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**EMOTION REGULATION IN CHILDREN EXPOSED TO MALTREATMENT: THE
INTERPLAY BETWEEN MALTREATMENT STATUS, PARENTING QUALITY, AND
TEMPERAMENT**

A Dissertation in
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by

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ABSTRACT

This study sought to address three main goals in order to elucidate the mechanisms that contribute to emotion regulation in children exposed to maltreatment. Specifically, this study examined (1) differences in children's emotion regulation and parenting quality between children from maltreating and non-maltreating families, (2) whether children's level of temperamental surgency moderated the relationship between maltreatment status and emotion regulation, and (3) if children's surgency impacted the relationship between parenting quality and emotion regulation, after considering the effects of maltreatment. Eighty-five mothers and their preschool children (n = 41 maltreating) were recruited as part of larger study and completed a laboratory visit. Children participated in an emotionally challenging situation in which their expressed anger and emotion regulation strategies were observationally assessed and ECG was recorded. Mother's use of negative/hostile control, positive/warm control, and warm autonomy support were micro-analytically coded during a joint problem solving task with her child. Finally, parent-report and observational assessments of children's temperament were obtained. The results revealed that surgent, non-maltreated children displayed less expressed anger and were less likely to suppress their vagal tone during an emotionally challenging situation. Additionally, it was revealed that regardless of maltreatment status and children's surgency, children of mothers who used more negative/hostile control showed lower vagal suppression, whereas, children of mothers who used more positive/warm control showed greater vagal suppression and less adaptive emotion regulation strategies. The present study is one of the first to consider the influence of both maltreated children's temperament and parenting quality on their emotion regulation development, and it demonstrates the need for future research to further clarify how maltreated children's characteristics and the parenting they are exposed to shape their emotion regulation development given the considerable variability in maltreatment experienced by these children.

TABLE OF CONTENTS

LIST OF TABLES	vi
LIST OF FIGURES	vii
ACKNOWLEDGEMENTS	viii
Chapter 1 Introduction	1
Chapter 2 Review of Literature.....	4
Developmental Psychopathology	4
Emotion Regulation	7
Regulation of anger in children	9
Physiological regulation of emotion	10
Emotion regulation in maltreated children	15
Parenting	17
Parental contributions to children’s emotion regulation	20
Influence of parenting on children’s vagal functioning	22
Maltreating parent behaviors.....	23
Maltreating parents influence on children’s emotion regulation.....	27
Temperament	29
Temperament and behavioral adjustment.....	30
Temperament and emotion regulation.....	32
Temperament and maltreatment.....	33
Temperament and parenting.....	34
Proposed Research Questions/Hypotheses	37
Chapter 3 Method	44
Participants	44
Inclusion/exclusion criteria	44
Procedures	45
Cardiac physiology.....	46
Duplo blocks	46
Transparent Box	47
Child temperament	47
Measures	48
Parenting behaviors.....	48
Child temperament.....	50
Parent-report of child temperament.....	50
Observer ratings of child temperament	50
Surgency composite	51
Emotion regulation.....	51
Emotional expression	51
Emotion regulation strategies.....	52

Vagal reactivity	54
Child maltreatment group status	55
Child Abuse Potential Inventory	55
Maltreatment Classification System	55
Demographic survey	55
Objective measure of SES	56
Chapter 4 Results	57
Preliminary Analyses	57
Primary Analyses	58
Differences between maltreating and non-maltreating children on emotion regulation	58
Differences between maltreating and non-maltreatment mothers on parenting quality	59
Surgency as a moderator between maltreatment status and emotion regulation	59
Surgency as a moderator between parenting quality and children's emotion regulation	61
Chapter 5 Discussion	63
Limitations and future directions	71
References	76
Appendix A Tables	94
Appendix B Figures	98

LIST OF TABLES

Table 1: Descriptives of study variables	94
Table 2: Correlations between study variables and covariates.	96
Table 3: Maltreatment group X surgency multiple regression analyses.	97

LIST OF FIGURES

Figure 1: Structural Analysis of Social Behavior (SASB) simplified cluster model	98
Figure 2: Maltreatment status moderates the relationship between surgency and expressed anger.....	99
Figure 3: Maltreatment status moderates the relationship between surgency and RSA change.	100

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Chapter 1

Introduction

Child maltreatment is a critical public health problem in the U.S. with approximately one million American children experiencing maltreatment each year (National Center on Child Abuse and Neglect, 2000). Children who are maltreated are at greater risk for profound short and long term mental health problems including difficulties in emotional functioning, conduct disorder, and anxiety problems (Cicchetti & Toth, 2005; Cicchetti & Valentino, 2006). Despite this, very little is known about the mechanisms and processes that may contribute to maltreated children's problematic developmental pathways, and it is crucial to identify the factors which influence these early developmental trajectories in order to eradicate the long term negative effects of maltreatment.

Pathways to either adaptive or maladaptive development in children exposed to maltreatment may be better understood when considered within a developmental psychopathology framework. Developmental psychopathology is a multidisciplinary framework that focuses on the interplay between biological, psychological, and social-contextual processes across the lifespan in order to elucidate how these multiple levels of influence affect individual differences in trajectories leading to both normal and abnormal development (Cicchetti, 2006; Cicchetti, 1993; Cicchetti & Toth, 1998). Importantly, this theoretical framework emphasizes identifying precursors to more serious pathology as a way to try and modify individuals' maladaptive pathways and place them on more adaptive developmental trajectories (Cicchetti, 2006; Cicchetti & Toth, 1995). One important precursor that has consistently been identified as a common underlying feature of several serious psychopathologies, including conduct disorder, depression, and antisocial behavior, is the inability to regulate negative emotions (Cole, Michel, & Teti, 1994). In the case of maltreated children, they are more likely to show difficulty with regulating their emotions (Maughan & Cicchetti, 2002; Shields & Cicchetti, 1998), and as previously mentioned, maltreated children are at greater risk for the

manifestation of these serious psychopathologies associated with difficulties in regulating negative emotions.

Despite this, not all maltreated children develop maladaptive outcomes and it is still somewhat unclear as to why this occurs (Cicchetti & Valentino, 2006). Therefore, it is necessary to clarify both environmental factors and characteristics of the child, and more importantly, the interplay between the two, that may contribute to either adaptive or maladaptive functioning in these children. For example, while it is known that children identified as being a victim of a specific act of maltreatment, such as physical abuse or neglect, is detrimental to their emotion regulation functioning (e.g., Trickett, 1998), less is known about how the quality of parenting that maltreated children experience may further explain their emotion regulation functioning. In other words, the variability in the quality of parenting that children experience daily in maltreating families, beyond specific acts of physical abuse and/or neglect, may better explain differences in children's emotion regulation functioning (Reid, Taplin, & Lorber, 1981).

Secondly, characteristics of the child, such as their temperament, may further explain why variability exists in emotion regulation outcomes in children exposed to maltreatment. Despite this, very little research has investigated the role that children's temperament plays in their development. It is possible that children's temperamental characteristics may either exacerbate or buffer against the effects of maltreatment. Furthermore, research in normative populations has shown that the quality of parenting that children experience can impact their self-regulation development depending on children's temperamental characteristics (e.g., Kochanska, 1995, 1997; Kochanska, Aksan, & Joy, 2007), which suggests that it is not sufficient to look at environmental factors and characteristics of the child in isolation. Yet no published research to date has investigated how temperamental differences in children exposed to maltreatment may moderate relationships between (a) maltreatment status or (b) quality of parenting experienced and these children's emotion regulation.

To address these issues with maltreatment research, this study was guided by developmental psychopathology in order to accomplish three main goals. The first goal was to document

differences in emotion regulation functioning among preschool children from child maltreating (CM) and non-maltreating (non-CM) families, and to assess differences between CM and non-CM mothers on their quality of parenting. The second goal was to investigate the interaction between children's surgent temperament and CM status, and how this influences children's emotion regulation as measured by their degree of expressed anger, emotion regulation strategies, and physiologic regulation during a frustrating situation. Finally, the third goal was to explore whether variations in parenting processes, specifically, (a) maternal negative/hostile control, (b) maternal positive/warm forms of control, and (c) maternal autonomy support, predicted children's emotion (after considering CM status). The current study was designed to contribute to our understanding of the mechanisms and processes that play a role in maltreated children's emotion regulation, and thus, inform design and focus of prevention and intervention programs for children from at-risk families.

Chapter 2

Review of Literature

The following chapter is divided into five main sections. The first section reviewed developmental psychopathology and how this framework guided the current study. The second section addressed emotion regulation by specifically reviewing literature related to regulation of anger in children, physiologic regulation of anger, and emotional development in maltreated children. The third section reviewed important aspects of parenting, parental contributions to children's emotion regulation, the behaviors of maltreating parents, and maltreating parents influence on children's emotion regulation functioning. The fourth section addressed literature related to children's surgent temperament, surgent temperament and behavioral adjustment, temperament and emotion regulation, temperament and maltreatment, and temperament and parenting research. Finally, the last section focused on the purpose and research questions/hypotheses of the study.

Developmental Psychopathology

Developmental psychopathology is a multidisciplinary framework, drawing from fields such as clinical, developmental, and experimental psychology in addition to genetics, neuroscience, and sociology, with the main overall objective to clarify how mental health problems and pathology develop in individuals. Taking this multidisciplinary approach to pathology, the goal of developmental psychopathology is to investigate the interplay between biological, psychological, social-contextual processes across the lifespan in order to understand the impact that these multiple levels of influence have on individual differences in both normal and abnormal developmental trajectories (Cicchetti, 2006; Cicchetti, 1993; Cicchetti & Toth, 1998). Further, under this framework, pathology is not viewed as inherent within the individual but rather as a result of interactions between the individual's own characteristics and her current environmental context

(Cicchetti, 2006; Cicchetti & Toth, 2005; Sameroff, 2000), such that some individuals, because of their own characteristics, may be more likely to manifest mental health problems when in a dysfunctional or unsupportive environment.

Child maltreatment (CM) is an important environmental context to consider when thinking about adaptive and maladaptive development because the toxic relational environment these children are exposed to can significantly impair their functioning in various domains of development (Cicchetti & Toth, 2005). Affecting nearly one million children each year, child maltreatment is considered a serious public health concern as it is an extreme economic burden to society and more importantly, has serious negative consequences for the victims (Azar, 2002; Cicchetti & Toth, 2005; National Center on Child Abuse and Neglect, 2000). Maltreated children who experience physical abuse (i.e., inflicting harm on a child from non-accidental means) and/or neglect (i.e., failure to provide or provide age appropriate supervision) are at risk for a myriad of psychological, cognitive, and social problems including difficulty with affect regulation and expression (Maughan & Cicchetti, 2002), attachment issues (Crittenden, 1988), problems with peer relationships (Rogosch & Cicchetti, 1994), and poor school readiness and academic performance (Eckenrode, Laird, & Doris, 1993). Furthermore, maltreated children show compromised functioning in fear-stress physiology and brain development (Cicchetti & Rogosch, 2001; Teicher, Dumont, Ito, Vaituzis, Giedd, & Andersen, 2004). At a more serious level, maltreated children are overrepresented in diagnoses of serious psychopathologies (Erickson & Egeland, 2001) including anxiety issues, PTSD, depressive disorders, early onset conduct problems, personality disorders, and life-course persistent antisocial behaviors (NIMH, 2000; Kolko, 2002; Patterson, Reid, & Dishion, 1992).

Because there is a great deal of variability within maltreated children on dimensions such as the subtype, severity, developmental timing, and chronicity of the maltreatment they experience (Cicchetti & Valentino, 2006; Cicchetti & Toth, 2005), one critical factor of the maltreating environment that may be particularly important in determining adaptive or maladaptive development in these children is the quality of parenting maltreated children experience in their daily interactions

with their parents (Reid et al., 1981). It is possible that variability in parenting processes experienced by children over and above the occurrence of maltreatment, rather than simply whether children have been identified in a home where a specific act of maltreatment has occurred, could better explain children's overall adjustment. However, very little research has explored the parenting behaviors that maltreating parents use at a micro-analytic level and how this impacts children's development (Reid et al., 1981; Wahler, Williams, & Cerezo, 1990).

In addition to identifying the developmental processes associated with variation in functioning from those who are normal to those who show extreme pathology, developmental psychopathologists are interested in individuals who fall in between the range of normal and pathological functioning (Cicchetti, 2006). In particular, developmental psychopathologists believe it is crucial to identify those individuals who show some signs of dysfunction yet are not considered disordered. These individuals could become disordered if their current developmental trajectory continues, and therefore, those individuals who are on the cusp of manifesting serious pathology could be a critical time for intervention in order to place them on a more adaptive developmental pathway (Cicchetti, 2006). Importantly, this could include identifying precursors associated with pathology. Children's regulation of negative emotions is an important precursor to consider because the inability to regulate negative emotions can have short and long term ramifications for children's overall functioning, and it is a common underlying feature of several serious psychopathologies, such as conduct disorder, depression, and antisocial behavior (Cole et al., 1994). Furthermore, maltreated children are more likely to show difficulty with regulating their emotions (Maughan & Cicchetti, 2002; Shields & Cicchetti, 1998; Trickett, 1998), and as previously mentioned, maltreated children are at greater risk for the manifestation of these serious psychopathologies associated with difficulties in regulating negative emotions. Despite this, little attention has been paid to clarifying the ways in which characteristics of the child and specific aspects of the maltreating context have on children's emotion regulation functioning (Cicchetti & Toth, 2005; Trickett, 1998), and it is the goal of the current study to try and clarify these potential relationships.

Finally, according to developmental psychopathology, it is important to consider biologically based individual characteristics of children that may play a role in whether they manifest adaptive or maladaptive outcomes (Cicchetti, 2006). However, very little research has considered the role that children's temperament may play in how the maltreating context affects them and the quality of parenting they experience. This seems especially important to consider because not all maltreated children manifest maladaptive outcomes (Cicchetti, 2006; Cicchetti & Valentino, 2006). Therefore, the current study attempts to fill this gap in our understanding of pathways to adaptive and maladaptive development in children exposed to maltreatment by exploring the interplay between differences in children's temperament and (a) maltreatment status or (b) quality of parenting experienced and how these relationships influence children's emotion regulation. As developmental psychopathology is interested in identifying critical developmental periods that could make individuals more vulnerable to maladaptive development (Cicchetti, 2006), these processes were investigated in preschool children because preschool age has been identified as a developmental period in which it is crucial for children to learn to self-regulate their emotions (Denham, Bassett, & Wyatt, 2007; Eisenberg & Morris, 2002; Halberstadt, Denham, & Dunsmore, 2001; Kopp, 1982).

