BAS) is sensitive to reward and escape from punishment (Carver & White, 1994). Those high in BAS might be more likely to make an effort to reach goals. Additionally, BAS is associated with approach behaviors as well as positive affect.

The BAS/BIS Inventory is associated with several personality constructs of the Five Factor Model of Personality (Smits & Boeck, 2006); however, the literature is limited. The BAS is similar to the Five Factor Model Extraversion construct, but they are not strongly associated (Smits & Boeck, 2006). More specifically, Extraversion is associated with high activity level, sensation seeking, and positive affect (McCrae & Costa, 1987). Therefore, the association between the BAS and Extraversion is likely due to the approach tendency with both constructs (Smits & Boeck, 2006). The BIS maps onto the trait of Neuroticism and is associated with a propensity towards negative affect and anxiety (McCrae & Costa, 1987). The association between BIS and Neuroticism may be due to the negative affect sensitivity found in both constructs (Smits & Boeck, 2006). However, the literature is sparse with regard to mapping the BAS/BIS Inventory onto the remaining constructs of the Big Five Inventory, Openness, Agreeableness, and Conscientiousness (McCrae & Costa, 1987). The BIS/BAS subscales do map onto Openness, Agreeableness, and Conscientiousness, but to a lesser degree than Neuroticism and Extraversion (Smits & Boeck, 2006). Agreeableness has been found to be positively

associated with BIS and negatively associated with BAS Drive. However, Conscientiousness was found to be negatively associated with BAS Fun-seeking in one sample but not the other. Finally, Openness has not been found to be significantly predicted by the BIS/BAS Inventory (Smits & Boeck, 2006).

The BAS/BIS is preferable over other personality inventories for the current study because this inventory is sensitive to behaviors that may be more associated with how parents interact with their children, specifically approach and inhibition behaviors (Carver & White, 1994). These behaviors would be more associated with a parents' likelihood or capability to attending to their infants' emotional needs than the constructs that comprise the Five Factor Model (McCrae & Costa, 2004). Additionally, the validity and reliability data for the constructs of the BIS/BAS Inventory are more consistent than that of the Five Factory Model (McCrae & Costa, 2004). Therefore, the current study used the BIS/BAS Inventory (Carver & White, 1994) to assess parent personality.

Parent Personality and the Parent-Child Relationship. Parent personality impacts child developmental outcomes both directly and indirectly (Belsky, 1984; Kochanska et al., 1997). Parent personality can have a direct impact on children (Belsky, 1984), such as emotional and mental development (Casalin et al., 2014; Molfese et al., 2010). For example, negative aspects of maternal personality, such as rigidity and negative affect, have been found to negatively impact infants' mental development (Molfese et al., 2010). In addition, high maternal neuroticism and low conscientiousness, additional negative aspects of personality, have been associated with increased externalizing problems (Prinzie et al., 2009) and defiance (Kochanska et al., 1997) in

children. Therefore, it is important to examine the impact of parent personality on the development of regulation in children.

In addition to the direct effects of parent personality on child developmental outcomes through parenting behaviors, personality has an indirect effect on children through the marital relationship (Belsky, 1984). Personality traits such as conscientiousness and extraversion have been found to be associated with supportive parenting (Werneck et al., 2004). Whereas, neuroticism has been found to be associated with less supportive parenting (Clark et al., 2000) or difficulties in the marriage (Shiota & Levenson, 2007). These findings may be due to the negative emotionality and emotion dysregulation associated with this personality trait (O'Rourke, Claxton, Chou, Smith, & Hadjistavropoulose, 2010). Additionally, low levels of neuroticism are associated with higher parental worth, or how one feels about themselves as a parent (Achtergarde et al., 2015). The direct and indirect influences of parent personality go on to impact the development of infant physiological regulation. Thus it is important to evaluate the effects of parent personality in conjunction with marital satisfaction due to the effect of personality on the marital relationship.

In sum, parent personality impacts children via different pathways (Werneck et al., 2014). One pathway of influence is through the effect of parent personality on parenting behaviors (Belsky, 1984). Children of parents who are high on negative personality traits are at risk for poorer emotion regulation (Kochanska et al., 1997) and poor developmental outcomes (Prinzie et al., 2009). A second pathway of influence though parenting affects the marital relationship, which can then impact the child through parenting. Previous research has acknowledged the direct role of personality on the

marital relationship, parenting, and child developmental outcomes (Karney & Bradbury, 1995). However, no studies have examined the how individual differences in parents contribute to infant physiological regulation. The current study assessed whether individual differences in parent personality impacts the association between marital satisfaction and infant RSA.

The Inclusion of Fathers

Historically, much of the literature involving infant physiological regulation and parent factors has primarily focused on the mother-infant relationship, whereas less focus has been placed on the father-infant relationship. What is known about the effect of marital satisfaction on infant physiological regulation is based on maternal appraisal of the marriage (e.g., Porter et al., 2003). Infants of mothers who are high in marital satisfaction are better at emotion regulation compared to infants of mothers who are high in marital dissatisfaction. However, it is not clear how paternal factors affect infant physiological regulation.

The social context of the family has changed. Fathers are now more involved with their families currently than they were in previous generations (McBride et al., 2005). Additionally, mothers and fathers interact differently with their infants (Forbes et al., 2004). Mothers are typically involved in more caregiving activities (Forbes et al., 2004), whereas fathers are typically more involved in play (Belsky, Gilstrap, & Rovine, 1984). Few studies have evaluated the differences between mother-infant and father-infant interactions in terms of physiological regulation. Therefore, it is reasonable to assume that these differences between mothers and fathers might be reflected in infant physiological regulation. Additionally, there might be differences between mothers and

fathers for the Still Face Paradigm (Forbes et al., 2004). Thus, the present study focused on the inclusion of both parents to assess whether mothers and fathers differentially impact physiological regulation.

The Current Study

Research has focused on the association between infant RSA and parent marital conflict. Even though marital conflict influences the marital relationship, it is not an indicator of the overall state of the marriage (Bradbury & Karney, 1993). Although conflict can influence marital satisfaction, high levels of conflict do not imply that the marriage is unsatisfactory (Bradbury & Karney, 1993). Marital satisfaction is more reflective of the global marital relationship in community samples (Bradbury & Karney, 1993) and has been found to predict a host of developmental outcomes in young infants and children (Fincham, Grych, & Osborne, 1994). For example, infants of parents who are more satisfied are better at regulating their emotions (e.g., Howes & Markman, 1989). Children of mothers who displayed more negative affect were more prone to anger (Kochanska et al., 1997). Additionally, negative affect is found to impact child emotional stability; children of parents who respond frequently with anger or frustration are likely to have lower emotional stability (Prinzie et al., 2004). However, it is unclear how parent marital satisfaction impacts infant RSA suppression, and specifically physiological indicator of regulation (Conradt & Ablow 2010). The current study examined the associations between parent marital satisfaction and infant RSA suppression in a community sample.

Previous research has also established the role of individual differences in parents, or parent personality, in parent-child interactions (Belsky, 1984; Prinzie et al., 2009) and

developmental outcomes. For example, parent personality impacts child emotionality (Kochaksa et al., 1997) and emotional stability (Prinzie et al., 2004). Children of parents who possess negative personality traits (e.g., Neuroticism; Kochanska et al., 2004) are at risk for poor developmental outcomes (Prinzie et al., 2009). Thus, parent personality impacts multiple relationships, specifically how parents interact with their children (Karney & Bradbury, 1995) and how spouses interact with each other (O'Rourke et al., 2010). Negative aspects of personality, such as high BIS sensitivity or high Neuroticism, can negatively impact familial relationships (O'Rourke et al., 2010).

Parent personality may moderate the association between marital satisfaction and infant RSA suppression. Moderation exists when the direction and/or strength of an association of the independent and dependent variables is due to a third, moderating variable (Baron & Kenny, 1986). Moderating variables impact the association between two variables, such that variations in the moderating variable can explain differences in the association between the variables of interest (MacKinnon, 2011). Specifically, a parent's level of BAS or BIS sensitivity was expected to impact the association between marital satisfaction and infant RSA suppression. In the case of parent personality, the moderating variable is continuous, which allows for the assessment of how a parent's level of BAS/BIS impacts the proposed association between parent marital satisfaction and infant RSA suppression (MacKinnon, 2011).

The current study aimed to examine the association between parent marital satisfaction and personality on infant RSA suppression during a stress-inducing task (e.g., the Still Face Paradigm; Tronick et al., 1978). Taking previous research into consideration, the current study aimed to address the following questions: 1) To what

extent does parent marital satisfaction predict infant RSA? 2) Does parent personality (BAS, BIS) moderate the association between marital satisfaction and infant RSA suppression? The current study utilized a moderation framework to examine these research questions. The study aimed to address the following hypotheses.