Emotion Regulation

One of the most important developmental abilities children must achieve is the capacity to self-regulate their negative emotions, and by the time children are in preschool, they should be able to regulate emotions in adaptive, socially, and age appropriate ways (Denham, Bassett, & Wyatt, 2007; Eisenberg & Morris, 2002; Halberstadt, Denham, & Dunsmore, 2001; Kopp, 1982). Given this, the preschool period is a critical time point to investigate the development of emotion regulation abilities. Emotion regulation (ER) can be defined as the internal and external processes involved in initiating, maintaining, and modulating the occurrence and intensity of emotional expressions and one's ability to adapt to stressful demands and emotional experiences (e.g., Cole et al., 1994; Thompson, 1994). Further, emotion regulation involves recruitment of other processes, such as

attentional, cognitive, social, or behavioral, that can serve to modulate emotional responses in a way that is contextually appropriate (Cole, Martin, & Dennis, 2004). Additionally, the expansion of ER strategies is also dependent on the experiences of children and maturation in motor, cognitive, and emotional domains (Calkins, 1994).

Within their daily lives, children experience unavoidable situations that may evoke frustration or anger. However, the ways in which they manage this anger can be critical to their overall functioning. Anger is experienced when an individual's goals are blocked by some impeding obstacle, and therefore, anger fuels motivation and persistence within individuals in order to overcome the obstacle (Campos, Campos, & Barrett, 1989). Thus, anger, in some instances, can be socially appropriate and adaptive to an individual's functioning because it helps individuals to achieve their goals (Cole & Hall, 2008; Saarni, 1999). According to Kopp (1989), the experience of negative emotions may operate as a mechanism through which children learn adaptive ways to regulate or manage their negative arousal, and thus allow them to alleviate discomfort they may feel. However, when children do not develop effective ways to regulate their anger, it can deter them from achieving their goals, greatly impairing their overall functioning (Cole et al., 1994; Cole & Hall, 2008).

Children's ability to regulate their negative emotions is an extremely important skill they must achieve because the inability to control negative emotions, especially their anger, has been identified as an important precursor in the development of more serious psychopathologies including conduct disorder, depression, and personality disorders (Beuchaine, Gatzke-Kopp, & Mead, 2007; Cicchetti, 2006; Cole et al., 1994; Cole & Hall, 2008; Leibenluft, Charney, & Pine, 2003). From a developmental psychopathology perspective, it is important to identify potential precursors to serious psychopathologies throughout development in order to possibly alter an individual's developmental trajectory (Cicchetti, 2006; Cicchetti & Toth, 2005). Additionally, it is important to study the development of these precursors to pathological outcomes in children who are growing up in adverse

environmental circumstances, such as children exposed to maltreatment (Cicchetti & Toth, 2005; Cicchetti & Valentino, 2006).

Because maltreated children are at greater risk of developing emotion regulation difficulties (Maughan & Cicchetti, 2002; Shields & Cicchetti, 1998) and for serious psychopathologies associated with poor regulation of anger (Rogosch, Cicchetti, & Aber, 1995; Kolko, 2002), considering the environmental context that the child is living in can further contribute to our understanding of how they develop ER skills. It is important to note that children's strategies for regulating anger may be adaptive when living in adverse environmental contexts, but ultimately, the strategies that are adaptive in these atypical contexts may be developmentally maladaptive and interfere with children's long-term adjustment, resulting in serious mental health problems (Cole et al., 1994). In the case of maltreated children, children may develop ER skills that are adaptive for them when in violent contexts and/or contexts where their needs are not met. However, in the long term, the ER strategies they rely upon may prove to be maladaptive or developmentally inappropriate resulting in serious developmental consequences. Therefore, it is important to clarify the mechanisms and processes that contribute to maltreated children's ER development.

Regulation of anger in children

Research with normative populations has demonstrated that children use several emotion regulation strategies, some that are effective and others that are ineffective, to manage their anger when placed in challenging or frustrating situations. Research assessing children's ER in frustrating situations has shown that when children display increases in emotional distress, they were more likely to kick, hit, or throw the object of frustration, or focus their attention on the frustrating object and less likely to use strategies such as attending to the mother, distracting themselves with other objects, trying to use more constructive behaviors to overcome a barrier to the frustrating object, or engaging with their surroundings (Grolnick, Bridges, & Connell, 1996; Calkins & Johnson, 1998; Calkins, Smith, Gill, & Johnson, 1998). In a study investigating preschool children's use of ER strategies during a frustrating situation, children who showed more anger, compared to sadness or

happiness, were more likely to engage in strategies such as problem solving, focusing attention on the desired object, and distraction (Dennis, Cole, Wiggins, Cohen, & Zalweski, 2009).

Buss and Goldsmith (1998) conducted a study in which they observed levels of anger and the regulatory behaviors toddlers and assessed whether certain strategies were effective at reducing expressions of anger. They found that regulation behaviors of distraction, gaze aversion, and redirected action predicted a temporal reduction in observable anger in children during a frustrating situation. Following procedures similar to Buss and Goldsmith (1998), Gilliom and colleagues (2002) found that shifting attention and seeking information about the situational constraints were related to decreases in anger, and passive waiting and distraction were associated with less than expected increases in anger. Further, children's focused attention on the desired object was related to increases in anger.

In sum, research with normative populations has shown that behaviors such as redirecting attention, distraction, or constructive coping were associated with lower levels of anger and shown to be effective at reducing children's negative emotions. On the other hand, focusing attention on the frustrating object and aggressive/venting behavior was associated with greater expressed anger and was found to be ineffective at reducing anger.

Physiologic regulation of emotion

In addition to looking at the amount of anger children express and the behavioral strategies children use to manage their emotions, research has recently begun to explore how children are able to physiologically manage their arousal in emotionally eliciting situations by exploring their autonomic nervous system functioning. Porges' Polyvagal Theory (Porges, 1995, 1997, 1998, 2007, 2001; Porges, Doussard-Roosevelt, Portales, & Greenspan, 1996) is a model which explains the neural regulation of the autonomic nervous system. According to Polyvagal theory, through evolution of the autonomic nervous system within mammals, the foundation for neurophysiological substrates necessary for social engagement have been laid. Further, this

determines how adept an individual's nervous system is at expressing emotion, engaging in quality communication, and regulating bodily and behavioral states.

Originating from the 10th cranial nerve (vagus), there are two separate autonomic nervous system branches which are associated with distinct and adaptive behavioral strategies. Polyvagal theory (Porges, 1995, 1997, 1998, 2007, 2001; Porges et al., 1996) proposes three phylogenetically ordered subsystems that neurally control the heart, and these three subsystems are linked to an individual's social communication and the mobilization and immobilization of behaviors. The most primitive component is the immobilization system (i.e., death feigning, passive avoidance) which is a function of the unmyelinated vagus or "vegetative vagus" and is referred to as the dorsal vagal complex. The mobilization system (i.e., active avoidance, fight-flight behaviors) is linked to the sympathetic nervous system. Finally, the system responsible for social communication and engagement originates in the myelinated vagus or "smart vagus" and is referred to the ventral vagal complex. This system, from parasympathetic input, has a calming effect on the individual and serves to inhibit the sympathetic influence to the heart. Functionally, the ANS is organized hierarchically such that the newest neural structures (ventral vagal complex) response strategies are activated first when exposed to threat, and when this response fails, the next newest structure is activated.

Uniquely mammalian, the myelinated vagus functions as "brake," such that it allows for either inhibition or disinhibition of vagal input to the heart which can either mobilize or calm an individual (Porges, 1995, 1997, 1998, 2001, 2007; Porges et al., 1996). Therefore, "removing" the vagal brake results in less parasympathetic input and modulates cardiac output to speed heart rate and mobilizes the individual. On the other hand, by "putting on" the vagal brake and allowing for greater parasympathetic influence on the heart, it slows heart rate and has a calming effect on the individual.

Vagal influence is measured by using the amplitude of Respiratory Sinus Arrhythmia (RSA), or influence of respiration, and is quantified to provide an index that captures the influence of the

myelinated vagus on the heart (Porges, 1995). RSA is used to assess dynamic regulation of the vagal brake during challenging situations and how variability in parasympathetic nervous system functioning is related with attentional, emotional, and behavioral control. Most research investigating the influence of the parasympathetic system on children's functioning has focused on how children's baseline vagal tone and the ability to suppress vagal tone are related to children's behavioral, attentional, and emotional responding.

Baseline vagal tone promotes homeostasis in the individual and reflects the individual's resources for engagement with the environment (Porges, 1995, 1997, 1998, 2001, 2007; Porges et al., 1996). Research has demonstrated that high resting RSA is associated with a number of positive developmental outcomes in children. For example, higher vagal tone has been linked to emotional reactivity and associated with more activity, less sensitivity to the environment, and more positivity (Calkins, 1997). Additionally, high baseline vagal tone is related to increased attentional abilities in children (Suess, Porges, & Plude, 1994).

Recent attention has been given to a second measure of cardiac reactivity that is believed to be related to children's self-regulatory capacities, including their ability to regulate emotions. Vagal suppression, or withdrawal, involves decreases in RSA during demanding situations due to limiting the amount of parasympathetic influence on the individual, and this is believed to be a physiologic process allowing for sustained attention and behaviors indicative of active coping in individuals (Porges, 1995, 1997, 1998, 2001, 2007; Porges et al., 1996). Research has investigated children's physiologic regulation, or vagal suppression, during emotionally challenging situations and has found it to be related to various aspects of children's social, behavioral, and emotional functioning.

Research has shown that children's vagal suppression during emotionally challenging situations is related to their overall emotional functioning, including the ER strategies they use. Calkins (1997) found that children displayed more orienting to a puppet when they simultaneously showed greater vagal suppression during a task designed to elicit positive emotion. Further, greater vagal suppression in children was related to more orienting toward the experimenter, whereas lower

vagal suppression was associated with focusing on a prohibited object during a frustrating situation. Similarly, children who used more aggressive or venting behavioral regulation strategies during situations that elicited negativity were more likely to exhibit lower vagal suppression (Calkins, Smith, Gill, & Johnson, 1998). Similarly, Calkins and Keane (2004) assessed vagal suppression across several emotionally eliciting contexts including a frustrating situation and found children showed high stability in vagal suppression across all the situations. Also, children who displayed a stable pattern of high vagal suppression also tended to be less emotionally reactive.

Research has also demonstrated a link between children's vagal suppression during emotionally and socially challenging situations and their behavior problems and overall ER functioning. In particular, infants and children who displayed less vagal suppression tended to show more behavior problems when they were preschoolers (Porges et al., 1996) and were at greater risk for externalizing problems (Calkins, Blandon, Williford, & Keane, 2007), whereas children with stable and high vagal suppression during emotion-eliciting situations were less likely to have behavior problems and received better ratings on ER capacities (Calkins & Keane, 2004; Hastings, Nuselovici, Underdale, Coutya, McShane, & Sullivan, 2008). Children who were at-risk for the development of aggressive behavior problems displayed consistently less vagal suppression during challenging situations compared to children who were at less risk for aggressive problems (Calkins & Dedmon, 2000). In a group of children at-risk for depression, Gentzler, Santucci, Kovacs, and Fox (2009) found that greater suppression of vagal tone to a sad video clip was predictive of more adaptive ER.

In sum, research has generally demonstrated that children's physiologic regulation, in particular their vagal suppression, is associated with children's use of more adaptive emotion regulation strategies and better behavioral adjustment. Children who show greater vagal suppression during emotionally challenging situations are less likely to be emotionally reactive and to use more adaptive ER strategies. Additionally, children with greater vagal suppression tend to show less behavioral adjustment difficulties compared to children who have less vagal suppression.

Despite evidence from some studies indicating that children at-risk are showing less vagal suppression in emotionally challenging situations (Calkins & Dedmon, 2000; Gentzler et al., 2009), other research investigating children's vagal reactivity in higher risk children, in particular those with clinically diagnosed aggressive or anxiety problems, has shown that children are actually displaying greater vagal suppression, and thus whether vagal suppression is an adaptive physiological response in these children is somewhat unclear. Beauchaine (2001) suggests that this excessive vagal withdrawal shown by children with aggressive or anxiety problems during challenging or attentional situations may actually be problematic and an indication of overall emotional lability and emotion regulation difficulties. Beauchaine (2001) posits that this may be due to the fact that children with these problems already have a low baseline vagal tone, and therefore, have fewer resources to draw from. When children with low baseline vagal tone show greater withdrawal, it can create a "flooring" effect and may place these types of children closer to the threshold for sympathetic activation or fight/flight responses despite showing roughly equivalent RSA reductions compared to children who are not diagnosed with aggressive or anxiety problems (Beauchaine, 2001; Beauchaine, Gatzke-Kopp, & Mead, 2007). Therefore, it is important to consider the physiological boundaries that individuals are operating in.

For example, Beauchaine et al. (2007) found that conduct disordered adolescents displayed lower baseline vagal tone compared to control children, however, both groups of children were showing equal levels of vagal suppression during challenge. Despite equal levels of withdrawal, this may be problematic for the adolescents with conduct disorder because they had lower baseline vagal tone to start with and therefore, the excessive vagal withdrawal relative to their initial RSA levels could compromise their autonomic functioning and become dysregulatory. Similar results were found in a sample of conduct disordered children in middle childhood (Beauchaine et al, 2007). Interestingly, in another study, preschool children who scored above clinical cut-off scores on both internalizing and externalizing problems showed higher vagal suppression during a series of challenging tasks compared to children with clinical cutoff scores on externalizing problems and

children with no behavior problems (Calkins, Graziano, & Keane, 2007). Therefore, when higher risk children are showing vagal suppression, it may actually be indicative of poor regulation as opposed to adaptive regulation, which has been found in children from more normative samples.

Given this set of findings linking both low and high levels of vagal suppression to negative outcomes in children and because maltreatment puts children at greater risk for the development of psychopathologies, including aggressive and anxiety problems (Kolko, 2002; Patterson, Reid, & Dishion, 1992), it is possible that maltreated children may display either a pattern of less vagal suppression or greater vagal suppression compared to non-maltreated children. However, nothing is currently known about vagal reactivity in children exposed to maltreatment during challenging situations.

Emotion regulation in maltreated children

Research investigating maltreated children's emotion regulation development has consistently shown that maltreated children tend to have poorer ER compared to non-maltreated children. In general, maltreated children show more anger, frustration, and hostility (Gaensbauer, Mrazek, & Harmon, 1981; Cicchetti & Rogosch, 2005; Shields & Cicchetti, 1998; Trickett, 1998) and are more emotionally dysregulated (Shields & Cicchetti, 1998) compared to non-maltreated children. In a study conducted by Maughan and Cicchetti (2002), nearly 80% of maltreated preschool children were identified as showing emotion dysregulation after witnessing interadult violence. Similarly, other studies found that maltreated children were less likely to be rated as showing adaptive emotion regulation and had fewer effective coping strategies when dealing with anger compared to non-maltreated children (Shields & Cicchetti, 1998; Shipman, Edwards, Brown, Swisher, & Jennings, 2005; Shipman & Zeman, 2001; Teisl & Cicchetti, 2008).

Maltreated children's inability to regulate emotions has implications for their behavioral adjustment, emphasizing the importance of understanding ER development as a precursor to more serious mental health problems in these children. Maughan and Cicchetti (2002) found that an undercontrolled/ambivalent ER style in children mediated the relationship between maltreatment and

internalizing problems. Maltreated children tended to display an undercontrolled/ambivalent ER style and this increased the likelihood for internalizing problems in these children. Teisl and Cicchetti (2008) found that maltreated children with poor ER were more likely to be rated by peers as aggressive and disruptive.

These studies indicate that maltreated children are at-risk for developing difficulties in their ER. Further, maltreated children's deficits in ER have been associated with many problematic outcomes. However, the few studies that have looked at ER in maltreated children are lacking in two main ways. First, these studies were primarily conducted with school age children and not preschool age children. This is surprising given that preschool age is an important developmental period to assess ER capacity because by the time they reach preschool, children are relying less on external forces to regulate their emotions and should be able to self-regulate their emotions in socially and age appropriate ways (Denham, Bassett & Wyatt, 2007; Eisenberg & Morris, 2002; Halberstadt, Denham, & Dunsmore, 2001; Kopp, 1982). Therefore, it is important to understand maltreated children's development of ER before they reach school age because ER abilities are becoming more solidified during the preschool years. Second, these studies have relied on others' reports of maltreated children's ER rather than using observational measures to capture the ER strategies children actually engage in during challenging situations. Maltreated children show biases toward negative emotions (Pollak, Cicchetti, Hornung, & Reed, 2000), and therefore, it is important to study the ER strategies employed by maltreated preschool children using observational coding of behaviors in emotion-eliciting contexts, such as a frustrating situation. Additionally, no studies to date have explored vagal reactivity as another form of ER in maltreated children. Given these gaps in the research, the current study explored multiple forms of children's ER, including their expression of anger, ER strategies, and vagal suppression, in order to get a more holistic view of possible forms or regulation in children exposed to maltreatment. In order to rectify current weaknesses in the literature, the current study used observational and physiological assessments of preschool children's expression of anger and ER strategies used while participating in a frustrating

situation. The first goal of the study was to determine whether there are differences in CM and non-CM children's ER functioning during a frustrating situation.

Beyond the effects of maltreatment exposure on emotion regulation difficulties (e.g., Maughan & Cicchetti, 2002; Shields & Cicchetti, 1998), it is necessary to understand how variability in the quality of parenting processes along dimensions of warmth, autonomy support, and control and children's temperamental characteristics conjointly affect CM children's ER functioning. Hence, the primary goal of the current study is to investigate how temperamental differences in children exposed to maltreatment may moderate relationships between (a) maltreatment status or (b) quality of parenting experienced, and these children's emotion regulation functioning.

Parenting

As emphasized within a developmental psychopathology framework, it is important to consider an individual's context and how it influences both normal and abnormal development. Early in children's lives, parents play a large role in creating the context that their children are exposed to (Fox, Henderson, Marshall, Nichols, & Ghera, 2005), and one of the ultimate goals of parenting is to provide children with a supportive environment in order to promote optimal development. The average expectable environment refers to the range of environmental conditions, often created by parents, which will enhance children's chances of experiencing normative developmental outcomes across the lifespan, generally (Cicchetti & Toth, 2005; Hartman, 1958). However, when children are in an environment that is no longer in the average expectable range, their normal developmental pathway may be in jeopardy (Cicchetti & Valentino, 2006). In the case of child maltreatment, the parenting that children are exposed to represents an extreme deviation from the average expectable environment. This deviation seriously threatens children's functioning throughout their life and across several domains of development, including their physical, cognitive, social, and emotional functioning, which can increase their chances of manifesting serious psychopathologies (Cicchetti, 2006; Cicchetti & Toth, 2005; Cicchetti & Valentino, 2006).

The typical behaviors parents use while interacting with their children daily can greatly influence their children's development in various domains, including their emotional functioning (Cicchetti & Toth, 2005). Consistently, parenting researchers have emphasized that critical components of competent parenting which impact children's functioning involve the amount of control parents exert, how much warmth they display, and the type of autonomy support they provide for their children (Baumrind 1971; 1996; Benjamin 1979, 2003; Grusec & Davidov, 2007). Most notably, Baumrind identified parenting styles largely rooted in the amount of control and warmth that parents engaged in with their children. Authoritative parents are those who exhibit high levels of control, but they also show high levels of warmth, make age appropriate demands, and clearly communicate to the child. On the other hand, parents who are high in control but exhibit very low levels of warmth toward their child are identified as authoritarian. Authoritative parenting is typically associated with positive outcomes in children whereas authoritarian parenting is associated with negative child outcomes (e.g., Baumrind, 1973; Kaufmann, Gesten, Santa Lucia, Salcedo, Rendina-Gobioff, & Gadd, 2000).

Both authoritative and authoritarian parents are characterized as high in control, but the key differentiating feature is the quality of the control and how this control is conveyed to the child. Control that is accompanied by high levels of warmth is more beneficial to children's functioning, whereas control that is low in warmth and higher in negativity and hostility directed toward the child may impede children's overall functioning. When parental control does not pose a threat to children's autonomy, children may be more likely to tolerate it and comply to parental socialization tactics because the control signifies parental love and concern (Grusec & Davidov, 2007; Grusec, Goodnow, & Kuczynski, 2000; MacDonald, 1992). On the other hand, parental control that is accompanied by low levels of warmth and high levels of negativity can signify rejection and hostility to the child and lead to detrimental outcomes in children (Grusec & Davidov, 2007). Therefore, differentiating between the type of control (i.e., warm/positive vs. negative/hostile) that parents exert is critical to understanding its contribution to children's subsequent development.

Additionally, it is also important for parents to provide support for children's emerging autonomy. When parents provide autonomy related support to their children, children begin to perceive that their behavior is self-generated as opposed to being externally enforced by their parents (Grusec & Davidov, 2007). Parents' use of autonomy support also encourages children to show initiative in order to solve problems and complete tasks on their own (Grolnick, Price, Beiswenger, & Sauck, 2007). When promoting autonomy, parents lay the foundation and structure as to what children should do when engaging in various activities, remain actively involved with their children, and display warmth and emotional availability so that children are willing to accept the structure created by parents (Grusec & Davidov, 2007). Further, autonomy support is largely intertwined with a sense of warmth and connectedness felt between the parent and child (Ryan, Deci, Grolnick, & La Guardia, 2006). Therefore, as with control, the warmth that accompanies autonomy support appears to be crucial in promoting children's development. Further, the use of supportive behaviors by parents may be particularly important during the preschool years when children are beginning to learn to self-regulate their emotions in socially appropriate ways (Denham, Bassett, & Wyatt, 2007; Eisenberg & Morris, 2002; Halberstadt, Denham, & Dunsmore, 2001; Kopp, 1982).

These parenting dimensions of quality of control and autonomy support appear to be critical parenting behaviors associated with children's development (Baumrind 1971; 1996; Grusec & Davidov, 2007). Parents who maltreat their children generally use behaviors that are more negatively controlling and less supportive while interacting with their children (Bousha & Twentyman, 1984; Cerezo & D'Ocon, 1995), as will be explained in more detail in the following section. The variations in the use of these described behaviors by parents while they interact with their children may contribute and, in fact, better explain problematic developmental trajectories in children exposed to maltreatment (Cicchetti & Toth, 2005; Cicchetti & Valentino, 2006), over and above experiencing a specific act of maltreatment.

Despite the increased risk for problematic outcomes in children as a result of maltreatment and the quality of parenting they experience, not all children exposed to maltreatment are similarly

affected by it. Some children may not experience such profound negative developmental outcomes often associated with maltreatment, including difficulties in emotion regulation development (e.g., Cicchetti, 2006; Cicchetti & Toth, 2005; Cicchetti & Valentino, 2006). Scarr (1992, 1993) proposed that the way in which children respond to certain environments is partly due to individual differences. Additionally, according to a developmental psychopathology perspective, adaptive or maladaptive development involves the interplay between children's individual differences and their current environmental contexts (Cicchetti, 2006; Cicchetti & Toth, 2005; Sameroff, 2000). One factor that may influence how CM and the quality of parenting differentially affect children's subsequent development is children's individual, biologically based differences which is known as temperament. However, little is known about whether children's characteristics can serve as a potential risk or protective factor when exposed to maltreatment and the quality of parenting experienced. Therefore, it is necessary to understand these relationships in order develop more effective prevention and intervention programs for these children and their parents. Given this, the current proposal will investigate ER functioning in children exposed to maltreatment by first exploring whether children's temperament interacts with maltreatment status, and second, whether temperament interacts with variations in maternal use of negative control, positive control, and warm autonomy support.

Parental contributions to children's emotion regulation

Parents play a central role in helping children learn to regulate their emotions. In infancy and early childhood, parents help children regulate emotions, and as children move into preschool age, parental guidance allows children to learn strategies to internally control, or self-regulate, their emotions (Thompson, 1991; Winsler, et al., 2000). Understanding the contribution of the contexts children grow up is critical to understanding adaptive and maladaptive ER development in children (Cicchetti, 2006; Cicchetti & Toth, 2005). Research in normative populations has shown that the variations in behaviors parents use while interacting with their children can influence children's ER strategies and physiological regulation.

Generally, greater negative control and hostile behaviors used by parents while interacting with their children is associated with poor ER outcomes in their children. In a study exploring the link between parenting behaviors and children's ER strategies, children focused more on the object of frustration and used less distraction when mothers used more negative and controlling behaviors while interacting with their children (Calkins et al., 1998). When parents engaged in more insensitive, negative, and critical behaviors toward their children's displays of anger, their children showed increases in their anger expression and continued to show increases in anger throughout family interactions (Gottman, Katz, & Hooven, 1997; Snyder, Stoolmiller, Wilson, & Yamato, 2003). In a sample of Chinese preschool children, mothers who were rated higher on harsh parenting had children who received higher parental ratings of emotion dysregulation (Chang, Schwartz, Dodge, & McBride-Chang, 2003).

Parent's use of positive/warm control is typically associated with more adaptive and less maladaptive emotion regulation functioning in children (Feldman & Klein, 2003; Putnam, Sanson, & Rothbart, 2002). For example, Hardy, Power, & Jaedicke (1993) found that school age children indicated they used less aggressive ER coping strategies when parents provided more structure.

Research has also shown that warm/supportive or responsive parenting is related to adaptive ER, whereas, less use of these behaviors by parents is associated with poor ER in children. Calkins and Johnson (1998) found that toddlers displayed more distraction and constructive coping ER strategies during a frustrating situation when mothers used more positive support (i.e., verbal expressions that were positive and supportive and engagement in physical affection). Mothers who were more supportive of their children's negative emotions and validated their children's displays of emotions had children who showed better ER (Denham, 1989; Denham & Grout, 1993; Gentzler, Contreras-Grau, Kerns, and Weimer, 2005). In contrast, children showed greater distress to frustrating events when mothers interfered or engaged in behaviors that did not give their children the opportunity to do an activity for themselves (Calkins & Johnson, 1998).

In summary, research demonstrates that parental use of negative or hostile control and less use of warm supportive or responsive behaviors is typically associated with poor ER evidenced by increases in displays of anger, more focus on sources of frustration, less distraction, and more overall emotion dysregulation. However, parental use of positive control and warm supportive or responsive behaviors have been associated with adaptive ER in children including more use of constructive coping strategies, distraction, and less reliance on aggressive strategies.

Influence of parenting on children's vagal functioning

Recently, some research has explored the relationship between parenting behaviors and children's physiologic regulation. However, the evidence supporting this link is more limited compared to the well established link found between parental behavior and children's ratings or behavioral displays of ER as reviewed above. Although some research shows no link between parenting behaviors and children's vagal suppression (e.g., Calkins & Johnson, 1998), some research suggests a link between negative and controlling parenting behaviors and children's physiological regulation. Hastings and colleagues (2008) conducted a study investigating the relationship between parenting behaviors, children's adjustment, and children's vagal functioning and found that children who showed less vagal suppression during a social group context was associated with greater parental use of negative control. Further, they found that children's vagal regulation mediated the relationship between maternal negative control and children's emotion regulation and externalizing problems. In other words, mother's greater use of negative control was associated with less vagal suppression which was predictive of more emotion regulation difficulties and externalizing problems in children. Similarly, Calkins et al. (1998) found that children showed less vagal suppression during an emotionally eliciting task when mothers displayed more negative and controlling behaviors.

Although the evidence is mixed about the role parenting behaviors have on children's vagal reactivity, there seems to be an emerging link between hostile and controlling parenting as having a negative influence on children's physiological development. However, the research reviewed here is

primarily conducted with low-risk parents and children. Hence, the influence of parenting may be more important to maltreated children's physiological development because of (1) the adverse and hostile home environment they are living in and (2) because maltreating parents are more likely to engage in higher rates of negative and hostile behaviors compared to non-maltreating parents (e.g., Bousha, & Twentyman, 1984; Oldershaw et al., 1986) which may further put these children at greater risk for poorer vagal functioning. Additionally, although research has yet to demonstrate a link between positively controlling and warm autonomy supporting parenting (e.g., Calkins & Johnson, 1998), it is possible that when children exposed to maltreatment experience this type of parenting, it may actually be associated with greater vagal suppression.

Maltreating parent behaviors

The early parenting environment can largely influence children's subsequent development (Fox, Henderson, Marshall, Nichols, & Ghera, 2005). Parents who maltreat their children represent an extreme environmental failure for children, which can interrupt their normal developmental trajectories and leave children at greater risk for maladaptive outcomes, including their ER functioning (Cicchetti & Toth, 2005; Cicchetti & Valentino, 2006). Maltreating parents can suffer from various cognitive, psychological, and emotional deficits that can impede their ability to parent sensitively, effectively, and in a developmentally appropriate way (Azar, 2002; Larrance & Twentyman, 1983). More importantly, the effects of maltreatment, in particular physical abuse and/or neglect, on children's development might better be accounted for by the variations in the quality of parenting that children experience daily as opposed to whether their parents have been identified as engaging in a specific incident of maltreatment. Further, because there is high comorbidity between types of maltreatment (Cicchetti & Toth, 2005; Cicchetti & Valentino, 2006), the current study will examine differences between CM (neglect and/or physical abuse) and non-CM mothers' quality of parenting.

Research has demonstrated differences in parenting behavior between CM and non-CM parents while interacting with their children, especially in regards to more negative, hostile, and

aversive behaviors. In a study which observed parental disciplinary behavior directed toward children in physically abusive and non-physically abusive parents, Trickett and Kuczynski (1986) found that, overall, physically abusive parents used less reasoning and more punishment toward child transgression and reported greater use of severe physical punishment compared to non-physically abusive parents. Other studies have confirmed this finding and have observed similar behaviors in physically abusive parents (e.g., Cerezo & D'Ocon, 1995; Lahey et al., 1984; Lyons-Ruth et al., 1987; Trickett & Susman, 1988).