Hypothesis 1: **Main Effect of Marital Satisfaction.** It was predicted that greater marital satisfaction would be associated with greater infant RSA suppression during a stress-inducing task (Still-Face Paradigm; Tronick et al., 1978). Previous research has found that parent marital satisfaction is associated with child emotion regulatory abilities (Cummings & Davies, 2002). Children of parents who are higher in satisfaction are better at regulation emotions, whereas children of parents who are low in marital satisfaction are at greater risk for internalizing and externalizing disorders (Cummings & Davies, 2002). In addition, previous work has linked child RSA, a physiological proxy of emotion regulation (Graham et al., 2010), and marital conflict such that marital conflict was associated with lower levels of RSA suppression in children (Porter et al., 2003). However, parent marital satisfaction might be a better predictor of RSA suppression in children in a community sample, as the level of marital satisfaction might indicate the overall perceived state of the marriage. It was reasonable to expect that level of parent marital satisfaction would impact infant RSA suppression. As marital satisfaction might have different results between parents, separate models for mother and father data were ran. Such that, maternal marital satisfaction and maternal personality were used to predict infant RSA suppression with mothers and paternal marital satisfaction and paternal personality were used to predict infant RSA suppression with fathers.

Hypothesis 2: Parent Personality as a Moderator. It was predicted that parent personality would moderate the association between parent marital satisfaction and infant RSA suppression. Previous research has found that parent personality impacts the parent-child relationship and can impact the marital relationship (Werneck et al., 2014) as well as child developmental outcomes (Belsky, 1984). Parent emotionality, which has been factored into some models of personality, is known to impact child emotionality (Kochanska et al., 1997). Additionally, personality has been found to impact marital satisfaction (Karney & Bradbury, 1995) with negative personality traits (e.g., Neuroticism) being associated with decreased marital satisfaction and positive traits (e.g., Extraversion) being associated with higher marital satisfaction (O'Rourke et al., 2010).

It was expected that BIS and BAS would differentially impact infant RSA suppression, with optimal RSA suppression occurring in infants of parents who are high in BAS sensitivity and high and marital satisfaction. This association was expected due to the positive affect associated with high levels of BAS sensitivity (Smits & Boeck, 2006). Parents who are higher in approach and positive affect, which are components of the BAS, are likely to have more positive and rewarding interactions with their infants and might be more satisfied in their marriages. High levels of BIS sensitivity are associated with negative affect, increased inhibition, and higher levels of self-criticism (Smits & Boeck, 2006). Due to the association between negative affect and high level of BIS sensitivity, and the detrimental effect of negative personality traits on marital satisfaction (O'Rourke et al., 2010), infants of parents high in BIS sensitivity may not be able to properly regulate RSA. This effect could be due to the high negative affect associated with high BIS sensitivity. High BIS sensitivity may lead parents to withdraw from the

infant emotionally and display more negative affect during parent-infant interactions as well as withdrawing from the marital relationship. In order to assess for differences between personality traits, separate analysis were ran for BAS/BIS Inventory (Carver & White, 1994) subscales.

Hypothesis 3: Role of Infant RSA Baseline. It was predicted that baseline RSA would be an alternative outcome variable when assessing the influence of parent marital satisfaction and parent personality on infant RSA. Children and infants of dissatisfied marriages are at greater risk for emotion dysregulation than infants of more satisfactory marriages (Cummings & Davies, 2002). Additionally, children of marriages high in dissatisfaction have been found to have difficulty with physiological regulation (Moore, 2010). Previous research has found that high baseline RSA is indicative of a larger capacity to regulate emotions (Propper & Moore, 2006). Due to this, it was thought that baseline RSA would be another way to assess the influence of parent marital satisfaction and parent personality on infant physiological regulation. It is possible that high baseline RSA might be adaptive for infants who are in families with high marital dissatisfaction. In other words, the higher levels of baseline RSA might give infants in families with high marital dissatisfaction more capacity to physiologically regulate in response to their parents' marital dissatisfaction.

Hypothesis 4: Mothers versus Fathers. Previous research has found that mothers and fathers interact differentially with their infants (Forbes et al., 2004). Mothers more frequently engage in care activities whereas fathers are more involved in play (Belsky et al., 1986). Additionally, mothers and fathers respond differently to marital dissatisfaction (Karney & Bradbury, 1995). Mothers may limit father-infant interactions

through gatekeeping (Corio & Emery, 1998), whereas fathers may be more likely to withdraw from the marital relationship as well as the parent-infant relationship (Howes & Markman, 1989). Despite these qualitative differences between mothers and fathers in how they interact with their infants and how they respond to marital dissatisfaction, the research on how these apparent differences might differentially predict differences in infant RSA has not been examined.

It is known that maternal personality and marital satisfaction impacts infants' developmental outcomes (e.g., Molfese et al., 2010; Moore, 2010). However, this has not been examined as extensively in fathers as it has been in mothers. Based on the literature, however, differences in mother-infant and father-infant interactions were expected to differentially predict infant RSA suppression. It was hypothesized that infants would engage in less RSA suppression with mothers as opposed to fathers. This could be due to differences in caregiving such that mothers are more involved in early infancy than fathers (Belsky et al., 1986), therefore infants may be more accustomed to mothers responding more to emotion regulatory needs than fathers. However, the examination of the association between marital satisfaction, parent personality and infant suppression with mothers versus fathers was exploratory.

Method

Participants

The sample consisted of 38, 6-month old infants (39.5% female; +/- 2 weeks) and their parents (mothers and fathers) recruited as part of a larger longitudinal study. This larger study was approved by the Western Kentucky University Institutional Review Board (see Appendix for the WKU IRB Approval letter). Participants are actively being

recruited from the community expectant parent classes at a local hospital, community health fairs, through flyers at local businesses, and through birth announcement letters. Study inclusion criteria included: infants must be full-term (gestational age ≥37 weeks, birth weight ≥ 5.5 lbs.) and without birth complications, both parents must be able to participate and able to read/understand English and families must be available to participate at all time-points of the larger longitudinal study. Families were paid $20 for each session.

The majority of families in the study were European American (infants: 84.2%; mothers: 86.8%; fathers: 89.5%). The mean age for mothers was 31.05 (*SD*=5.20; range= 22 to 44) and the mean age for fathers was 33.45 (*SD*=6.40; range= 22 to 49). The majority of parents from the sample had completed an Associate's degree or higher (78.9% mothers; 84.2% fathers). The education for mothers were as follows: 21.1% had some college education, 2.6% completed an Associate's degree, 23.7% completed a Bachelor's degree, 7.9% had some graduate level education, and 44.7% had completed a graduate degree. The education for fathers were as follows: 5.3% received some high school education, 2.6% completed high school, 2.6% completed trade school, 5.3% completed an Associate's degree, 39.5% completed a Bachelor's degree, 7.9% had some graduate level education, and 31.6% completed a graduate degree.

The majority of the sample reported being middle class; 55.2% of the sample reported an income between $45,000-89,999. In regard to the rest of the sample, 21.1 % of the sample reported an income of $44,999 or less and 23.7% of the sample reported an income between $90,000-150,000 or more. The living arrangements of the families were

as follows: 89.5% of the parents were married and living together and 10.5% of the parents were unmarried and living together.

Procedure

Two weeks prior to the scheduled laboratory visit, parents received a packet of questionnaires in the mail, which included a measure of parent personality. Parents returned the completed packets at the laboratory visit. After signing consent forms, parents were randomly assigned to participate first or second with their infants in the Still-Face Paradigm (SFP; Tronick et al., 1978), which is a laboratory procedure involving alternating phases of play and blunted affect (play, still-face, reunion). Before the SFP, baseline cardiac physiology was collected while the parent (either mother or father) held the infant in his or her lap for 180 seconds. Following baseline, parents began the SFP beginning with a play episode (90 seconds) followed by the still-face episode (90 seconds). During the still-face episode parents were instructed to sit back in their chair with a neutral expression and refrain from interacting with their infant. This episode was followed by the reunion episode (90 seconds) and a second baseline (180 seconds). After the first parent-infant SFP was completed and the infant is in a calm state, the second parent participated in the same baseline, SFP, and second baseline (180 seconds) with his/her infant. After the second parent completed the second baseline with his/her infant, the remaining lab visit consisted of observational measures of temperament, as well as parent-infant dyadic free-play task. The Still-Face Paradigm (Tronick et al., 1978) was one of several laboratory tasks completed during the laboratory visit. Parents separately completed the remaining laboratory tasks with their infant. In between tasks, parents completed additional questionnaires, which included a measure of marital satisfaction.

All laboratory visits were video and audio recorded. Each lab visit lasted approximately 90 to 120 minutes.

Measures

Marital Satisfaction. The Short Marital Adjustment Test (SMAT; Locke & Wallace, 1959) was completed by both parents to measure global marital satisfaction. The measure consists of 15 items where the choices range on a 7-point scale (1: *very unhappy* to 7: *perfectly happy*) as well as questions with a forced choice (*yes/no*). The score is determined by participants' responses to the questions, with higher scores being indicative of greater marital satisfaction. Scores range from 1-158, with scores less than 100 indicating marital distress (Locke & Wallace, 1959). An example of a sample item is "Do you ever wish you had not married." Locke and Wallace (1959) reported a split half reliability of 0.90. In addition, previous research has determined that the SMAT is also able to discriminate between satisfied couples and couples experiencing marital distress (Freeston & Plechaty, 1997). In the present study, Cronbach α scores were .76 for mothers and .64 for fathers. However, one mother and 6 fathers did not complete item one of the questionnaire, which asks participants to select how happy they are at the current moment in their relationship (Locke & Wallace, 1959). This is likely influencing the lower α for fathers in comparison to mothers.

Parent Personality. The Behavioral Inhibition System/Behavioral Activation System (BIS/BAS; Carver & White, 1994) was administered to assess parent personality. The questionnaire consists of 20 questions assessing behavioral inhibition and behavioral activation. The BIS subscale is comprised of seven questions that assess withdrawal behavior as well as negative affect (i.e. anxiety). Two questions are reversed scored on

the BIS. The remaining 13 questions map onto 3 BAS subscales: approach behaviors or drive (4 items), reward responsiveness (5 items), and fun seeking (4 items). Subscale scores are computed by summing the answers to the items of that subscale. The respondents have a choice between 4 options (*1: very true for me, 2: somewhat true for me, 3: somewhat false for me, 4: very false for me*). An example of a sample item from the BIS subscale is "Even if something bad is about to happen to me, I rarely experience fear or nervousness."

Carver and White (1994) reported the scales to have the following reliabilities: BIS subscale α =.74, BAS Drive α =.76, BAS fun-seeking α =.66, and BAS Reward (α =.73). In the present study, Cronbach α scores were as follows: BIS subscale (mothers: α=.80; fathers: α = .77), BAS Drive (mothers: α =.81; fathers; α =.71), BAS Fun-seeking (mothers: α =.75; fathers: α =.57); BAS Reward Responsiveness (mothers: α =.55, fathers: α =.58). The overall Cronbach α score for the BAS subscales was .74 for mothers and .68 for fathers.

Cardiac Monitoring. At the beginning of the laboratory visit, disposable electrodes attached to leads were placed on the parents' and the infant's upper torsos. Three disposable electrodes were placed on the infant and parents' chest/ribcage in a triangular pattern to collect heart period. Additional electrodes are places on the midline of the back (2 electrodes) and on the midline of the chest (2 electrodes). The leads are attached to a harness, which is connected to a chassis and fed into a computer. The chassis (Mindware Technologies; Gahanna, OH) and the computer recorded heart interbeat intervals. After the laboratory visit, trained laboratory assistants edited the data

for artifacts using MindWare HRV 3.0.21. RSA was calculated every 30 seconds during the baseline and all episodes of the SFP, using Porges's (1985) method.

A positive correlation was also found between infant RSA baseline with mothers and fathers ($r(36)=.43$, $p=.01$). Due to the correlation between infant-father baseline RSA and infant-mother baseline RSA, these values were averaged together to create a composite baseline RSA score. In order to assess RSA suppression, differences scores were computed, which is similar to previous studies examining RSA suppression (Stifter, Dollar, & Cipriano, 2011). These differences scores were calculated by subtracting the mean RSA value from the still-face episode from the composite baseline RSA score. Therefore, infant RSA suppression with mothers was calculated by subtracting the still-face mean RSA value with mothers from the composite baseline RSA value. Similarly, infant RSA suppression with fathers was calculated by subtracting the still-face mean RSA value with fathers from the composite baseline RSA value. A positive RSA difference score (ΔRSA) indicated RSA suppression with larger scores representing greater RSA suppression.

Results

Results are organized into two sections. The first section consists of preliminary analyses of the study variables. Descriptive statistics were run for the variables of interest (BIS, BAS, marital satisfaction, infant RSA baseline, infant RSA suppression). Additionally, correlation analyses were run between the variables to examine relations among the variables. In addition, tests for the inclusion of covariates were run to assess whether covariates needed to be included in subsequent models. The second section contains the results from the hierarchical regression models that test the study hypotheses.

Table 1

Descriptive Statistics for Study Variables

Measures	*n*	*M* (*SD*)	Skewness	Kurtosis
Mother				
Marital Satisfaction	38	119.60 (21.3)	-1.12	1.61
BIS	38	1.80 (.50)	.25	-.76
BAS Drive	38	2.03 (.56)	.70	1.04
BAS Fun Seeking	38	2.17 (.54)	.58	-.25
BAS Reward Responsiveness	38	1.38 (.34)	.92	.09
Father				
Marital Satisfaction	37	119.00 (19.30)	-1.12	1.61
BIS	38	2.40 (.56)	-.11	-.31
BAS Drive	38	2.20(.55)	.05	.59
BAS Fun Seeking	38	3.25 (.48)	.63	.65
BAS Reward Responsiveness	38	2.40(.33)	.57	.14
Infant				
Baseline RSA: Mother	38	3.43(.87)	.68	.26
Baseline RSA: Father	37	3.52(.93)	-.23	-1.02
RSA Suppression: Mother	38	.21 (.78)	-.40	-.16
RSA Suppression: Father	37	.08 (.73)	1.14	3.01
Mean Baseline RSA	38	3.47(.75)	-.68	-.75

Preliminary Statistics

Descriptive Statistics and Bivariate Correlations. Descriptive statistics were run for the study variables and are reported in Table 1. All variables were relatively normally distributed. Bivariate correlations were conducted to assess the relationship between the variables of interest. Table 2 and Table 3 depict within parent correlations. Table 2 depicts the within parent correlations (mother personality, marital satisfaction, and infant RSA (baseline and suppression) for mothers. The three BAS subscales (Drive, Fun-seeking, and Reward) were positively correlated with each other, *r*s =.50-.56, for mothers. There were no additional significant correlations found between parent personality, marital satisfaction, or infant RSA baseline for mothers.

Table 2

Within-Parent Correlations for Mother Variables

Measure	1.	2.	3.	4.	5.	6.
1. Marital Sat.	-					
2. BIS	-.16	-				
3. BAS Drive	-.03	-.11	-			
4. BAS Fun	-.12	-.03	.50**	-		
5. BAS Reward	-.09	.14	.56**	.50**	-	
6. Infant Baseline RSA	.11	-.05	-.08	-.01	-.14	-
7. Infant RSA Suppression: Mother	-.01	-.06	.06	.04	-.01	.27

Note: $^{\dagger}p < .10$, * $p < .05$, ** $p <. 01$.

Table 3 depicts the correlations for father personality, marital satisfaction, and infant baseline RSA. Similar to mothers, the BAS subscale scores were correlated with one another, except the correlation between BAS Fun-seeking and Reward was a trend (r =.30, $p < .10$). In addition, the BIS subscale score and the BAS Drive subscale score were negatively correlated with each other, indicating that lower BIS scores were associated with higher BAS Fun-seeking scores in fathers. Similar to mothers, there were no

significant correlations between parent personality, marital satisfaction, or infant RSA baseline for fathers.

Table 3

Within-Parent Correlations for Father Variables

Measure	1.	2.	3.	4.	5.	6.
1. Marital Sat.	-					
2. BIS	-.07	-				
3. BAS Drive	.31†	-.40*	-			
4. BAS Fun	.30†	-.09	.60**	-		
5. BAS Reward	-.11	-.06	.30†	.34*	-	
6. Infant Baseline RSA	-.09	.38*	-.25	-.30†	-.18	-
7. Infant RSA Suppression: Father	.18	.10	.06	-.02	.21	.19

Note: $^{\dagger}p < .10$, * $p < .05$, ** $p <. 01$.

Between-parent correlations were run and are reported in Table 4. Mother and father marital satisfaction were positively associated, indicating that higher levels of marital satisfaction in one parent was associated with higher marital satisfaction in the other.

Tests for Covariate Inclusion. Chi-square and t-test analyses were run to examine demographic variables, such as parent order (who went first in the laboratory visit), parent education, family income, infant gender, and parity in mothers and fathers. All analyses were found to be non-significant. Therefore, none of the demographic variables were included as covariates in the remaining analyses.