Burgess and Conger (1978) observed parent-child interactions in an everyday context in physically abusive, neglectful, and non-maltreating families. They found that both maltreating groups, physically abusive and neglectful, showed very low rates of interactions with their children, generally. Neglectful mothers showed the highest rates of negative behavior while interacting with their children (Burgess & Conger, 1978). On the other hand, some research has demonstrated that neglectful mothers were less sensitive and responsive and more detached while interacting with their children (Crittenden, 1981; Erickson & Egeland, 2002).

Similar to Burgess and Conger (1978), Bousha and Twentyman (1984) found maltreating parents (physically abusive and neglectful) to show low interaction rates. They also found that physically abusive mothers displayed more physical and verbal aggression toward their children compared to neglecting and non-maltreating mothers. In a study comparing physically abusive to non-physically abusive mothers, Schindler and Arkowitz (1986) found that abusive mothers showed less overall interaction with their children, asked fewer questions, and displayed less approval toward their children.

Oldershaw and colleagues (1986) investigated physically abusive and non-physically abusive parents' use of control strategies while interacting with their children. Abusive parents used more power-assertive and less positive oriented strategies, and their interactions with their children were less contingent suggesting physically abusive parents were more intrusive. Relatedly, other studies found physically abusive parents tended to use less positive behaviors (Dolz, Cerezo, &

Milner, 1997; Kavanaugh et al., 1988), conveyed commands in a less positive emotional tone (Oldershaw et al., 1986; Lahey et al., 1984), and engaged in low rates of positive verbal behavior (Burgess & Conger, 1978; Dolz et al., 1997) while interacting with their children compared to non-physically abusive parents.

Argona and Eyberg (1981) observed interactional differences in mothers' behaviors between neglecting, non-physically abused children with behavior problems, and a control group (non-physically abused and children without behavior problems) in both a child directed and parent directed activity. Overall, neglecting mothers used a greater percentage of commands and critical statements and less praise compared to control parents. Interestingly, mothers with children high in behavior problems showed similar interactional behaviors to neglecting mothers.

In sum, the empirical research demonstrates that CM parents show maladaptive behavior when interacting with their children. In general, maltreating parents are observed as using more commands, prohibitions, and negative control strategies, engaging in more physical discipline and aggressive behaviors toward their children, and being less sensitive and responsive, more detached, and less engaged. Further, maltreating parents' emotional tone while interacting with their children tends to be more negative and less positive compared to non-maltreating parents. Although research has shown that the behaviors of maltreating parents, compared to non-maltreating parents, are high in negative or harsh control and low in warm supportive behaviors, it is less clear as to whether there are differences between maltreating and non-maltreating parents in terms of when they use control in a warm or positive way. However, because they display less positivity while interacting with their children (e.g., Lahey et al., 1984; Oldershaw et al., 1986), it may be reasonable to assume that maltreating parents will generally use less positive control and more negative control and harsh behaviors compared to non-maltreating parents. Further, the current study tested whether CM parents engaged in less warm and supportive behaviors compared to non-CM parents with their preschool-aged children.

It should be noted that the majority of research investigating maltreating parents' behaviors has been observed in discipline contexts or in everyday interactions (i.e., unstructured free play, home observations). However, less is known about the quality of parenting they display when they are engaging in challenging tasks, such as a situation that may require more guidance from the parent in order for the child to accomplish the task. It is possible that this type of context may further differentiate maltreating and non-maltreating parents' use of negative versus positive control and the amount of warm autonomy support they engage in with their children. Therefore, the current study observed CM mothers' displays of negative/hostile control, positive/warm control, and warm autonomy supportive behaviors during a challenging parent-child joint task and investigated whether CM and non-CM mothers displayed differences in these behaviors.

Secondly, the majority of the current research exploring the behaviors maltreating parents use while interacting with their children primarily assessed maltreating parenting behavior by giving parents a global rating on their general behavior throughout the interaction and did not assess parenting at a more micro-analytic level. Hence, less is known about which types of behaviors parents rely upon during a moment-to-moment basis, and how variations in the quality of parenting they display might affect their children's overall functioning. The variations in the quality of parenting experienced by maltreated children in their daily interactions may greatly contribute to the failure of CM parents to provide an environmental context within the average expectable range, which is necessary for normal development (Cicchetti & Valentino, 2006). Given this, the current study used the Structural Analysis of Social Behavior (SASB; Benjamin, 1979, 2003; Benjamin & Cushing, 2000) to micro-analytically code maternal behaviors during a challenging parent-child joint task. The SASB coding system captures the interpersonal and intrapersonal verbal and nonverbal exchanges between parents and children. Specifically, the SASB was used in order to assess parent's use of negative/hostile control, positive/warm control, and warm autonomy support. The current study will join handful of studies (e.g., Reid, Taplin, & Lorber, 1981; Wahler, Williams, & Cerezo, 1990) that have taken a more micro-analytic approach to the assessment of CM parent's behaviors in

interactions with their children in order to better understand how variations in parenting experienced by these children affects their ER functioning, over and above their maltreatment status.

Maltreating parents influence on children's emotion regulation

As previously mentioned, parents play a crucial role in children's development of ER (Thompson, 1991; Winsler et al., 2000), and maltreated children are at-risk for ER difficulties (e.g., Maughan & Cicchetti, 2002; Trickett, 1998). Further, beyond the particular act of maltreatment children may be exposed to, the effects of the maltreatment on children's ER functioning may largely be explained by the variation in the quality of parenting processes children experience in their daily interactions with their parents (Reid et al., 1981). However, very few studies have investigated how the quality of parenting processes affect ER development in children exposed to maltreatment.

In a study conducted by Shipman and Zeman (2001), maltreating mothers, in comparison to non-maltreating mothers, demonstrated fewer effective strategies at helping their children cope with their emotions and less understanding of their children's emotional displays. Further, parental support of their children's emotional displays and helping children cope with their emotions mediated the relationship between maltreatment and children's ER. Specifically, maltreatment was related to poor parenting behaviors and thus negatively impacted children's ER. Shipman and colleagues (2005) investigated how CM parents support and conflict to children's emotional displays impacted their children's ER. They found that neglected children were less likely to express emotion to their mothers, and that children expected less support and more conflict to their displays of anger or sadness. In a study investigating CM mothers' emotion socialization behaviors and how this impacted their children's ER development, CM mothers indicated less validation and emotion coaching and more invalidation in response to their children's emotional displays (Shipman, Schneider, Fitzgerald, Sims, Swisher, & Edwards, 2007). Further, maternal socialization practices, such as validation of children's emotions and emotion coaching, mediated the relationship between maltreatment and children's ER skills. In particular, maltreatment status was associated with poor

ER in children only when mothers engaged in invalidation of children's emotions and poor emotion coaching.

These few studies that have examined the influence of maltreating parents' behaviors on their children's ER have found that low support of children's anger displays, high conflict, and parental invalidation of children's emotions were all related to poor ER functioning in children who were maltreated. However, interestingly, most of these studies have relied on parent-report of parental behaviors and have not micro-analytically observed the behaviors maltreating parents use while interacting with their children during challenging situations. In particular, while it is known that parents who maltreat their children use behaviors that are more negative and hostile and less supportive (e.g., Bousha & Twentyman, 1984; Oldershaw et al., 1986), it is not known how maltreating parents' use of negative/hostile control, positive/warm control, and warm autonomy support influence their children's ability to behaviorally and physiologically self-regulate their emotions. Further, as indicated earlier when describing the short-comings of ER research with maltreated children, these studies have relied on parents' or others' reports of children's ER abilities and have not used observations of children's behavioral displays of ER or physiological measures during emotionally eliciting situations. Finally, these studies were primarily conducted with maltreated children who were in middle childhood and not with preschool age children, which is a critical time period when children develop emotion self-regulation skills (e.g., Denham, Bassett & Wyatt, 2007; Eisenberg & Morris, 2002; Halberstadt, Denham, & Dunsmore, 2001; Kopp, 1982). Therefore, the current study will assess relations between ER functioning and parenting processes in preschool age children exposed to maltreatment.

Although parents who maltreat their children appear to influence their children's ER functioning, the manifestation of problematic ER development in these children may be further influenced by the interplay between their own characteristics with the parenting they experience. However, nothing is known about how children's temperamental characteristics interact with maltreatment status and the parenting they experience and how this relationship impacts children's

ER abilities. Given this, the current study investigated whether temperament moderated the relationship between both children's CM status and the quality of parenting they were exposed to (i.e., negative control, positive control, and warm autonomy support) and how this impacted their ER functioning during a frustrating situation.

Temperament

Developmental psychopathology asserts that children's development is not solely a result of their environmental context, but rather, biologically based individual differences within a particular context can largely influence whether children experience normative or abnormal development (Cicchetti & Toth, 2005; Cicchetti & Valentino, 2006). One such characteristic of children that may impact how they respond to certain environments is temperament. Temperament, an individual differences characteristic exhibited by children, has received a great deal of attention because of the role it plays in children's behavior and subsequent development. Temperament reflects biologically based differences in an individual's reactivity and regulation (Rothbart, 1986; Rothbart & Bates, 2006; Rothbart & Derryberry, 1981). Reactivity refers to the excitability, responsivity, and arousability of behavioral and physiological systems, whereas regulation is processes that modulate reactivity (Rothbart, 1986; Rothbart & Bates, 2006; Rothbart & Derryberry, 1981).

In particular, recent research has focused on how children's approach/inhibition, or variations in surgency, may impact children's behavioral adjustment. Individual differences in approach-inhibition to novelty emerge during the second half the of the first year of life (Goldsmith, Buss, Plomin, Rothbart, Thomas, Chess, 1987; Kagan, Reznick, & Snidman, 1990; Rothbart, 1988; Rothbart & Derryberry, 1981), and children continue to show variations in the ways in which they modulate their behavior when presented with unfamiliarity or novelty (Garcia-Coll, Kagan & Reznick, 1984; Kagan, 1997; Rothbart & Bates, 1998, 2006). Children who are surgent or uninhibited are characterized as displaying high levels of sociability and low levels of fear (Fox, Henderson, Rubin, Calkins, & Schmidt, 2001), tend to seek out novelty and unfamiliar people and

situations (Garcia-Coll et al., 1984; Kagan, 1997; Kagan et al., 1984), and are high in positivity, impulsivity, and activity level and low in shyness (Rothbart & Bates, 2006). In contrast, low surgent or inhibited children are biologically predisposed to show wariness, fear, and distress when exposed to unfamiliar or novel situations, people, places, or objects (Garcia-Coll et al., 1984; Kagan, 1997; Kagan et al., 1984) and are characterized as high on shyness and low on positivity, impulsivity, and activity level (Rothbart & Bates, 2006). Low surgent or inhibited children may avoid or withdraw from novelty as a way to regulate the level of their distress when presented in novel situations or interacting with new people. Given the importance of considering the role children's temperament plays in their subsequent development, the current study investigated the interplay between children's level of surgency and (a) maltreatment status and (b) the quality of parenting they experience and how this impacts children's emotion regulation.

Temperament and behavioral adjustment

Research has demonstrated early surgent-like temperamental characteristics are associated with later adjustment difficulties in children. For example, children who displayed characteristics associated with high surgency, such as high activity level, approach behavior, and impulsivity, have a greater likelihood of displaying externalizing and aggressive problems. Vitaro, Brendgen, and Tremblay (2002) found that children who were rated by their parents as having a lower attention span and greater activity level, characteristics of surgent children, were more likely to display reactive aggression. Further, they found that compared to nonaggressive children, children who were both more reactively and proactively aggressive were also rated as more temperamentally approaching and adaptable to novelty (Vitaro et al., 2002). Similar to Vitaro and colleagues (2002), Rothbart, Ahadi, and Hershey (1994) found that infants who displayed greater activity level predicted greater aggression in children. Uninhibited, or fearless, children were more likely to be rated higher on externalizing problems (Eisenberg, Cumberland, Spinrad, Fabes, Shepard, Reiser, et al., 2001) and conduct disordered behavior (Lengua, Wolchik, Sandler, & West, 2000; Shaw, Gilliom, Ingoldsby, & Nagin, 2003). Interestingly, Stifter, Putnam, and

Jahromi (2008) found that exuberant children were more likely to be rated higher on both externalizing and internalizing behavior problems.

Research has also demonstrated that characteristics of low surgent children, including distress to novelty, fearfulness, or low approach of novelty, may put them at risk for the development of internalizing behaviors and anxiety problems. Keiley, Lofthouse, Bates, Dodge, & Pettit (2003) found that children who had an unadaptable temperament, as characterized by showing distress to novelty, were more likely to be rated by mothers and teachers as high on internalizing problems. Also, children high on inhibited, or fearful, temperament and low on approach were more likely to show concurrent and later internalizing problems (Lemery, Essex, & Smider, 2002; Patterson & Sanson, 1999; Putnam & Stifter, 2005). Prior, Smart, Sanson, and Oberklaid (2000) found that children who were stably shy across childhood were at greater risk for the development of anxiety disorders.

This research suggests that children who display high and low surgent temperamental characteristics may be at risk for behavioral adjustment problems. In particular, children with high surgent characteristics are at greater risk of developing externalizing, aggressive, and conduct problems. Low surgent children may have a greater propensity toward developing internalizing and anxiety problems. Despite the direct associations found between children's surgency and behavioral adjustment, the manifestation of problematic behavior is largely determined by the interplay between children's characteristics and their environment (Cicchetti & Toth, 2005; Cicchetti & Valentino, 2006). Therefore, it is possible that environmental factors, such as the parenting context, may exacerbate maladaptive adjustment or facilitate positive adjustment in children depending on their level of temperamental surgency. Despite this, little is known about these relationships in children exposed to maltreatment and how it affects their ER, and this is important to understand because the capacity for ER underlies many of these problems associated with surgency.

Temperament and emotion regulation

Although external factors, such as parents, play a crucial role in children's emotion regulation development, children's own surgent temperament can contribute to their ER. In particular, research has shown that low surgency in children, characterized by aspects such as shyness or inhibition, is associated with children's ER strategies. Infants and toddlers who were shy tended to seek more contact with their mother and to display more self-comforting, distracting, negative vocalizations, and gaze aversion when in challenging situations compared to less shy toddlers (Mangelsdorf, Shapiro, & Marzolf, 1995; Parritz, 1996). In a study with preschool children, children rated as higher in shyness used ER strategies such as seeking their caregiver when in a stranger approach situation (Zimmerman & Stansbury, 2003).

Research has also demonstrated a link between characteristics associated with high surgency, such as boldness or high activity level, and children's ER behaviors. Mangelsdorf and colleagues (1995) found that bold infants tended to engage in more self-distracting behaviors compared to shy infants. Bold preschool children tended to use more distraction in a situation where their parent was busy (Zimmerman & Stansbury, 2003). Carson and Bittner (1994) found that children rated higher in activity level, a characteristic of high surgent children was associated with more effective coping strategies in a school environment.