Table 4

Between-Parent Correlations

Measure	Mother Marital Sat.	Mother BIS	Mother BAS Drive	Mother BAS Fun	Mother BAS Reward	Infant Baseline RSA: Mother	Infant RSA Suppression: Mother
Father Marital Sat.	.48**	-.11	.02	-.20	-.12	-.14	-.06
Father BIS	-.06	-.03	.17	-.02	-.07	.38*	.10
Father BAS Drive	.12	-.07	.13	-.001	.06	-.24	.10
Father BAS Fun	.09	-.06	.17	.07	.05	-.18	.14
Father BAS Reward	-.22	.23	-.06	-.03	.14	-.07	-.19
Infant Baseline RSA	.08	-.19	-.16	-.03	-.30	.43**	.16
Infant RSA Suppression: Father	.16	-.10	-.02	-.29†	.00	.30	.32†

Note: $^{\dagger}p < .10$, * $p < .05$, ** $p <. 01$. B.RSA=Baseline RSA; RSA S.=RSA Suppression

Hierarchical Multiple Regression Analysis

The remaining analyses used hierarchical multiple regression to test the study hypotheses. Separate models were run for infant-mother and infant-father data. The first step of the regression models included the main effects of marital satisfaction and parent personality with infant RSA suppression as the outcome. This step of the hierarchical multiple regression model tested hypotheses 1 and 2. The second step of the analyses included the main effects and the two-way interaction between marital satisfaction and parent personality with infant RSA suppression as the outcome. The second step also addressed hypothesis 2. Separate models were run for BIS and BAS subscales. A second set of hierarchical multiple regression models were run to assess hypothesis 3, to assess whether infant baseline RSA was predicted by parent marital satisfaction and parent personality. The models were run in a similar fashion to the previous set of hierarchical multiple regression models; however infant baseline RSA was included as the outcome. Because the two sets of hierarchical multiple regression models were run separately for mother-infant and father-infant dyads, hypothesis 4 could be assessed.

Infant RSA suppression: Mother-infant model results. Table 5 reports the hierarchical multiple regression results for the model examining the extent to which marital satisfaction and parent personality predicted infant RSA suppression. Step 1 of the hierarchical multiple regression models examined the main effects of marital satisfaction and parent personality (BIS, BAS Drive, BAS Fun-seeking, BAS Reward-responsiveness) as predictors of infant RSA suppression with mothers. Across all models, the main effects of marital satisfaction and mother personality did not significantly

predict infant RSA suppression. Step 2 included the two-way interactions between marital satisfaction and mother personality as predictors of infant RSA suppression with mothers. Similar to Step 1, all of the models were non-significant.

Table 5

Infant RSA Suppression with Mother Predicted by Maternal Marital Satisfaction and Maternal Personality

Model	*B*	*SE*(*B*)	*β*	*df*	*F*	R^2	ΔR^2
BIS							
I.				2	.07	.004	
Marital Satisfaction	-.001	.01	-.02				
BIS	-.10	.26	-.06				
II.				3	.15	.01	.01
Marital Satisfaction	.00	.01	-.01				
BIS	-.10	.27	-.07				
Marital Sat. X BIS	-.01	.02	-.10				
BAS Drive							
I.				2	.07	.004	
Marital Satisfaction	.00	.01	-.01				
BAS Drive	.08	.23	.06				
II.				3	.22	.02	.02
Marital Satisfaction	.00	.01	.00				
BAS Drive	.16	.26	.12				
Marital Sat. X BAS Drive	.01	.01	.14				
BAS Fun Seeking							
I.				2	.03	.002	
Marital Satisfaction	.00	.01	-.01				
BAS Fun Seeking	.06	.24	.04				
II.				3	.06	.01	.003
Marital Satisfaction	.00	.01	-.01				
BAS Fun Seeking	.07	.25	.05				
Marital Sat. X BAS Fun	.004	.01	.06				
BAS Reward Responsiveness							
I.				2	.004	.00	
Marital Satisfaction	.00	.001	-.01				
BAS Reward	-.02	.39	-.01				
II.				3	.003	.00	.00
Marital Satisfaction	.00	.01	-.01				
BAS Reward	-.02	.39	-.01				
Marital Sat. X BAS Reward	.00	.02	.003				

Note: $^{\dagger}p < .10$, * $p < .05$, ** $p <. 01$.

Table 6

Infant Baseline RSA with Mother Predicted by Maternal Marital Satisfaction and Maternal Personality

Model	*B*	*SE*(*B*)	*β*	*df*	*F*	R^2	ΔR^2
BIS							
I.				2	.23	.01	
Marital Satisfaction	.004	.006	.10				
BIS	-.06	.26	-.04				
II.				3	.38	.03	.02
Marital Satisfaction	.003	.006	.09				
BIS	-.05	.26	-.03				
Marital Sat. X BIS	.01	.02	.14				
BAS Drive							
I.				2	.30	.017	
Marital Satisfaction	.004	.006	.11				
BAS Drive	-.10	.22	-.07				
II.				3	.23	.02	.003
Marital Satisfaction	.004	.006	.11				
BAS Drive	-.07	.25	-.04				
Marital Sat. X BAS Drive	.003	.01	.06				
BAS Fun Seeking							
I.				2	.21	.01	
Marital Satisfaction	.004	.006	.11				
BAS Fun Seeking	.01	.24	.009				
II.				3	.73	.06	.05
Marital Satisfaction	.003	.006	.085				
BAS Fun Seeking	.06	.235	.043				
Marital Sat. X BAS Fun	.02	.01	.23				
BAS Reward Responsiveness							
I.				2	.53	.03	
Marital Satisfaction	.003	.006	.10				
BAS Reward	-.30	.37	-.13				
II.				3	.62	.05	.02
Marital Satisfaction	.005	.006	.15				
BAS Reward	-.31	.38	-.14				
Marital Sat. X BAS Reward	.02	.02	.16				

Note: $^{\dagger}p < .10$, * $p < .05$, ** $p <. 01$.

Table 7

Infant RSA Suppression with Father Predicted by Paternal Marital Satisfaction and Paternal Personality

Model	*B*	*SE*(*B*)	*β*	*df*	*F*	R^2	ΔR^2
BIS							
I.				2	.81	.05	
Marital Satisfaction	.01	.01	.20				
BIS	.16	.22	.12				
II.				3	.58	.05	.01
Marital Satisfaction	.01	.01	.13				
BIS	.17	.23	.14				
Marital Sat. X BIS	.01	.01	.10				
BAS Drive							
I.				2	.55	.03	
Marital Satisfaction	.01	.01	.18				
BAS Drive	.01	.23	.01				
II.				3	.37	.03	.002
Marital Satisfaction	.001	.001	.19				
BAS Drive	.02	.24	.02				
Marital Sat. X BAS Drive	.002	.009	.05				
BAS Fun Seeking							
I.				2	.84	.05	
Marital Satisfaction	.001	.017	.22				
BAS Fun Seeking	-.20	.26	-.13				
II.				3	.55	.05	.00
Marital Satisfaction	.001	.001	.22				
BAS Fun Seeking	-.20	.27	-.13				
Marital Sat. X BAS Fun	.00	.02	.001				
BAS Reward Responsiveness							
I.				2	.99	.06	
Marital Satisfaction	.01	.01	.19				
BAS Reward	.35	.37	.16				
II.				3	3.68*	.26	.20
Marital Satisfaction	.01	.01	.20				
BAS Reward	.48	.34	.22				
Marital Sat. X BAS Reward	.05*	.02	.45				

Note: $^{\dagger}p < .10$, * $p < .05$, ** $p <. 01$.

Infant RSA baseline: Mother-infant model results. Additional hierarchical multiple regression models were ran with infant RSA baseline as the outcome variable to examine hypothesis 3 and are reported in Table 6. All models predicting infant RSA baseline were non-significant.

Infant RSA suppression: Father-infant model results. Table 7 reports the hierarchical multiple regression results for the model examining to the extent that marital satisfaction and parent personality predicted infant RSA suppression with fathers, assessing hypothesis 1, 2, and 4. Step 1 of the hierarchical multiple regression included the main effects of marital satisfaction and parent personality as predictors of infant RSA suppression. Significant results were not found for step 1 of the hierarchical multiple regression models predicting infant RSA suppression

Similar to the mother-infant models, Step 2 also included the two-way interaction between marital satisfaction and father personality as predictors of RSA suppression with fathers. The only model that was significant was the BAS Reward Responsiveness model (F (3,32) = 3.68, p = .02). The Marital Satisfaction X BAS Reward Responsiveness interaction was significant (B = .05, SE = .02, t = 2.93, p = .006). Follow-up simple slopes tests were used to examine simple slopes one standard deviation above and below the mean (Aiken & West, 1991). As seen in Figure 1, the simple slopes test revealed that infants of fathers who were high in BAS Reward Responsiveness and high in marital satisfaction had higher levels of RSA suppression (B = .03, SE = .01, p = .006). The simple slope for infants of fathers who were low in BAS Reward Responsiveness and low in marital satisfaction was non-significant (B = -.01, SE = .01, p = .28).