In sum, research has demonstrated children may be more likely to engage in certain ER strategies depending on their surgent-like characteristics. Children low in surgency, as characterized by shyness or inhibition, tend to seek out their caregiver and use more self-comforting, gaze aversion, and passive forms of ER. High surgent children, as demonstrated by boldness or activity level, tend to use more distraction and effective coping strategies. However, nothing is known about surgency in children exposed to maltreatment and how it is related to their ER functioning during a frustrating situation. In the current study, both parent and observer ratings of children's surgency were obtained and the relationship between these two measures and how they may vary between CM and non-CM families was explored.

Because there is evidence that environmental factors, in particular parenting behaviors, and individual differences in children's temperamental surgency appear to both contribute to children's ER functioning, the essential next step is to explore the interplay between these two factors to further understand the impact it has on ER development in children exposed to maltreatment. Additionally, there is evidence that the relationship between children's temperamental surgency and self-regulation abilities are influenced by environmental factors in normative children (e.g., Kochanska, 1995, 1997; Kochanska et al., 2007), yet nothing is known about these relationships in children exposed to maltreatment and how it impacts their ER functioning.

Temperament and maltreatment

Evidence supports the notion that children's temperamental differences may require different parental approaches to obtain the most optimal developmental outcomes in children (Kagan, Reznick, & Gibbons, 1989). In order to parent effectively, parents need to have an adequate repertoire of parenting behaviors and strategies in order to be flexible and adaptive when responding to their child (Azar, 2002). This includes being able to recognize the child's individual differences and responding with the appropriate behaviors best suited for that child. Indeed, research has demonstrated that infants or children with a difficult temperament, children who show intense reactions to stimuli, increased negative mood, or low adaptability to change (Thomas & Chess, 1977), experienced more hostile and negative behaviors from their parents creating a coercive parent-child interaction pattern (Patterson, 1980), and this increases the likelihood that parents will maltreat their temperamentally difficult children (Bugental, Blue, & Cruzcosa, 1989; Bagley & Mallick, 2000). Additionally, not all children who experience maltreatment develop poor outcomes (Cicchetti & Valentino, 2006), and it is possible that characteristics of the child may make the child more or less susceptible to the effects of maltreatment. Despite this, little research to date has been conducted exploring the role that children's temperamental surgency plays in ER in children exposed to maltreatment.

However, some research has explored how personality characteristics in maltreated children impact their overall functioning. Specifically, the role of ego control and additional personality factors has been investigated as a potential risk or protective factor in maltreated children's functioning. Ego control involves an individual's ability to modulate his impulses in a developmentally appropriate way (Block & Block, 1980). Children who display ego undercontrol show poor impulse control and low frustration tolerance, whereas ego overcontrol involves high control of impulses and affect (Block & Block, 1980). Although not exactly the same constructs, impulsivity is one of the key characteristics of both surgency and ego control. Indeed, research has demonstrated that maltreated children who are high or moderate on ego overcontrol, in combination with other personality characteristics such as positive self-esteem and high ego resiliency, were more likely to experience adaptive functioning including high social competence and low behavior problems (Flores, Cicchetti, & Rogosch, 2005; Cicchetti & Rogosch, 1997), whereas high ego undercontrol, in combination with low ego resiliency, was related to maladaptive functioning (Cicchetti & Rogosch, 2007). Therefore, this research suggests that some personality characteristics of children associated with their ability to control their impulses can contribute to adaptive or maladaptive functioning in maltreated children.

Despite this, nothing is known about how the relationship between maltreatment status and children's ER functioning varies depending of children's level of temperamental surgency. It is possible that high or low surgency in children may attenuate or intensify the effects of maltreatment status on children's ER. Therefore, goal two of the current study was to investigate this potential relationship.

Temperament and parenting

Despite a child's temperamental predisposition to exhibit a certain behavioral profile, temperament can be moderated by environmental factors, influencing children's subsequent development (Putnam, Sanson, & Rothbart, 2002; Rothbart & Bates, 1998, 2006). According to a developmental psychopathology perspective, abnormal and normal development is largely

determined by the interaction between children's biologically based characteristics and their environmental context (Cicchetti & Toth, 2005; Cicchetti & Valentino, 2006). Hence, understanding how parenting impacts children of differing temperaments may be more important in children who are within a maltreating context in order to further understand their development in various domains, including their capacity to regulate emotions.

Previous research has demonstrated that the development of children's self-regulatory behaviors in normative populations is dependent upon both children's surgent-like temperamental characteristics and the parenting behaviors they are exposed to. Generally, with children who have characteristics reflective of high surgency, research has demonstrated that warm and positive behaviors and positive control are more effective at promoting self-regulation abilities in these children. Kochanska and colleagues (1995; 1997; Kochanska, Askan, & Joy, 2007) have investigated how parental behavior interacts with children's level of fear, a characteristic of surgency, in order to predict their conscience development. When mothers of fearless, uninhibited, or high surgent children displayed more warmth or a positive mother-child orientation while interacting with their children, then these children showed greater internalization and conscience development. Dennis (2006) found that when mothers encouraged children to focus on positive aspects during a wait task, children high in approach, a characteristic of high surgent children, displayed greater task persistence. Other research has also shown that parental positive control can impact exuberant or high surgent children's effortful control development. Mothers of exuberant toddlers who engaged in more controlling strategies that were delivered in a positive way were predictive of greater effortful control in preschoolers (Cipriano & Stifter, 2010).

Other research has shown that certain parental behaviors, such as warm gentle guidance, intrusiveness, or oversolicitousness, is associated with self-regulatory development in children low in surgency. Fearful, inhibited, or low surgent children were more likely to internalize maternal requests and displayed greater conscience development when their mothers used more gentle discipline while interacting with them (Kochanska, 1995, 1997; Kochanska et al., 2007). Children

low in approach, typically seen in low surgent children, displayed greater compliance when mothers displayed more warmth during a free play situation (Dennis, 2006). When mothers engaged in more intrusive or oversolicitous behavior while interacting with their inhibited, or low surgent, toddlers then children were more likely to display socially reticent and peer-inhibition behavior during preschool (Rubin, Burgess, & Hastings; 2002; Rubin, Hastings, Stewart, Henderson, & Chen, 1997).

Generally, this research suggests that surgent or uninhibited children were more compliant, better able to internalize rules and standards, and demonstrated better self-regulatory capacities when their mothers displayed warm and responsive behaviors and positive control. Children low in surgency, reflected in shyness or inhibition, showed more compliance and internalization of rules and standards when their mothers used gentle discipline and warmth. Taken together, these studies demonstrate that within normative populations, parenting behaviors can have a differential influence on children's development depending on children's surgent-like characteristics.

Despite the evidence that different parenting behaviors influence children's self-regulation related functioning depending on children's surgent-like characteristics in normative populations, nothing is known about these relationships in more at-risk populations, especially in children from a maltreating environment. Further, very little research has specifically explored how children's temperamental surgency interacts with quality of parenting behaviors and how this specifically impacts children's ER functioning. Because both children's surgency and parenting behaviors are so influential to children's ER functioning, it is necessary to investigate the interplay between the two in order to more fully understand children's ER development. Therefore, goal three of the current study was to explore whether children's temperamental surgency interacted with mothers use of negative/hostile control, positive/warm control, and warm autonomy support and the impact this had on children's ER. Because the effects of maltreatment on children's ER could be better accounted for by the variations in the quality of parenting children exposed to maltreatment experience, these relationships were tested in order to examine whether the relationships remain after accounting for maltreatment status.

Proposed Research Questions/Hypotheses

Following a developmental psychopathology framework, the purpose of the current study was to first investigate whether maltreating mother-child dyads and non-maltreating mother-child dyads differ in children's emotion regulation and quality of parenting. The second goal was to investigate whether temperamental surgency moderated the relationship between maltreatment group status and children's ER. The final goal was to investigate the interplay between children's temperamental surgency and quality of parenting and how this influences children's ER after accounting for maltreatment group status. To investigate the final question/goal, maternal negative/hostile control, positive/warm control, and warm autonomy support behaviors were coded micro-analytically in a challenging parent-child joint task. Children's expressed anger, ER strategies, and physiologic reactivity were observed during a frustrating situation. Finally, children's surgency was assessed from observer ratings and parental report. The following were the research questions addressed in the current study.

Goal 1 of the present study was to examine whether there were group differences between CM mother-child dyads and non-CM dyads on children's ER as measured by expressed anger, ER strategies, and vagal suppression and in their quality of parenting.

1a. Are there differences between children of CM mothers and children of non-CM mothers in their ER?

Research has consistently demonstrated that maltreated children, compared to non-maltreated children, show more anger, frustration, and hostility (Cicchetti & Rogosch, 2005; Trickett, 1998). Therefore, it was hypothesized that CM-group children would show more expressed anger during a frustrating situation compared to non-CM children.

Additionally, maltreated children show more difficulties regulating their emotions compared to non-maltreated children such that maltreated children have been rated as showing less adaptive ER, had fewer effective coping strategies when dealing with anger, and showed more

undercontrolled regulation (Maughan & Cicchetti, 2002; Shields & Cicchetti, 1998; Shipman et al., 2005; Shipman & Zeman, 2001). However, little is known about the behavioral strategies that maltreated children use to manage their anger in a frustrating situation. As the goal of transparent box task (Goldsmith et al., 1999) is to try and open the container to obtain a prize, it is believed that children will display both adaptive and maladaptive strategies. Based on previous research demonstrating that certain behaviors are better at managing frustration (e.g., Calkins et al., 1998; Gilliom et al., 2002), adaptive emotion regulation behaviors included strategies such as goal directed behavior/task persistence, positive self-speech, and distraction. On the other hand, behaviors such as giving up, negative self-speech, and physical venting behaviors were considered to be maladaptive strategies because research has shown these behaviors may be less effective at managing frustration or may be developmentally inappropriate for preschool children (e.g., Buss & Goldsmith; Gilliom et al., 2002). Given this, it was hypothesized that CM children would show more maladaptive ER strategies and less adaptive ER strategies compared to non-CM children. Specifically, in a frustrating situation, CM children would display less goal directed behavior, distraction, and positive/neutral self-speech, and more giving up, negative self-speech, and physical venting behaviors compared to non-CM children.

As indicated earlier, children not only behaviorally regulate their emotions, but they can also show changes in their physiology during emotionally eliciting situations and changes in physiology has been related to the behavioral strategies children use (e.g., Calkins, 1996; Calkins et al., 1998; Calkins & Keane, 2004) and their overall behavioral adjustment (e.g. Calkins & Keane, 2004; Porges et al., 1996). However, to date, no published studies have investigated CM children's physiological regulation as measured by vagal suppression during a frustrating situation and its relation to adaptive or maladaptive ER development in these children. As indicated earlier, within children at-risk for behavioral problems, there is evidence demonstrating that they show less vagal suppression (Calkins & Dedmon, 2000; Gentzler et al., 2009). Additionally, children clinically diagnosed with aggressive or anxiety problems have shown a pattern of high vagal suppression (Beauchaine et al., 2007).

Therefore, it is possible that either low or high vagal suppression may be indicative of poor ER. However, although children exposed to maltreatment are at greater risk for serious pathology, the sample in the current study was not composed of children with clinically diagnosed disorders. Therefore, as the majority of the research in normative and some research with children at-risk for behavior problems have found less vagal suppression, or increases in RSA due to greater parasympathetic input (Porges, 1995, 1997, 1998, 2001, 2007; Porges et al., 1996), to be a marker of poor ER, the current study hypothesized that CM children would show less vagal suppression compared to non-CM children during a frustrating situation.

1b. Do CM mothers and non-CM mothers differ on their use of negative/hostile control, positive/warm control, and warm autonomy support while interacting with their children?

Research has consistently shown that while interacting with their children, CM parents engage in more commands, prohibitions, and negative control strategies (Bousha & Twentyman, 1984; Cerezo & D'Ocon, 1995; Lahey et al., 1984; Lyons-Ruth et al., 1987; Trickett & Susman, 1988), use more physical discipline and aggressive behaviors toward their children (Bousha & Twentyman, 1984), and are less sensitive and responsive, more detached, and less engaged (Crittenden, 1981; Erikson & Egeland, 2002; Bousha & Twentyman, 1984), compared to non-CM parents. Additionally, CM parents' emotional tone while interacting with their children is more negative and less positive compared to non-CM parents (Lahey et al., 1984; Oldershaw et al., 1986). Because of this evidence, it was hypothesized that CM mothers, compared to non-CM mothers, would display more negative/hostile control and less positive/warm control and warm autonomy support while interacting with their children in a challenging parent-child joint task.

Goal 2 of this study was to investigate whether children's temperamental surgency moderated the relationship between CM status (CM vs. non-CM) and children's ER as measured by expressed anger, ER strategies, and vagal suppression.

2. Does children's temperamental surgency moderate the relationship between CM status and children's ER?

Because not all children who experience maltreatment develop poor functioning (Cicchetti & Valentino, 2006), it is possible that temperamental characteristics of the child may make them more or less vulnerable to the negative effects of maltreatment. Although no research to date has specifically explored how children's level of surgency attenuates or intensifies the effects of maltreatment on children's ER, research investigating personality characteristics in maltreated children have shown that it can serve as a protective or risk factor on their overall adjustment. Specifically, ego control, which includes the ability to control impulses, has been identified as one such personality characteristic with high or moderate ego control as being protective against the negative effects of maltreatment (Flores et al., 2005; Cicchetti & Rogosch, 1997) and ego undercontrol as a risk factor for poor adaptation in maltreated children (Cicchetti & Rogosch, 2007). Although ego control and surgency are different constructs, they are both characterized by impulsivity.

However, it is unclear as to whether high or low surgency in children will serve as potential risk or protective factor when exploring the relationship between maltreatment status and children's ER as no previous research has explored this relationship. Specific features of children high in surgency, such as their impulsivity, could potentially increase their chances of experiencing poor ER outcomes when in a maltreating environment, but other characteristics, including their high positivity, might protect them from poor ER functioning. Children low in surgency have high control of their impulses which could protect them from the negative effects of maltreatment, yet, other characteristics such as their high fear proneness might magnify the effects of maltreatment on their ER functioning. Given the absence of published research to date, the analyses investigating how surgency moderates the relationship between maltreatment status and children's ER were exploratory.

Goal 3 of the current study was to determine whether children's temperamental surgency moderated the relationship between quality of parenting and children's ER in the entire sample.

3a. Does children's surgency moderate the relationship between maternal negative/hostile control and children's ER functioning?

Research has consistently demonstrated that parental behavior that is negative, controlling, or hostile is detrimental to children's emotional and ER development and vagal suppression including expression of more negative emotion (e.g., Gottman et al., 1996; Snyder et al., 2003), use of maladaptive ER strategies (e.g., Calkins et al., 1998; Hastings et al., 2008), and lower vagal suppression (e.g., Calkins et al., 1998; Hastings et al., 2008). Therefore, because this type of parenting is so detrimental to children's socio-emotional functioning, it was hypothesized that greater expression of anger, greater use of maladaptive and less adaptive ER strategies, and less vagal suppression in children during a frustrating situation will be expected among children whose mothers engage in high levels of negative control, regardless of the children's level of surgency. Therefore, children's level of surgency would not moderate the relationship between parental negative control and children's ER functioning and rather a direct relationship was posited.