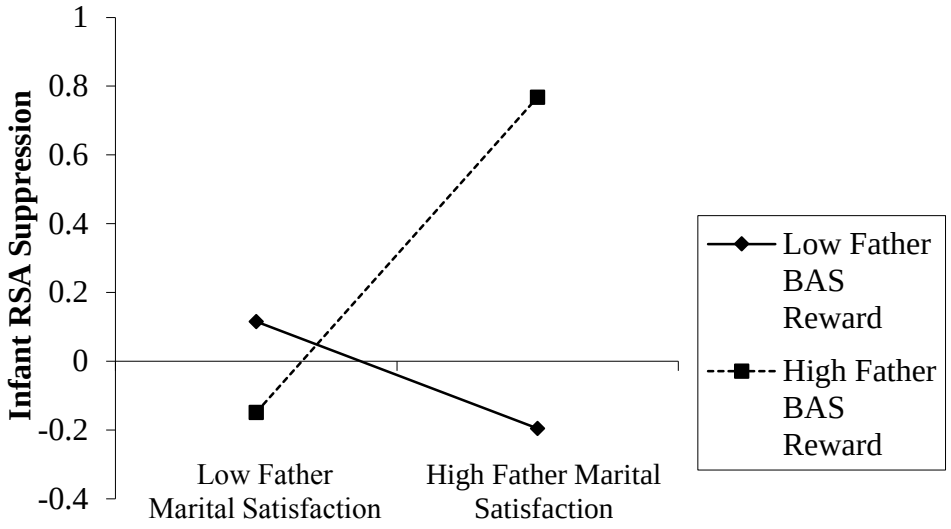

Figure 1. Graph of infant RSA suppression by paternal marital satisfaction and personality.

Infant RSA Baseline: Father-infant model results. Additional hierarchical multiple regression models were ran with infant RSA baseline as the outcome variable and are reported in Table 8. This assessed hypotheses 3 and 4. All models predicting infant RSA baseline were non-significant. Step 1 of the hierarchical multiple regression models revealed that there was a main effect of BIS, $F(2, 36) = 3.40$, $p < .05$, as a significant predictor of infant RSA baseline. Step two of the hierarchical multiple regression models revealed non-significant findings. The model containing BIS was trending, but was no longer significant.

Table 8

Infant Baseline RSA with Father Predicted by Paternal Marital Satisfaction and Paternal Personality

Model		*B*	*SE*(*B*)	*β*	*df*	*F*	R^2	ΔR^2
BIS								
I.					2	3.40*	.17	
	Marital Satisfaction	-.002	.01	-.06				
	BIS	.52*	.20	.40				
II.					3	2.47†	.18	.02
	Marital Satisfaction	-.01	.01	-.14				
	BIS	.57*	.21	.44				
	Marital Sat. X BIS	.01	.01	.15				
BAS Drive								
I.					2	1.28	.07	
	Marital Satisfaction	.00	.007	-.01				
	BAS Drive	-.35	.23	-.26				
II.					3	.89	.08	.01
	Marital Satisfaction	.00	.007	.003				
	BAS Drive	-.34	.24	-.25				
	Marital Sat. X BAS Drive	.004	.01	.07				
BAS Fun Seeking								
I.					2	1.23	.07	
	Marital Satisfaction	-.001	.01	-.02				
	BAS Fun Seeking	-.39	.27	-.25				
II.					3	1.10	.09	.02
	Marital Satisfaction	-.001	.01	-.03				
	BAS Fun Seeking	-.37	.27	-.24				
	Marital Sat. X BAS Fun	.02	.02	.16				
BAS Reward Responsiveness								
I.					2	.43	.03	
	Marital Satisfaction	-.004	.01	-.11				
	BAS Reward	-.29	.39	-.13				
II.					3	.34	.03	.01
	Marital Satisfaction	.00	.01	-.01				
	BAS Reward	-.02	.39	-.01				
	Marital Sat. X BAS Reward	.00	.02	.003				

Note: †$p < .10$, * $p < .05$, ** $p <. 01$.

Discussion

This study aimed to address the extent to which parent marital satisfaction and parent personality predicted infant RSA suppression. This study is one of few that included parent marital satisfaction instead of marital conflict (e.g., Moore et al., 2009) as a predictor of infant RSA suppression. In addition, it is the only study to examine parent personality as a moderator of the relationship between marital satisfaction and infant RSA suppression. Findings from hierarchical multiple regression analyses revealed non-significant findings for mothers, but significant findings for fathers were found.

Parent Marital Satisfaction

Previous research has shown that parent marital satisfaction impacts children's emotion regulation (Cummings & Davies, 2002) and physiological regulation (Gottman & Katz, 1989). The current study found that mother marital satisfaction was not a significant predictor of infant RSA suppression. These non-significant findings for mothers could be for several reasons. First, previous literature has found that mothers are better at role-differentiation than fathers (Belsky et al., 1991). This means that the mother's level of marital satisfaction might not carry over to impact her relationship with her infant. Thus, infant RSA baseline and suppression may not be affected by mother marital satisfaction.

Second, there might be better mother predictors of infant physiological regulation than marital satisfaction and parent personality. For example, studies have found maternal sensitivity to be associated with affect regulation in infants (Braungart-Rieker, Garwood, Powers, & Wang, 2001). It is possible that maternal sensitivity might be mitigating the effects of mother marital satisfaction on infant RSA baseline and

suppression. Future studies should include additional parent predictors in order to more thoroughly capture how parents influence physiological regulation in infants.

Finally, previous research has predominantly used maternal evaluations of marital conflict as a predictor of infant RSA suppression as opposed to marital satisfaction (e.g., Moore, 2009). Although marital satisfaction scales, like the SMAT (Locke & Wallace, 1959), may capture a better picture of the marriage as a whole, exposure to parent marital conflict may have a larger impact on infant physiological regulation. During conflict parents may not be attending to their infant's emotional needs and instead may be focusing their attention to the conflict at hand (Moore, 2010). Therefore, it is possible that marital conflict is a better predictor of infant RSA suppression with mothers as opposed to parent marital satisfaction. Future studies should include both marital conflict and marital satisfaction as possible predictors of infant RSA baseline and suppression.

Parent Personality

Previous research has examined how parent personality impacts the parent-infant relationship (e.g., Shiota & Levenson, 2007) and the marital relationship (e.g., O'Rourke et al., 2010). However, no previous studies have evaluated the associations between parent personality and infant physiological regulation. Results examining the association between maternal personality and infant RSA (baseline and suppression) were non-significant. This lack of association is counter to previous literature that has found specific maternal personality characteristics to negatively impact infant emotion regulation (e.g., Prinzie et al., 2009). For example, maternal neuroticism has been found to be associated with increased externalizing problems in children (Prinzie et al., 2009).

However, the current study utilized an assessment of personality, the BAS/BIS Inventory, which is different from the measure that previous research has used, the Five Factor Model. In contrast to the specific factors of the Five Factor Model, the BAS/BIS Inventory is considered a more global assessment of personality (Carver & White, 1994). Although factors of the Five Factor Model and the BAS/BIS Inventory have been found to map onto similar constructs of personality (Smits & Boeck, 2006), it is possible that the BAS/BIS Inventory is too broad of a measure to predict infant physiological regulation. Future studies should continue to examine the association between parent personality and infant physiological regulation utilizing additional measures of personality.

Significant findings were found for fathers with aspects of parent personality predicting infant RSA. There was a main effect of BIS predicting infant baseline RSA, such that infants of fathers who were high in behavioral inhibition had higher levels of RSA baseline. High RSA baseline is associated with a greater capacity to regulate emotions (e.g., Propper & Moore, 2006). Fathers who are high in BIS might be higher in negative affect and withdrawal behaviors due to their personality (Carver & White, 1994), and might be less able to attend to their infants' emotional needs (Donovan, Leavitt, & Walsh, 1998). Therefore, infants of fathers who are high in BIS might need this larger capacity to regulate compared to infants of fathers who are low in BIS. Thus, high baseline RSA may serve as a protective factor for these infants.

In addition, an interaction between father marital satisfaction and BAS Reward Responsiveness was found to predict infant RSA suppression. More specifically, infants of fathers who were high on marital satisfaction and high on Reward Responsiveness had

higher levels of RSA suppression. This finding is consistent with the marital satisfaction literature that fathers are more susceptible to spill-over effects (Coiro & Emery 1998). In addition, children of parents who are high in marital satisfaction tend to have better emotion and physiological regulation (e.g., Cummings & Davies, 2002) whereas children of parents who are low in marital satisfaction are at greater risk to have difficulties with emotion regulation later in childhood (e.g., Cummings & Davies, 2002; Fisherman &

However, what makes this finding in the current study unique is that parent personality was found to interact with marital satisfaction to predict infant RSA suppression. This finding suggests that for fathers who exhibit a personality type that is high in reward responsiveness and who are also high in marital satisfaction might be more likely to continually seek out rewarding interactions (Johnson et al., 2005) with not only their spouses, but their infants too. Therefore, they are more likely to be engaged within the spousal relationship and parent-child relationship than fathers who display high reward responsiveness and low marital satisfaction. This active engagement in the parent-infant interaction might help infants with the development of physiological regulation.

Taken together, findings from the current study confirm our hypothesis that there are differences between maternal and paternal influences on infant physiological regulation. More specifically, marital satisfaction and parent personality may be better predictors of infant physiological regulation with fathers than for mothers. These findings emphasize the importance of assessing father predictors of infant physiological regulation in addition to mother predictors.