3b. Does children's surgency moderate the relationship between maternal positive/warm control and children's ER?

Work by Kochanska has revealed that children low in fear, a characteristic of high surgent children, show greater compliance and internalization when their mothers engage in behaviors that are warm and positive while interacting with their children (e.g., Kochanska, 1995, 1997; Kochanska et al., 2007). This suggests that a warm and positive relationship contributes to children's self-regulation development among those who are low in fear or highly surgent. Further, exuberant, or high surgent children, showed greater effortful control when their mothers used more commands in a positive way (Cipriano & Stifter, 2010) suggesting that high surgent children need positive control in order to develop successful self-regulatory related outcomes. Therefore, it was hypothesized in the present study that mothers who displayed more positive or affiliative control in a challenging joint task with their highly surgent children would have children who show less expressed anger, more adaptive and less maladaptive ER strategies, and greater vagal suppression in a frustrating situation.

3c. Does children's surgency moderate the relationship between maternal warm autonomy support and children's ER?

Research has demonstrated that children display more adaptive emotion self-regulation behaviors when parents used warm and supportive behaviors (e.g., Calkins & Johnson, 1998; Gentzler et al., 2005), and children who are low on surgency, or inhibited, tended to engage in more passive forms of emotion regulation and request assistance from caregivers to help regulate their emotions (e.g., Mangelsdorf et al., 1995; Zimmerman & Stansbury, 2003). Because of this, low surgent children may require more warm autonomy support in order to foster the development of their self-regulation of emotion. Research has also found that gentle guidance, a parenting behavior characterized as warm and supportive, is associated with better compliance and internalization in more inhibited, fearful or low surgent children (Kochanska, 1995, 1997; Kochanska, et al., 2007). Although gentle guidance is still a very mild form of control, warm autonomy support used by parents while interacting with their inhibited children may have a similar positive effect on inhibited children's functioning because of the warmth that accompanies this behavior. Given this evidence, it was hypothesized that temperamental surgency will interact with maternal warm autonomy support. Specifically, mothers who displayed warm autonomy support while interacting with their low surgent children would have children who showed less expressed anger, more adaptive and less maladaptive ER strategies, and greater vagal suppression in a frustrating situation.

3d1. Over and above maltreatment group status, do specific parenting processes (i.e., negative/hostile control, positive/warm control, and warm autonomy support) predict ER in children?

3d2. After the effects of maltreatment group status (i.e., CM vs. non-CM) are considered, does surgency moderate the relationship between parenting (i.e., negative/hostile control, positive/warm control, and warm autonomy support) and ER functioning in children?

Although the maltreating context is generally detrimental to children's overall development, not all maltreated children experience poor outcomes (Cicchetti & Valentino, 2006). Variability in specific parenting processes that CM children experience may better account for differences in maladaptive ER functioning, over and above the effects of specific acts of physical abuse or neglect (i.e., failure to provide, lack of supervision) that occur (Reid et al., 1981). In other words, it may be that the quality of parenting processes experienced, as opposed to maltreatment status per se, better accounts for children's ER functioning. Thus, it was hypothesized that the relationships proposed in 3a, 3b, and 3c will remain even after controlling for children's maltreatment status (CM vs. non-CM).

Chapter 3

Method

Participants

This present study used data from the larger NIMH funded FaMILY Study. Eighty-five mothers and their preschool children were recruited. Forty-one (48.2%) mothers with children ages 3-5 years referred to preventive and protective services with the Children and Youth Services (CYS) Bureau in Centre, Blair, Mifflin, and Clearfield counties in Pennsylvania were enrolled. Inclusion for the child maltreating (CM) group required that CYS records indicated the mother was the perpetrator (i.e., physical abuse or neglect), the 3-5 year old child lived with the mother, the mother remained the primary caregiver, and the mother was 18 years or older and spoke fluent English. Of these children from families identified as maltreating, 48.8% were neglected only, 19.5% were physically abused only, and 31.7% experienced neglect and physical abuse. Additionally, 44 (51.8%) mothers who were identified as not perpetrating child maltreatment (non-CM) and their 3-5 year child were recruited from Penn State's FIRSt Families data base and enrolled as a comparison group.

The average age of children was 3.75 years, and 41 (45.6%) were male and 49 (54.4%) were female. In terms of the child's ethnicity, 66 (77.6%) were identified as White, 2 as Black (2.2%), and 15 as multi-racial (17.6%), with 2 unreported. The mother's average age was 30.0 years, and the majority of mothers were White (90.6%), unmarried (57.6%), and had a high school degree or less (64.7%). Twenty-one (24.7%) of the mothers reported an average yearly income of \$10,000 or less, 35 (41.2%) \$10,001-\$30,000, 9 (10.6%) \$30,001-\$50,000, and 19 (22.3%) more than \$50,001 (2 did not report).

Inclusion/exclusion criteria

CYS-involved (referred) mother-child dyads were included in the proposed study if they had a record of CYS involvement and at least one codable instance of physical abuse or neglect extracted from their CYS case records using the Maltreatment Classification System (MCS; Barnett, Manly, & Cicchetti, 1993). Non-CYS-involved (control) mother-child dyads were confirmed to have no CYS involvement and maternal CAPI-Abuse scale scores below the clinical cut-off of 215 (Milner, 1986). Therefore, although CM families were all CYS referred, families with case records containing no MCS codable incidences of physical abuse or neglect were excluded from analyses, and non-CM families were excluded if the mother posted a CAPI abuse score above the clinical cut-off of 215. This was done to insure that both CM and non-CM groups were unique from one another in terms of maltreatment status but matched on other key demographics. Given these criteria, eight CM families did not have a MCS codable instance of physical abuse and/or neglect, and, two non-CM families were excluded from the present study because mothers posted scores above the clinical cut-off of 215 on the CAPI (original sample was 95 but is now 85).

Procedures

The FaMILY study is an on-going project exploring how child maltreatment and the stresses families experience influence mother-child relationships, maternal self-regulation, and children's self and emotion regulation development. Families participated in three visits: two home visits and one laboratory visit. During the first visit, researchers went to the homes of the families and mothers completed several psychosocial questionnaires and information about family demographics. Additionally, both the mother and her preschool child were administered cognitive screenings. Approximately one week later, the second visit was completed in the home, and again, the mother completed several psychosocial questionnaires and genetic samples were obtained from both the mother and her child.

Families came to the laboratory for the third visit approximately one week after completing the second visit. Mothers and their preschool child engaged in several activities, including electrode

placement, the preschool Strange Situation, mother-child joint tasks, child emotion and self-regulation tasks, an assessment of mother's cognitive functioning, and parent and observer ratings of the child's temperament. Mothers were briefed about the procedures before the visit began. For the current study, procedures during the laboratory visit were used and are described in greater detail. In particular, child physiology was measured during a baseline procedure. Parenting behaviors were assessed during a challenging parent-child joint task (Duplo Blocks). Additionally, children's expression of emotion and emotion regulation strategies were observed and ECG was recorded during a frustrating situation (Transparent Box). Finally, mother ratings of child temperament were obtained while the child completed individual tasks, and observer ratings of child temperament were conducted at the completion of the laboratory visit.

Cardiac physiology

Three electrodes were placed in a triangular pattern on the distal end of the right clavicle, lower left rib cage chest, and the lower abdomen on both the mother and child. After the electrodes were placed on both the mother and child, they were instructed to watch a neutral video, remain still, and try not to talk to one another. While the child watched a neutral children's video for 5 minutes, the electrocardiogram was recorded from which baseline RSA or vagal tone was derived. Children's electrodes were connected to Mindware[®] (Westerville, OH) ambulatory Electrocardiograph (ECG) equipment, and the output was transmitted by wireless signals to a computer equipped with data acquisition hardware and software. Children wore the electrodes and autonomic reactivity was recorded for the entire laboratory visit for each of the mother-child joint tasks and child individual tasks.

Duplo blocks

Mothers and their children participated in a problem solving, challenging joint task called the Duplo Blocks (Hoffman, Crnic, & Baker, 2006), which was used to assess parenting behavior. The mother and her child were seated at a child-sized table. The interviewer showed the child a model figure made of red, green, blue, and yellow blocks and placed it on the table. The interviewer

also placed blocks in the same colors as the model in front of the child. The interviewer instructed the child that s/she should build one that looks just like the model figure using the blocks in front of him/her, and if the child completed the task, that s/he would receive a sticker. The interviewer then instructed the mother that she could help her child as she would at home but to let her child handle the blocks. If the child built a figure that was exactly the same as the model before 3 minutes, then the task was ended. If the child did not complete it before 3 minutes, then the task continued and ended at 5 minutes. When time was completed, the interviewer re-entered the room. If the child failed to build a figure like the model, then the interviewer told the mother that she could help her child complete the figure and was permitted to physically manipulate the blocks. Finally, the interviewer allowed the child to choose a sticker for completing the task.

Transparent box

Children's emotional expression, emotion regulation behaviors, and RSA were measured during a task designed to elicit frustration in preschool-aged children called the Transparent Box (Goldsmith et al., 1999). The interviewer presented the child with two different types of toys, two trains and two dolls, and asked that child which ones s/he likes best. After the child chose a toy, the interviewer told the child that she would put the trains/dolls in a clear box and then put a lock on it. The interviewer gave the child a set of keys and told the child s/he could use the keys to unlock the box and then play with the toys. The interviewer demonstrated to the child how to open the lock on the box with the correct key. The interviewer then palmed the correct key, gave a set of keys that did not work back to the child, and then told the child she would be back in a few minutes. After 4 minutes, the experimenter returned to the room, told the child she gave him/her the wrong key, and then gave the child the correct key in order to open the box and play with the toys.

Child temperament

During the laboratory visit, mothers completed a questionnaire that assessed their child's temperament called the Child Behavior Questionnaire short-form (CBQ; Rothbart et al., 2001). Additionally, after the laboratory visit was completed, the two interviewers who conducted the three

visits with the family met, came to a consensus, and globally rated the child's temperament based on their observations of the child's behavior during the laboratory visit using an adapted version of the Infant Behavior Record (IBR; Bayley, 1969) called the Observation of Child Temperament Scale (OCTS; Stifter, Willoughby, & Towe-Goodman, 2008).

Measures

Parenting behaviors

The mother's use of negative/hostile control, warm/positive control, and warm autonomy support were coded during the Duplo Blocks task. The three parenting behaviors were coded using the Structural Analysis of Social Behavior (SASB; Benjamin, 1979, 2003; Benjamin & Cushing, 2000). The SASB is a model of interpersonal and intrapsychic representations captured in a circumplex. The SASB observational coding system consists of 16 simple codes that are distributed across two circumplex surfaces, transitive (involves focusing behaviors on others) and the intransitive (involves focusing behaviors on the self). Coding of a unit of behavior includes three steps which were to determine the focus, the degree of warmth/affiliation, and the degree of interdependence (Humphrey & Benjamin, 1986). Refer to Figure 1 for the SASB simplified cluster model. Affiliation describes communications on a continuum ranging from loving to hostile. Interdependence describes communications on a continuum ranging from differentiated (e.g., autonomy-granting) to enmeshed (e.g., controlling). The SASB has been used to code brief segments of interaction between parents and children (e.g., Donenberg, 1995; Florsheim, Tolan & Gorman-Smith, 1996; Katz, 1995).

Verbatim transcripts of video recorded interactions during the Duplo Blocks task were prepared and then unitized to indicate each coding unit. These coding units were defined as a speaking/action turn. From the transcripts, each mother speaking turn was assigned a SASB cluster and surface code. For the present study, only behaviors coded on the transitive surface were used. Transitive behaviors in Clusters 2, 3, and 4, are believed to represent "positive" behaviors which are

2: **Affirm/Understand**, 3: **Love/Approach**, and 4: **Nurture/Protect**. Conversely, Clusters 6, 7, and 8 represent “negative” behaviors which are 6: **Blame/Criticize**, 7: **Attack/Reject**, and 8: **Ignore/Neglect**. Of these possible positive and negative behaviors on the transitive surface, only 3 were used in the current study. The first behavior lies on Cluster 6, is characterized as hostile control, and was referred to as blaming/criticizing. This behavior was coded when the mother engaged in control of the child’s behavior but was done in a negative, hostile, or critical way. An example of this behavior was “*(in a harsh tone of voice)* Stop being silly. You know how to do this. You’re just acting like a baby.” This behavior was referred to as negative/hostile control in the present study. The second behavior is on Cluster 4 of the circumplex (benign/affiliative control) and is called nurturing/protect. This also reflected the mother’s use of control but it also captured the warmth and praise that the mother expressed toward her child. An example of this behavior was “Why don’t you try putting the blue piece on top of the red one just like the pieces in the model.” This was referred to as positive/warm control in the current study. The third behavior is on Cluster 2 is equal parts affiliative and autonomy-granting and is called affirming/understanding. This behavior captured the degree to which the mother granted autonomy and support for her child’s behavior in warm, affiliative ways. An example of this behavior was “How do you want to do this puzzle?” This behavior was referred to as warm autonomy support in the present study.

Coders were trained using practice tapes to achieve sufficient reliability (weighted kappa > .70) prior to scoring the video recordings. SASB coding began during the Duplo Block task with the first codable event (i.e., first utterance by mother or child) in the sequence of mother-child interactions and ended with the last codable behavior that occurred within the duration of the task. Mother transactions were assigned a SASB cluster and surface code. Inter-rater reliability was assessed on approximately 14% of sample, with weighted Cohen kappas ranging from .67-.84 ($M = .75$). Proportion scores were created for each of the three parenting behaviors by dividing the number of times the parent uses each the behavior by the total number of parent speaking turns in the Duplo Block task.

Child temperament

Parent-report of child temperament

The Child Behavior Questionnaire Short Form Version 1 (CBQ; Rothbart et al., 2001) is a child temperament questionnaire that consists of items asking parents to respond to statements describing their child's reactions to a number of situations. Mothers rated their child on a 7-point scale for each statement (*1=extremely unlike your child to 7=extremely true of your child*). For the purposes of the present study, the Surgency superfactor was used and includes the following subscales: activity level, impulsivity, shyness, and high intensity pleasure. Research has shown that the CBQ has adequate validity and good internal consistency (e.g., Rothbart et al., 2001), and the alphas for activity level, impulsivity, shyness, and high intensity please were .72, .73, .86, and .74 in the present study, respectively. An overall Surgency score was computed by summing and then averaging each of the subscale scores. Higher scores reflected greater surgency while lower scores reflected less surgent behavior.