Limitations and Future Directions

There were limitations to the current study. First, the sample size was small, consisting of only 38 mother-infant and 37 father-infant dyads, and lacked diversity. These limitations limit the overall generalizability of the results. It is possible that if the sample size were larger, the models would have had increased statistical power to detect significant effects. In addition, the sample consisted of mostly European American, middle-class families, whose parents were fairly well educated. It is possible that marital satisfaction and parent personality might play more of a role in families who are low-income and/or minorities. Future studies should examine the associations between marital satisfaction, parent personality, and infant physiological regulation in a larger, more diverse sample in order to fully examine these associations.

Second, there were also limitations due to how some constructs were measured. The results containing BAS Reward Responsiveness for fathers should be interpreted with caution due to the low Cronbach α score (α =.58). In addition, all of the parent variables (parent personality and marital satisfaction) were self-report and there was only one questionnaire assessing each construct. Future studies should take a more multi-method approach to assessing these parent variables. Infant RSA suppression was also only measured during one task, the SFP. Previous research has indicated that infant RSA suppression is context specific (Brooker & Buss, 2010; Calkins & Keane, 2004). Therefore, future studies should examine parent predictors of infant RSA suppression in additional contexts. It is possible that parent personality and/or marital satisfaction might differentially predict infant RSA suppression during a different task, such as a fear or anger task. In the future, utilizing multiple indicators for all variables of interest could help understand how these parent variables predict infant physiological regulation.

Lastly, the findings were only assessed at one time-point. It is possible that associations between marital satisfaction, parent personality, and infant physiological regulation may change over time. Previous research has found that there is a decrease in marital satisfaction after the birth of a child (Lawrence, Rothman, Cobb, Rothman, & Bradbury, 2008) and that the decrease in marital satisfaction dissipates as children grow up (Moore, 2010). It is possible that the effects of marital satisfaction change depending on how long it takes parents to rebound from that initial dip in marital satisfaction after childbirth and how the effects of personality change in response to fluctuations in marital satisfaction. In addition, research has shown that the infant physiological system to be rapidly fluctuating in the first year of life (Bornstein & Suess 2000). As infants grow older, their physiological system becomes more stable (Calkins & Keane, 2004). By assessing the associations between marital satisfaction, parent personality, and infant physiological regulation longitudinally we might better be able to understand how parents contribute to the ever-changing infant physiological system.

Conclusions

In conclusion, the current study found differences in predictors of infant physiological regulation for mothers and fathers. For mothers, there were no significant influence of parent marital satisfaction and parent personality predicting infant physiological regulation. For fathers, parent personality and marital satisfaction both predicted infant physiological regulation, with father BIS predicting infant baseline RSA and an interaction of marital satisfaction and reward predicting infant RSA suppression. These findings suggest that personality and marital satisfaction might be better predictors of infant RSA suppression and RSA baseline for fathers compared to mothers.

The current study highlights the importance of assessing the influence of both mothers and fathers on infant physiological regulation. Previous research has focused primarily on maternal factors as they relate to infant physiological regulation. However, it is important to assess how both mothers and fathers contribute to infant RSA baseline and RSA suppression. By examining these associations, we might better be able to understand how mothers and fathers differentially contribute to the development of this important skill early in infancy.

References

Achtergarde, S., Postert, C., Wessing, I., Romer, G., & Müller, J. M. (2015). Parenting and child mental health influences of parent personality, child temperament, and their interaction. *The Family Journal*, *23*, 167-179. doi:10.1177/1066480714564316

Aiken, L. S., & West, S. G. (1991). *Multiple regression: Testing and interpreting interactions.* Newbury Park, CA: Sage.

Allen, S. M., & Hawkins, A. J. (1999). Maternal gatekeeping: Mothers' beliefs and behaviors that inhibit greater father involvement in family work. *Journal of Marriage and the Family*, *61*(1), 199-212. doi:10.2307/353894

Aunola, K., Stattin, H., & Nurmi, J. E. (2000). Parenting styles and adolescents' achievement strategies. *Journal of Adolescence*, *23*(2), 205-222. doi:10.1006/jado.2000.0308

Baron, R. M., & Kenny, D. A. (1986). The moderator–mediator variable distinction in social psychological research: Conceptual, strategic, and statistical considerations. *Journal of Personality and Social Psychology*, *51*, 1173-1182. doi:10.1037/0022-3514.51.6.1173

Barnett, M. A., Deng, M., Mills-Koonce, W. R., Willoughby, M., & Cox, M. (2008). Interdependence of parenting of mothers and fathers of infants. *Journal of Family Psychology*, *22*, 561-573. doi:10.1037/0893-3200.22.3.561

Beauchaine, T. P., Gatzke-Kopp, L., & Mead, H. K. (2007). Polyvagal theory and developmental psychopathology: Emotion dysregulation and conduct problems from preschool to adolescence. *Biological Psychology*, *74*(2), 174-184.

doi:10.1016/j.biopsycho.2005.08.008

Belsky, J. (1984). The determinants of parenting: A process model. *Child Development, 55*, 83–96. doi:10.2307/1129836.

Belsky, J., Crnic, K., & Woodworth, S. (1995). Personality and parenting: Exploring the mediating role of transient mood and daily hassles. *Journal of personality*, *63*, 905-929. doi:10.1111/j.1467-6494.1995.tb00320.x

Belsky, J., Gilstrap, B., & Rovine, M. (1984). The Pennsylvania infant and family development project, I: Stability and change in mother-infant and father-infant interaction in a family setting at one, three, and nine months. *Child Development, 55*, 692-705. doi:10.1111/j.1467-8624.1984.tb03808.x

Belsky, J., Lange, M., & Huston, T. L. (1986). Sex typing and division of labor as determinants of marital change across the transition to parenthood. *Journal of Personality and Social Psychology*, *50*, 517-522. doi:10.1037/0022-3514.50.3.517

Belsky, J., Youngblade, L., Rovine, M., & Volling, B. (1991). Patterns of marital change and parent-child interaction. *Journal of Marriage and the Family, 53*, 487-498. doi:10.2307/352914.

Ben-Porath, Y. S., & Tellegen, A. (2011). *Minnesota Multiphasic Personality Inventory–2 Restructured Form: Manual for Administration, Scoring, and Interpretation*. Minneapolis: University of Minnesota Press.

Berntson, G. G., Cacioppo, J. T., & Quigley, K. S. (1993). Respiratory sinus arrhythmia: autonomic origins, physiological mechanisms, and psychophysiological implications. *Psychophysiology, 30*(2), 183-196. doi:10.1111/j.1469-8986.1993.tb01731.x

Brooker, R. J., & Buss, K. A. (2010). Dynamic measures of RSA predict distress and regulation in toddlers. *Developmental Psychobiology, 52,* 372-382. doi:10.1002/dev.20432

Bornstein, M. H., & Suess, P. E. (2000). Child and mother cardiac vagal tone: Continuity, stability, and concordance across the first 5 years. *Developmental Psychology, 36,* 54. doi:10.1037/0012-1649.36.1.54

Bradbury, T. N., & Karney, B. R. (1993). Longitudinal study of marital interaction and dysfunction: Review and analysis. *Clinical Psychology Review, 13,* 15-27. doi:10.1016/0272-7358(93)90005-7

Braungart-Rieker, J., Garwood, M., Powers, B., & Wang, X. (2001). Parental sensitivity, infant affect, and affect regulation: Predictors of later attachment. *Child Development, 72,* 252-270. doi: 10.1111/1467-8624.00277

Calkins, S. D., Blandon, A. Y., Williford, A. P., & Keane, S. P. (2007). Biological, behavioral, and relational levels of resilience in the context of risk for early childhood behavior problems. *Development and Psychopathology, 19*(3), 675-700. doi:10.1017/S095457940700034X

Calkins, S. D., Graziano, P. A., & Keane, S. P. (2007). Cardiac vagal regulation differentiates among children at risk for behavior problems. *Biological Psychology, 74,* 144-153. doi:10.1016/j.biopsycho.2006.09.005

Calkins, S. D., & Dedmon, S. E. (2000). Physiological and behavioral regulation in two-year-old children with aggressive/destructive behavior problems. *Journal of Abnormal Child Psychology, 28,* 103–118. doi:10.1023/A:1005112912906

Calkins, S., & Hill, A. (2007). Caregiver influences on emerging emotion regulation. In J.

J. Gross (Ed.), *Handbook of Emotion Regulation* (pp. 229-248). New York, NY: Guilford Press.

Calkins, S. D., & Keane, S. P. (2004). Cardiac vagal regulation across the preschool period: Stability, continuity, and implications for childhood adjustment. *Developmental psychobiology*, *45*, 101-112. doi:10.1002/dev.20020

Calkins, S. D., Smith, C. L., Gill, K. L., & Johnson, M. C. (1998). Maternal interactive style across contexts: Relations to emotional, behavioral and physiological regulation during toddlerhood. *Social Development*, *7*, 350-369. doi:10.1111/1467-9507.00072

Carver, C. S., & White, T. L. (1994). Behavioral inhibition, behavioral activation, and affective responses to impending reward and punishment: the BIS/BAS scales. *Journal of Personality and Social Psychology*, *67*, 319-333. doi:10.1037/0022-3514.67.2.319

Casalin, S., Tang, E., Vliegen, N., & Luyten, P. (2014). Parental personality, stress generation, and infant temperament in emergent parent-child relationships: Evidence for a moderated mediation model. *Journal of Social and Clinical Psychology*, *33*, 270-291. doi:10.1521/jscp.2014.33.3.270

Clark, L. A., Kochanska, G., & Ready, R. (2000). Mothers' personality and its interaction with child temperament as predictors of parenting behavior. *Journal of Personality and Social Psychology, 7,* 274–285. doi:10.1037/0022-3514.79.2.274

Coiro, M. J., & Emery, R. E. (1998). Do marriage problems affect fathering more than mothering? A quantitative and qualitative review. *Clinical Child and Family Psychology Review*, *1*, 23-40. doi:10.1023/A:1021896231471

Cole, P. A., Martin, S. E., & Dennis, T. A. (2004). Emotion regulation as a scientific construct: Methodological challenges and directions for child development research. *Child Development, 75*, 317-333. doi:10.1111/j.1467-8624.2004.00673.x

Conradt, E., & Ablow, J. (2010). Infant physiological response to the still-face paradigm: Contributions of maternal sensitivity and infants' early regulatory behavior. *Infant Behavior and Development, 33,* 251-265. doi: 10.1016/j.infbeh.2010.01.001

Crockenberg, S. C., & Leerkes, E. M. (2004). Infant and maternal behaviors regulate infant reactivity to novelty at 6 months. *Developmental Psychology, 40,* 1123–1132. doi:10.1037/0012-1649.40.6.1123

Crockenberg, S.C., & McCluskey, K. (1986). Change in maternal behavior during the baby's first year of life. *Child Development, 57,* 746-753. doi:10.2307/1130351

Cummings, E. M., & Davies, P. T. (2002). Effect of marital conflict on children: recent advances and emerging themes in process-oriented research. *Journal Of Child Psychology & Psychiatry & Allied Disciplines*, *43*, 31-63. doi:10.1111/1469-7610.00003

DeLuccie, M. F. (1995). Mothers as gatekeepers: A model of maternal mediators of father involvement. *Journal of Genetic Psychology, 152*, 225-238.

Donovan, W. L., Leavitt, L. A., & Walsh, R. O. (1998). Conflict and depression predict maternal sensitivity to infant cries. *Infant Behavior and Development, 21*, 505-517. doi:10.1016/S0163-6383(98)90023-6

Egan, V., Deary, I., & Austin, E. (2000). The NEO-FFI: Emerging British norms and an item-level analysis suggest n, a and c are more reliable than o and e. *Personality and Individual Differences*, *29*, 907-920. doi:10.1016/S0191-8869(99)00242-1

Ekas, N. V., Braungart-Rieker, J. M., Lickenbrock, D. M., Zentall, S. R., & Maxwell, S. M. (2011). Toddler emotion regulation with mothers and fathers: Temporal associations between negative affect and behavioral strategies. *Infancy, 16,* 266-294. doi:10.1111/j.1532-7078.2010.00042.x

Feldman, R. (2000). Parents' convergence on sharing and marital satisfaction, father involvement, and parent-child relationship at the transition to parenthood. *Infant Mental Health Journal, 21,* 176-191. Doi:10.1002/1097-0355(200007)21:3<176::AID-IMHJ3>3.0.CO;2-4

Fincham, F. D., Grych, J. H., & Osborne, L. N. (1994). Does marital conflict cause child maladjustment? Directions and challenges for longitudinal research. *Journal of Family Psychology, 8,* 128-140. doi:10.1037/0893-3200.8.2.128

Fishman, E. A., & Meyers, S. A. (2000). Marital satisfaction and child adjustment: Direct and mediated pathways. *Contemporary Family Therapy, 22,* 437-452. doi:10.1023/A:1007848901640

Freeston, M.H., & Plechaty, M. (1997). Reconsideration of the Locke-Wallace Marital Adjustment Test: Is it still relevant for the 1990s. *Psychological Reports, 81,* 419-434. doi:10.2466/pr0.1997.81.2.419

Forbes, E. E., Cohn, J. F., Allen, N. B., & Lewinsohn, P. M. (2004). Infant affect during parent- infant interaction at 3 and 6 months: Differences between mothers and fathers and influence of parent history of depression. *Infancy, 5,* 61-84. doi:10.1207/s15327078in0501_3.

Gottman, J. M., & Katz, L. F. (1989). Effects of marital discord on young children's peer interaction and health. *Developmental Psychology, 25,* 373-381. doi:10.1037/0012-1649.25.3.373

Graham, A. M., Ablow, J. C., & Measelle, J. R. (2010). Interparental relationship dynamics and cardiac vagal functioning in infancy. *Infant Behavior & Development, 33,* 530-544. doi:10.1016/j.infbeh.2010.07.005

Graziano, P. A., Reavis, R. D., Keane, S. P., & Calkins, S. D. (2007). The role of emotion regulation in children's early academic success. *Journal of School Psychology, 45,* 3-19. doi:10.1016/j.jsp.2006.09.002

Graziano, P. A., Keane, S. P., & Calkins, S. D. (2007). Cardiac vagal regulation and early peer status. *Child Development, 78,* 264-278. doi:10.1111/j.1467-8624.2007.00996.x

Ham, J., & Tronick, E. (2006). Infant resilience to the stress of the still-face. *Annals of the New York Academy of Sciences, 1094*(1), 297-302. doi:10.1196/annals.1376.038

Howes, P., & Markman, H. J. (1989). Marital quality and child functioning: A longitudinal investigation. *Child Development, 60,* 1044-1051. doi:10.2307/1130778

Jahromi, L. B., Putnam, S. P., & Stifter, C. A. (2004). Maternal regulation of infant reactivity from 2 to 6 months. *Developmental Psychology, 40,* 477. doi: 10.1037/0012-1649.40.4.477

Johnson, M. D., Cohan, C. L., Davila, J., Lawrence, E., Rogge, R. D., Karney, B. R., Sullivan, K. T., & Bradbury, T. N. (2005). Problem-solving skills and affective

expressions as predictors of change in marital satisfaction. *Journal of consulting and Clinical Psychology*, *73*(1), 15. doi:10.1037/0022-006X.73.1.15

Karney, B. R., & Bradbury, T. N. (1995). Assessing longitudinal change in marriage: An introduction to the analysis of growth curves. *Journal of Marriage and the Family*, *57*, 1091-1108. doi:10.2307/353425

Kochanska, G., Clark, L. A., & Goldman, M. S. (1997). Implications of mother's personality for their parenting and their young children's developmental outcomes. *Journal of Personality*, *65*, 387-420. doi:10.1111/1467-6494.ep9708305699

Kochanska, G., Friesenborg, A. E., Lange, L. A., & Martel, M. M. (2004). Parents' personality and infants' temperament as contributors to their emerging relationship. *Journal of Personality and Social Psychology*, *86*, 744-759. doi:10.1037/0022-3514.86.5.744

Kopp, C. B. (1982) Antecedents of self-regulation: A developmental perspective. *Developmental Psychology, 18*, 199-214 doi: 0012-1649/82/1802-0199S00.75

Kopp, C. B., & Neufeld, S. J. (2003). Emotional development during infancy. In R. J. Davidson, K. R. Scherer, H. H. Goldsmith, R. J. Davidson, K. R. Scherer, H. H. Goldsmith (Eds.), *Handbook of Affective Sciences* (pp. 347-374). New York, NY, US: Oxford University Press.

Lawrence, E., Rothman, A. D., Cobb, R. J., Rothman, M. T., & Bradbury, T. N. (2008). Marital satisfaction across the transition to parenthood. *Journal of Family Psychology*, *22*, 41-50. doi: 10.1037/0893-3200.22.1.41

Locke, H. J., & Wallace, K. M. (1959). Short marital-adjustment and prediction tests: Their reliability and validity. *Marriage and family living, 21*, 251-255. doi:10.2307/348022

Losoya, S.H., Callor, S., Rowe, D.C., & Goldsmith, H. H. (1997). Origins of familial similarity in parenting: A study of twins and adoptive siblings. *Developmental Psychology, 33,* 1012–1023. doi: 10.1037/0012-1649.33.6.1012

Maccoby, E. E. (1980). *Social development: History, theory, and research*. New York: Harcourt, Brace, Jovanovitch.