Observer ratings of child temperament

After the completion of the lab visit, each child was rated using the Observed Child Temperament Scale (OCTS; Stifter, Willoughby, & Towe-Goodman, 2008). The scales of the OCTS (description; scoring range) include: Activity level (amount of gross body movement; 1-9), Reaction to novel persons (social responsiveness to examiners; 1-5), Positive affect (level of happiness/positive mood; 1-9), and Shyness/fearfulness (degree of fear of persons, situation; 1-9). The four scales had an alpha of .75 indicating adequate internal consistency between the subscales. Two observers who had different roles during the lab visit conferred at the end of the visit, came to consensus, and then scored the child on each of the above scales. To simulate conditions under which parents rated their children, observers were minimally trained on the application of the scale prior to its use (for details see Stifter et al., 2008). To reflect child surgency, a composite variable was made by first standardizing the ratings of activity level, reactions to novel persons, positive

affect, and shyness/fearfulness (reverse scored) and then summing the total. Higher scores reflected high surgency and lower scores reflected low surgency.

Surgency composite

Because CBQ Surgency and OCTS Surgency were moderately correlated ($r = .38, p < .001$), a composite Surgency variable was formed. CBQ Surgency and OCTS Surgency scores were standardized and summed. Higher scores on the composite Surgency reflected more surgency, whereas lower scores reflected lower surgency.

Emotion regulation

Emotional expression

Children's emotional expression was observationally coded by two trained research assistants during the Transparent Box task. Anger, Sadness, and Joy were coded in 5 second intervals for the presence or absence of the emotion from facial and vocal cues, and the intensity of emotion was rated on a 2-point scale (1-low/moderate, 2-high). The coding scheme was adapted from Ekman & Friesen's (1978) FACS and from coding schemes developed by Cole et al. (1992, 1994). In the present study, only anger was used, and its coding is described in greater detail.

Anger was coded facially when the child showed tightening or narrowing of the eyelids, lips pressed together or tightened, an open, squarish mouth with teeth clenched, or when the eyebrows came closer together and lowered in a furrowed manner. Vocal indicators of anger included when the child's voice was harsh or had an insistent quality, the volume increased and the pitch was louder and deeper, or when there was protest irritation, frustration or hostility conveyed. Anger was coded when the child displayed a facial cue, a vocal cue, or a facial and vocal cue.

Anger was also given an intensity rating when the emotion was present. Low/moderate was coded when the child showed clear but low-key levels of affect and only one facial or vocal cue may be present. Also, a low/moderate rating was given when facial involvement was low (i.e., only one part of the face seems present to a very low degree signifying the emotion), but could also include facial involvement in more than one part of the face. Further, a steady, constant cue of the emotion,

either facially or vocally, may be present throughout the display. A high intensity rating was given when the child displayed several occurrences of very intense affect facial and/or vocal affect. The child may also show a very full facial expression involving more than one part of the face in which all were very clear and intense. Typically, there were multiple, intense emotion cues (i.e., facial and vocal). However, in the present study, ratings of high intensity on anger occurred less than 1% of the time, and therefore were dropped from the analyses.

Inter-rater reliability for low/moderate anger was calculated on 19% of the sample, and anger had a Cohen's Kappa of .71. Proportion scores were calculated for anger by dividing the number of intervals the child expressed anger by total number of intervals during the entire task. Therefore, higher proportion scores reflected more expressed anger whereas lower scores reflected less.

Emotion regulation strategies

Children's emotion regulation behaviors were coded by trained research assistants in the same 5 second intervals that emotional expression was coded during the Transparent Box task. The presence or absence of each of the following seven behaviors were coded based on research exploring how children cope when presented with difficult situations (e.g., Calkins & Johnson, 1998; Eisenberg et al., 1996; Gilliom et al., 2002): goal directed, giving up, distraction, positive/neutral self-speech, negative self-speech, physical venting, and self-soothing.

Goal directed was coded when the child interacted with the box in a way that was strategic or planful, which could include trying to open the box with or without the keys or manipulating the keys in different ways to see if it opens the box. This was also coded when the child persisted at opening the box. A code of *Giving up* was given when the child did not try to open the box or use the keys in a goal-directed manner. The child was clearly not engaging with anything else and most likely, the child was just sitting in the chair not attempting to do anything. *Distraction* was coded when the child turned his/her attention away from trying to open the box and when the child attended to something other than trying to open the box. Distraction included behaviors such as the child

moving or looking around the room, playing with other objects, or playing with task objects in a way that did not clearly involve trying to open the box (e.g., jingling the keys). *Positive/neutral self-speech* was coded when the child was talking to him/herself and the content of what the child was saying was positive or reaffirming such as when the child says “I can do this,” “Maybe I should try this,” etc. This was also coded when the child said statements that were neutral and without negative content. A *Negative self-speech* code was when the child was talking to him/herself and the content of what the child was saying was negative or critical. This also included whiney statements or when the child said things such as “I can’t do this,” “This is too hard,” etc. A code of *Physical venting* was given when the child engaged in banging, kicking, throwing, hitting the object of frustration or any other object (e.g. door) in an aggressive manner. This included things such as banging on the door, throwing the keys, throwing the box, or banging the box. *Self-soothing* was coded when the child engaged in certain behaviors during the task that might help the child soothe him/herself. These behaviors were often (but not always) repetitive in nature and examples included thumb-sucking, hair-twirling, rocking, resting one’s head in one’s hands or on the floor, making repetitive noises, humming, and singing.

The following behaviors were not mutually exclusive and more than one behavior could occur in a given interval (e.g., engaging in goal directed/task persistence and positive self-speech). Inter-rater reliability was assessed on 18% of the sample for each of the seven behaviors and Kappas were as follows: .84 goal directed, .96 giving up, .81 distraction, .85 positive/neutral self-speech, .73 negative self-speech, .74 physical venting, and .82 self-soothing. Proportion scores were created indicating the amount of time the child engaged in each of the regulation behaviors by dividing the total number of intervals the child used a behavior by the total number of intervals in the task.

Because of the large number of regulation variables, composite variables were formed based on inter-correlations amongst the variables. Giving up, physical venting, and negative self-speech were all significantly positively correlated with one another with r 's ranging from .24-.69. Therefore, if children engaged in any one of these behaviors, they were more likely to engage in

greater levels of the other two. Given their interrelations, giving up, physical venting, and negative self-speech scores were summed to create a composite score called maladaptive ER, with higher scores reflecting greater use of maladaptive ER strategies during the Transparent Box task. Additionally, goal directed was negatively correlated with distraction ($r = -.92, p < .001$), such that when children used more goal directed behavior, they were using less distraction. Although it was unrelated to goal directed and distraction, positive/neutral self-speech was considered a more adaptive ER strategy. Therefore, an adaptive ER composite was formed by summing goal directed, positive/neutral self-speech, and reverse scored distraction, with greater scores reflecting more adaptive ER strategies during the Transparent Box task. The maladaptive ER and adaptive ER composites were used in the main analyses of the present study. Self-soothing was not included in the current analyses

Vagal reactivity

ECG was recorded using Mindware[®] (Westerville, OH) ambulatory Electrocardiograph (ECG) equipment, and the output was transmitted by wireless signals to a computer equipped with data acquisition hardware and software. Heart rate data was quantified by taking the ECG signals and passing them through an A/D converter with ECG sampled at 1000 Hz. RSA values were derived from the interbeat interval series and are resampled at 25 msec to create a stationary wave form. The integral of the power in the RSA band (.24-1.04 for children) was extracted in order to obtain the RSA statistic. Trained research assistants engaged in visual inspection of movement artifact and artificial heart beats were interpolated to retain the time series.

Mean RSA was calculated in 30 second segments from the five minute baseline episode and four minute Transparent Box task. In cases of movement artifact, data was edited manually. Mean baseline RSA and mean transparent box RSA were calculated by averaging the 30 second segments of the tasks. Vagal reactivity was calculated by subtracting the mean RSA during the Transparent Box from mean baseline RSA. Therefore, positive scores represented greater vagal suppression.

Child maltreatment group status

Child Abuse Potential Inventory

The Child Abuse Potential Inventory (CAPI; Milner, 1986) is self-report measure completed by mothers that identifies individuals at risk to physically abuse children. Mothers indicated whether they thought a variety of statements were either true or false. There were three main scales derived from the CAPI items which are psychological difficulties, interactional problems, and validity indices. The 77-item CAPI Abuse scale assesses physical child abuse and consists of six factor scales named distress, rigidity, unhappiness, problems with family, problems with child and self, and problems from others. The CAPI Abuse scale has shown good discriminate validity with a clinical cutoff score of 215, correctly classifying 89.2% of confirmed child abusers and 96.3% of non-abusing controls (Milner, Gold, & Wimberley, 1986). Non-CM mothers who have clinical cut-off scores above 215 were excluded from the analyses (2 families excluded). The CAPI has been shown to have adequate validity and reliability (e.g., Milner, 1994).

Maltreatment Classification System

Mothers' maltreatment histories were rated using the Maltreatment Classification System (MCS; Barnett, Manly, & Cicchetti, 1993) from CYS records. The MCS classifies case records based on subtype of child maltreatment, severity, frequency, chronicity, identity of perpetrator, and separations of out of home placements. Parental written consent was obtained before reviewing the cases. Research assistants with expertise in child maltreatment services were trained to code the case records, after achieving sufficient reliability (i.e., weighted kappa > .70). CM families that were referred from CYS but have case records that do not receive an MCS code were excluded from the current proposal (8 families excluded).

Demographic Survey

Demographic information was collected on each family. Key demographics that were collected included the child's gender, family income, maternal education and employment, and race/ethnicity and age of both the mother and child. In the current proposal, these factors, such as

child age and gender and objective SES, were examined as possible covariates in analyses where it was appropriate.

Objective measure of SES

Socioeconomic status was assessed using Adler's index of objective SES (Adler, Epel, Castellazzo, & Ickovics, 2000; Operario, Adler, & Williams, 2004; Wilkinson, 1999). The objective SES measure was composed of mother's education, household income, and occupation. Education was coded into four categories that indicate the highest degree the mother earned: a) high school degree, b) college c) masters, and d) higher degree (e.g., doctorate or law degree). Household income was also coded in to for categories which were: a) 10,000 or less, b) 10,001-30,000, c) 30,001-50,000), and d) 50,001 and higher. Occupation status was coded into the following three categories: a) blue collar/service, b) clerical/self-employed, and c) professional or managerial. The composite SES score was created by standardizing and taking the mean of maternal education, income, and occupation.

Chapter 4

Results

Preliminary Analyses

Descriptive statistics for the study variables can be found in Table 1. A paired samples t-test revealed that children spent a greater proportion of time using adaptive ER strategies ($M = .37$) compared to maladaptive ER strategies ($M = .05$), $t(1, 76) = 5.22, p < .001$, during the Transparent Box task. Additionally, a repeated measures ANOVA revealed differences between the three SASB coded parenting behaviors, $F(3, 31) = 381.9, p < .001$. Follow-up tests revealed that mothers spent more time using SASB coded positive/warm control (Cluster 4) than warm autonomy support (Cluster 2), $t(1, 34) = -10.30, p < .001$ and negative/hostile control (Cluster 6), $t(1, 34) = 18.05, p < .001$ during the Duplo task. Mothers also spent more time using warm autonomy support than negative/hostile control, $t(1, 34) = 6.06, p < .001$. Overall, mothers were more likely to use positive/warm control compared to both negative/hostile control and warm autonomy support, and also used greater amounts of warm autonomy support than negative/hostile control while interacting with their children during the Duplo Blocks task.

Zero-order correlations were conducted to assess the relationships between the study variables including child surgency, SASB coded parenting behaviors (negative/hostile control, positive/warm control, warm autonomy support), and child ER (expressed anger, adaptive ER, maladaptive ER, and vagal suppression). All correlations can be found in Table 2. Children's expressed anger was correlated with adaptive ER ($r = .35, p < .01$) and maladaptive ER ($r = .23, p < .05$). Children who expressed more anger were also showing more adaptive and maladaptive ER strategies during the Transparent Box task. Additionally, RSA_{baseline} was positively correlated with RSA_{change} , $r = .64, p < .001$. Children with greater baseline RSA scores showed greater RSA change scores during the Transparent Box task. Further, SASB coded positive/warm control was negatively

correlated with warm autonomy support ($r = -.34, p < .05$) and negative/hostile control ($r = -.52, p < .001$). Mothers who used more positive/warm controlling behaviors used less warm autonomy support and negative/hostile control during the Duplo Blocks task. Finally, RSA_{baseline} and RSA_{change} scores were positively associated with SASB coded positive/warm control ($r = .44, p < .01$; $r = .51, p < .001$, respectively) and negatively related to negative/hostile control ($r = -.52, p < .01$; $r = -.64, p < .001$, respectively). Children whose mothers engaged in more positive/warm control and less negative/hostile control during the Duplo Blocks task showed higher baseline RSA and greater RSA suppression scores during the Transparent Box task. Additionally, potential covariates with the study variables were examined, including child gender and age and the family's Objective SES. No gender differences were revealed on any of the study variables (surgency, SASB coded parenting behaviors, child ER). Only one relationship emerged with child age. Child age was positively associated with adaptive ER, $r = .34, p < .01$. As children became older, they engaged in more adaptive ER strategies during the Transparent Box task. Because of this relationship, child age was entered as a covariate in the regression analyses when adaptive ER was the outcome. Relations were also examined between Objective SES and the study variables, and no significant associations were revealed. Finally, CM group differences were examined with potential covariates. An independent samples t-test revealed differences between CM and non-CM groups on Objective SES, $t(2, 83) = 8.08, p < .001$. CM families ($M = -.61$) were lower on Objective SES scores compared to non-CM families ($M = .52$). Given this, Objective SES was entered as a covariate in the regression analyses when CM group status was used. However, no CM group difference was revealed on child age, $t(2, 83) = .04, p = \text{n.s.}$

Primary Analyses

Differences between maltreating and non-maltreating children on emotion regulation

The first goal of the study was to investigate whether differences existed between CM and non-CM children's emotion regulation. Multivariate analysis of variance was used to determine whether there were mean differences on children's expressed anger, adaptive ER strategies, and

maladaptive ER strategies between CM and non-CM groups. The ER variables were entered as the dependent variables, CM group status (CM vs. non-CM) as the independent variable, and Objective SES and child age as covariates. The results revealed no differences between the CM and non-CM children on expressed anger: $F(2, 76) = 1.41, p = \text{n.s.}$, adaptive ER: $F(2, 75) = 1.59, p = \text{n.s.}$, or maladaptive ER: $F(2, 75) = .16, p = \text{n.s.}$, during the Transparent Box task. Next, a logistic regression analysis was conducted to determine whether baseline RSA and RSA change scores predicted whether children were more likely to be in the CM or non-CM group. CM group was the dependent variable with 0 representing the non-CM group and 1 representing the CM group. The results revealed that both $\text{RSA}_{\text{baseline}}, B = .12, p = \text{n.s.}$, and $\text{RSA}_{\text{change}}, B = -.39, p = \text{n.s.}$, did not predict children's group status indicating that there were no differences between CM groups, $\chi^2 = 1.92, df = 8$, on children's baseline RSA and RSA change scores.