MacKinnon, D. P. (2011). Integrating mediators and moderators in research design. *Research on Social Work Practice, 21,* 675-681. doi: 10.1177/1049731511414148

McBride , B. A., Brown , G. L., Bost , K. K., Shin , N., Vaughn , B. & Korth, B. (2005). Paternal identity, maternal gatekeeping, and father involvement. Family Relations, *54*, 360–372. doi: 10.1111/j.1741-3729.2005.00323.x

McCrae, R. R., & Costa, P. T. (1987). Validation of the five-factor model of personality across instruments and observers. *Journal of Personality and Social Psychology, 52*, 81-90. doi:10.1037/0022-3514.52.1.81

Molfese, V. J., Rudasill, K. M., Beswick, J. L., Jacobi-Vessels, J. L., Ferguson, M. C., & White, J. M. (2010). Infant temperament, maternal personality, and parenting stress as contributors to infant developmental outcomes. *Merrill-Palmer Quarterly, 56*, 49-79. doi:10.1353/mpq.0.0039

Moore, G. A. (2010). Parent conflict predicts infants' vagal regulation in social interaction. *Developmental Psychopathology, 22*, 23–33. doi:10.1017/S095457940999023X.

Moore, G. A., & Calkins, S. D. (2004). Infants' vagal regulation in the still-face paradigm is related to dyadic coordination of mother--infant interaction. *Developmental Psychology, 40,* 1068-1080. doi:10.1037/0012-1649.40.6.1068

Moore, G. A., Hill-Soderlund, A. L., Propper, C. B., Calkins, S. D., Mills-Koonce, W. R., & Cox, M. J. (2009). Mother–infant vagal regulation in the face-to-face still-face paradigm is moderated by maternal sensitivity. *Child Development, 80,* 209-223. doi:10.1111/j.1467-8624.2008.01255.x

Morris, A. S., Silk, J. S., Steinberg, L., Myers, S. S., & Robinson, L. R. (2007). The role of the family context in the development of emotion regulation. *Social Development, 16,* 361-388. doi:10.1111/j.1467-9507.2007.00389.x

Myers, I. B., & Briggs, K. C. (1976). *Myers–Briggs Type Indicator*. Palo Alto, CA: Consulting Psychologists Press.

NICHD Early Child Care Research Network (2004). Affect dysregulation in the mother-child relationship in the toddler years: Antecedents and consequences. *Development and Psychopathology, 6,* 43–68. doi:10.1017/0S0954579404040404

O'Rourke, N., Claxton, A., Chou, P. H. B., Smith, J. Z., & Hadjistavropoulos, T. (2011). Personality trait levels within older couples and between-spouse trait differences as predictors of marital satisfaction. *Aging & Mental Health, 15*, 344-353. doi: 10.1080/13607863.2010.519324

Parke, R. D., & Tinsley, B. J. (1987). Family interaction in infancy. In J. Osofsky (Ed.), *Handbook of infant development* (2nd ed., pp. 579- 641). New York: Wiley.

Parker, W. D., & Stumpf, H. (1998). A validation of the five-factor model of personality in academically talented youth across observers and instruments. *Personality and Individual Differences, 25,* 1005-1025. doi:10.1016/S0191-8869(98)00016-6

Porges, S. W. (1985). *U.S. Patent No. 4,510,944*. Washington, DC: U.S. Patent and Trademark Office.

Porges, S. W., Doussard-Roosevelt, J. A., Portales, A. L., & Greenspan, S. I. (1996). Infant regulation of the vagal "brake" predicts child behavior problems: A psychobiological model of social behavior. *Developmental Psychobiology*, *29*, 697-712. doi:10.1002/(SICI)1098-2302(199612)29:8<697::AID-DEV5>3.0.CO;2-O

Porter, C. L., Wouden-Miller, M., Silva, S. S., & Porter, A. E. (2003). Marital harmony and conflict: links to infants' emotional regulation and cardiac vagal tone. *Infancy*, *4*, 297-307. doi:10.1207/S15327078IN0402_09

Prinzie, P., Onghena, P., Hellinckx, W., Grietens, H., Ghesquière, P., & Colpin, H. (2005). Parent and child personality characteristics as predictors of negative discipline and externalizing problem behaviour in children. *European Journal of Personality*, *18*, 73-102. doi: 10.1002/per.501

Prinzie, P., Stams, G. J. J., Deković, M., Reijntjes, A. H., & Belsky, J. (2009). The relations between parents' Big Five personality factors and parenting: A meta-analytic review. *Journal of Personality and Social Psychology, 97*, 351-362. doi:10.1037/a0015823

Propper, C., & Moore, G. A. (2006). The influence of parenting on infant emotionality: A multi-level psychobiological perspective. *Developmental Review*, *26*, 427-460. doi:10.1016/j.dr.2006.06.003

Rothbart, M. K., Ahadi, S. A., & Evans, D. E. (2000). Temperament and personality: Origins and outcomes. *Journal of Personality and Social Psychology, 78*, 122–135. doi:10.1037/0022-3514.78.1.122

Schofield, T. J., Conger, R. D., Donnellan, M. B., Jochem, R., Widaman, K. F., & Conger, K. J. (2012). Parent personality and positive parenting as predictors of positive adolescent personality development over time. *Merrill-Palmer Quarterly*, *58*, 255-283. doi:10.1353/mpq.2012.0008

Shiota, M. N., & Levenson, R. W. (2007). Birds of a feather don't always fly farthest: Similarity in Big Five personality predicts more negative marital satisfaction trajectories in long-term marriages. *Psychology and Aging*, *22*, 666-675. doi:10.1037/0882-7974.22.4.666

Smits, D. J., & Boeck, P. D. (2006). From BIS/BAS to the big five. *European Journal of Personality*, *20*, 255-270. doi: 10.1002/per.583

Stifter, C. A., Dollar, J. M., & Cipriano, E. A. (2011). Temperament and emotion regulation: the role of autonomic nervous system reactivity. *Developmental Psychobiology*, *53*, 266-279. doi: 10.1002/dev.20519

Suess, P. E., Porges, S. W., & Plude, D. J. (1994). Cardiac vagal tone and sustained attention in school- age children. *Psychophysiology*, *31*, 17-22. doi:10.1111/j.1469-8986.1994.tb01020.x

Thompson, R. A. (1994). Emotion regulation: A theme in search of definition. *Monographs of the Society For Research In Child Development*, *59,* 25-52. doi:10.1111/j.1540-5834.1994.tb01276.x

Tronick, E. Z., Als, H., Adamson, L., Wise, S., & Brazelton, T. B. (1978). Infant's response to entrapment between contradictory messages in face-to-face interaction. *Journal of the American Academy of Child Psychiatry*, *17,* 1-13. doi:10.1016/S0002-7138(09)62273-1

Wang, L., & Crane, D. R. (2001). The relationship between marital satisfaction, marital stability, nuclear family triangulation, and childhood depression. *American Journal of Family Therapy*, *29*, 337-347. doi:10.1080/01926180126502

Werneck, H., Eder, M. O., Yanagida, T., & Rollett, B. (2014). Predicting adolescents' parent–child relationship quality from parental personality, marital conflict and adolescents' personality. *European Journal of Developmental Psychology*, *11*, 159-176. doi:10.1080/17405629.2013.876914

Appendix: WKU IRB Approval Letter

INSTITUTIONAL REVIEW BOARD
OFFICE OF RESEARCH INTEGRITY

DATE: December 7, 2015

TO: Diane Lickenbrock, Ph.D.
FROM: Western Kentucky University (WKU) IRB

PROJECT TITLE:[427010-7] The development of emotion regulation within the parent-infant relationship: Intrinsic and extrinsic contributors

REFERENCE #: IRB-16-228(formerly 13-202)
SUBMISSION TYPE: Renewal

ACTION: APPROVED
APPROVAL DATE: December 7, 2015
EXPIRATION DATE: December 7, 2016
REVIEW TYPE: Full Committee Review

Thank you for your submission of Other materials for this project. The Western Kentucky University (WKU) IRB has APPROVED your submission. This approval is based on an appropriate risk/benefit ratio and a project design wherein the risks have been minimized. All research must be conducted in accordance with this approved submission.

This submission has received Full Committee Review based on the applicable federal regulation. Please remember that informed consent is a process beginning with a description of the project and insurance of participant understanding followed by a *signed* consent form. Informed consent must continue throughout the project via a dialogue between the researcher and research participant. Federal regulations require each participant receive a copy of the consent document.

Please note that any revision to previously approved materials must be approved by this office prior to initiation. Please use the appropriate revision forms for this procedure.

All UNANTICIPATED PROBLEMS involving risks to subjects or others and SERIOUS and UNEXPECTED adverse events must be reported promptly to this

office. Please use the appropriate reporting forms for this procedure. All FDA and sponsor reporting requirements should also be followed.

All NON-COMPLIANCE issues or COMPLAINTS regarding this project must be reported promptly to this office.

This project has been determined to be a Minimal Risk project. Based on the risks, this project requires continuing review by this committee on an annual basis. Please use the appropriate forms for this procedure. Your documentation for continuing review must be received with sufficient time for review and continued approval before the expiration date of December 7, 2016.

Please note that all research records must be retained for a minimum of three years after the completion of the project.

If you have any questions, please contact Paul Mooney at (270) 745-2129 or irb@wku.edu. Please include your project title and reference number in all correspondence with this committee.

This letter has been electronically signed in accordance with all applicable regulations, and a copy is retained within Western Kentucky University (WKU) IRB's records.