Differences between maltreating and non-maltreating mothers on parenting quality

MANOVA was used to test for mean group differences between CM and non-CM mothers on SASB-coded maternal behaviors. The parenting variables were entered as the dependent variables, CM group status (CM vs. non-CM) was entered as the independent variable, and Objective SES as a covariate. The results revealed that there were no mean group differences between CM and non-CM mothers on their use negative/hostile control: $F(1, 34) = .41, p = \text{n.s.}$, warm/positive control: $F(1, 34) = .08, p = \text{n.s.}$, and warm autonomy support: $F(1, 34) = .08, p = \text{n.s.}$.

Surgency as a moderator between maltreatment status and children's emotion regulation

The second goal of the present study was to test whether child surgency moderated the relationship between maltreatment status (CM vs. non-CM dyads) and children's emotion regulation as measured by expressed anger, adaptive ER, maladaptive ER, and vagal suppression. Separate multiple regression analyses were performed for each of the four ER outcome variables. In each model, Objective SES was entered as a covariate in the first step. When adaptive ER was the outcome, child age was entered as a second covariate. Further, baseline RSA was entered as an additional covariate in regression analyses with vagal suppression as the outcome. The predictor

variables of surgency, maltreatment group (CM vs. non-CM), and the interaction between surgency and maltreatment group were entered in the second step. The interaction term was created by centering surgency and then multiplying it by the CM group status. Separate regressions were conducted for each of the outcome variables: expressed anger, adaptive ER, maladaptive ER, and vagal suppression. The results from the regression analyses can be found in Table 3.

A significant interaction effect was revealed when expressed anger was the outcome variable, $B = .05$, $t(4, 73) = 1.98$, $p < .05$. Following procedures recommended by Aiken and West (1991), the simple effects of surgency were examined separately in the CM and non-CM groups at 1 *SD* above and 1 *SD* below the mean of surgency. As can be seen in Figure 2, as non-CM children's surgency increased, they showed less expressed anger during the Transparent Box task, $B = -.05$, $t(4, 73) = -2.43$, $p < .05$. However, the simple slope was non-significant for the CM group, $B = .001$, $t(4, 73) = .40$, $p = \text{n.s.}$, such that the amount of anger expressed by CM children was unaffected by their level of surgency.

Next, regression analyses with adaptive ER and maladaptive ER as the outcome variables were conducted. After accounting for the effects of covariates, no significant interaction effect was revealed with adaptive ER, $B = .06$, $t(5, 71) = .78$, $p = \text{n.s.}$, or maladaptive ER, $B = .00$, $t(4, 71) = .22$, $p = \text{n.s.}$

Finally, a regression analysis with $\text{RSA}_{\text{change}}$ as the outcome variable was conducted. A near significant interaction between surgency and CM group status was revealed, $B = .19$, $t(5, 62) = 1.84$, $p = .07$, after accounting for the effects of covariates. Again, procedures recommended by Aiken and West (1991) were followed, with the simple effects of surgency examined separately in the CM and non-CM groups at 1 *SD* above and 1 *SD* below the mean of surgency. As can be seen in Figure 3, as non-CM children's surgency increased, they showed less vagal suppression during the Transparent Box task, $B = -.12$, $t(5, 62) = -1.62$, $p < .10$. The simple slope was non-significant for the CM group, $B = -.02$, $t(5, 62) = 1.07$, $p = \text{n.s.}$, such that CM children's RSA change scores were not influenced by their level of surgency.

Surgency as a moderator between parenting behaviors and children's emotion regulation

To test the third goal of the present study, a series of multiple regression analyses were conducted to test whether children's surgency moderated the relationship between SASB coded parenting behavior (negative/hostile control, positive/warm control, warm autonomy support) and children's ER. As reported above, no significant mean differences were revealed between CM and non-CM children on their expressed anger, adaptive ER, maladaptive ER, and vagal suppression. Therefore, CM status was not used as a covariate in these set of analyses. Separate models were conducted for each of the three SASB coded parenting variables with each of the four outcome variables (expressed anger, adaptive ER strategies, maladaptive ER strategies, and vagal suppression) resulting in 12 regressions total. First, the two predictor variables of surgency and the parenting behavior were centered by subtracting each variable from their mean. Where appropriate, covariates were entered in the first step (e.g., child age when adaptive ER was the outcome; baseline RSA when vagal suppression was the outcome). The centered predictor variables of surgency and the three SASB coded parenting behaviors as well as their interactions (surgency X SASB coded parenting behavior) were entered next.

First, a set of four regression analyses with SASB coded negative/hostile control was conducted for each of the four ER outcomes. After the effects of RSA_{baseline} were considered, a main effect was revealed for negative/hostile control when RSA_{change} was the outcome, $B = -12.67$, $t(5, 25) = -2.40$, $p < .05$. Children of mothers who engaged in more negative/hostile control during the Duplo task showed lower RSA suppression during the Transparent Box task. However, the surgency X negative/hostile control interactions were all non-significant for each of the four ER outcomes: expressed anger: $B = -.32$, $t(4, 26) = -.42$, $p = \text{n.s.}$; adaptive ER: $B = .55$, $t(5, 26) = .26$, $p = \text{n.s.}$; maladaptive ER: $B = .27$, $t(4, 27) = .57$, $p = \text{n.s.}$; RSA_{change} : $B = -2.44$, $t(5, 25) = -.69$, $p = \text{n.s.}$

Next, a set of four regression analyses with surgency, positive/warm control and the four ER outcome variables was conducted. A near significant main effect was revealed for positive/warm control when adaptive ER was the outcome, $B = -1.22$, $t(5, 26) = -1.80$, $p = .08$, after considering

the effects of child age. Children of mothers who used more warm/positive control during the Duplo task showed less use of adaptive ER strategies during the Transparent Box task. Additionally, after accounting for the effects RSA_{baseline} , a significant main effect was revealed for positive/warm control when RSA_{change} was the outcome, $B = 2.12$, $t(5, 25) = 2.16$, $p < .05$. Children of mothers who used more positive/warm control during the Duplo task showed greater vagal suppression during the Transparent Box. None of the interaction effects between surgency X positive/warm control were significant for any of the four ER outcomes: expressed anger: $B = .11$, $t(4, 26) = -.47$, $p = \text{n.s.}$; adaptive ER: $B = .20$, $t(5, 26) = .32$, $p = \text{n.s.}$; maladaptive ER: $B = .04$, $t(4, 27) = .43$, $p = \text{n.s.}$; RSA_{change} : $B = -1.0$, $t(5, 25) = -1.09$, $p = \text{n.s.}$

A final set of four regressions with SASB coded warm autonomy support was conducted with each of the four ER variables. No main or interaction effects were revealed for the four ER outcomes: expressed anger: $B = .00$, $t(4, 26) = -.01$, $p = \text{n.s.}$; adaptive ER: $B = .26$, $t(5, 26) = .46$, $p = \text{n.s.}$; maladaptive ER: $B = -.09$, $t(4, 27) = -1.03$, $p = \text{n.s.}$; RSA_{change} : $B = .41$, $t(5, 25) = .53$, $p = \text{n.s.}$

Chapter 5

Discussion

The current study was guided by a developmental psychopathology framework and designed to contribute to our understanding of the mechanisms that play a potential role in maltreated children's emotion regulation. Specifically, developmental psychopathology asserts that it is the interplay between children's own characteristics and the environment they are exposed to which conjointly contribute to children's subsequent development (Cicchetti, 2006; Cicchetti & Toth, 1995). However, no previous research to date has explored how maltreated children's temperamental characteristics interact with parenting quality and how this affects children's emotion regulation, a critical precursor of several pathological outcomes. Given this, the current study sought to address three main goals in order to better understand possible contributors to maltreated children's emotion regulation. The first goal was to determine whether maltreated and non-maltreated preschool children differed in their ER and to assess differences between maltreating and non-maltreating mothers on their quality of parenting. Second, the interaction between children's surgent temperament and maltreatment status and the effect it had on children's ER was explored. Finally, the third goal investigated whether variations in parenting processes (i.e., negative/hostile control, positive/warm control, and warm autonomy-support) predicted children's ER, over and above maltreatment status. In sum, this study revealed that surgency affected non-maltreated, but not maltreated, children's ER. In addition, certain parenting behaviors were associated with children's ER, regardless of children's CM status or level of surgency.

Although there was no direct relationship between children's surgency and their ER capacities, the results revealed that children's level of surgency did impact emotion regulation in children from non-maltreating families, but not in children from maltreating families. Among

children from non-maltreating families, those who showed higher levels of surgency expressed less anger and were less likely to suppress their vagal tone during the Transparent Box task compared to their less surgent counterparts. Although children who are higher in surgency may be more prone to frustration, they are also characterized by high positivity. It is possible that during the Transparent Box task, high surgent children from non-maltreating families were able to generate more positive affect during the task. Therefore, they expressed less anger, overall, during the task because they had the ability to generate more positive emotions, which may be more difficult for low surgent children to do. Further, research has demonstrated that low surgent children tend to be more compliant and show greater effortful control compared to high surgent children (e.g., Aksan & Kochanska, 2004). Therefore, non-maltreated children lower on surgency may have been more likely to comply with the experimenter's request to open the locked box with the keys, which resulted in greater persistence at the task and thus may have induced more frustration in these children. In contrast, children higher on surgency may have been less likely to comply to the experimenter's request and were less frustrated overall. However, the present study did not directly assess children's compliance to the experimenter's request which was to unlock the box.

Previous research has suggested that the inability to suppress vagal tone during challenging situations may be indicative of difficulties with emotion regulation (e.g., Calkins et al., 2007; Porges et al., 1996). According to Porges' Polyvagal Theory (1995, 1997, 1998, 2001, 2007; Porges et al., 1996), the parasympathetic nervous system mediates individual differences in expression and regulation of emotion is believed to play an important role in individual's adjustment. When individuals are able to suppress vagal tone, or inhibit parasympathetic input, in challenging situations, it provides the individual with the metabolic requirements and potential to respond to the environment in an appropriate and adaptive way without engaging the sympathetic nervous system, which can be more costly to the individual's long term functioning when this system is activated (Porges, 1995, 1997, 1998, 2001, 2007; Porges et al., 1996). On the other hand, when individuals are unable to suppress their vagal tone in challenging situations, they may need to activate the

sympathetic nervous system, which is less adaptive for the individual's overall functioning and could result in poor regulation of emotion (Porges, 1995, 1997, 1998, 2001, 2007; Porges et al., 1996).

The present study revealed that high surgent children from non-maltreating families suppressed their vagal tone less during the Transparent Box task. Some previous research has found that infant approach behavior and social engagement with experimenters, characteristics of surgent children, were associated with greater vagal suppression during cognitively and emotionally challenging situations (e.g., Calkins 1997; Stifter & Corey, 2001). Despite this previous research, the present study found the opposite relationship: surgent children tended to display lower vagal suppression in an anger-inducing context. Perhaps, in this study, non-maltreated, surgent children may have found the task uninteresting and/or were not enticed by the toys in the box, and hence, were less attentive and less likely to persist at the task because of this disinterest. Therefore, because they were potentially disengaged or less interested and focused on the task, they may not have generated an arousal level that called for the inhibition parasympathetic input, or the withdrawal of vagal tone, which is associated with increased attention and active coping (Porges, 1995, 1997, 1998, 2001, 2007; Porges et al., 1996). There is some evidence which may support this explanation because in addition to showing less vagal suppression, these children were also showing less expressed anger during the Transparent Box task as reported above. This may suggest that these non-maltreated, surgent children, at the observational level, were not becoming frustrated or emotionally aroused during this task despite its intended design, and this underarousal may have resulted in the inability of these children to generate a physiological response that would be useful to meet the intended demands and purpose of the task. On the other hand, their low surgent counterparts were showing greater anger and vagal suppression during the Transparent Box task, which suggests that perhaps these children were generating a sufficient level of arousal helping them respond physiologically to the task demands. Hence, it is important to consider the context in which vagal reactivity is measured because children's surgency may affect how they perceive and emotionally respond to the task, and thus, impact their physiological response in different situations.

Despite this possible explanation, the current study did not assess attentional components of children's temperament, and it may be important for future research to also consider attentional components of temperament, in addition to surgency, when assessing children's vagal reactivity during emotionally challenging situations. Further, the current study did not directly measure whether children found the task or the toys that were put in the box as interesting, and therefore, it is difficult to infer whether they found them enticing or not. Future research should contain assessments of whether the child finds the task engaging or not because this could influence their vagal reactivity during the task. Although non-maltreated children's level of surgency was associated with both their expressed anger and vagal suppression, future research should sequentially measure the temporal associations between children's expressed anger and vagal reactivity across the task to assess whether changes in anger expression are associated with changes in vagal reactivity. This may help to better illuminate the possible emotional arousal/vagal reactivity relationship in children with varying levels of surgency.

Children's surgency had no impact on children's emotion regulation capacities from maltreating families suggesting that other factors besides children's temperament may be more influential on the ER development in children from higher risk environments. Although children's temperamental propensities are relatively stable (e.g., Rothbart & Bates, 2006), the behavioral expression of temperament and its influence on children's subsequent development is not impervious to environmental influences, especially in those individuals that may be in highly stressful and chaotic environments, such is often the case in children from maltreating families. For example, if maltreated children are experiencing chronic maltreatment from infancy, assessments of temperament in these children when they are preschoolers may more so reflect the influence of the environment on children's behavior and less so be capturing their core temperamental propensities. On the other hand, children from non-maltreating families may be living in a more supportive environment, and therefore, children's own characteristics may be more influential on their subsequent ER behavior.

Interestingly, the results from the present study demonstrated that when the quality of parenting children experienced was considered, children's maltreatment status and level of surgency appeared to have no impact on children's ER. Specifically, the current study found that children of mothers who used more negative/hostile control during the Duplo task were less likely to suppress their vagal tone during the Transparent Box task, regardless of children's maltreatment status or level of surgency. This finding builds upon previous research which has found that children show lower vagal suppression when parents used negatively controlling behaviors (Calkins et al., 1998; Hastings et al., 2008), and extends it to children who are primarily low-income whom may have been exposed to maltreatment. It is possible that when parents engage in this type of behavior while interacting with their children, it may impede children's ability to physiologically sustain their attention and appropriately engage with the environment, and result in poor physiological regulation, or less vagal suppression.

Previous research within normative populations has shown that parent's use of warm/positive control is often associated with better self-regulatory outcomes in children (e.g., Cipriano & Stifter; Kochanska, 1995, 1997; Kochanska et al., 2007), the current study found that children of mothers who used more positive/warm control were more likely to suppress their vagal tone during the Transparent Box task, regardless of maltreatment status or surgency. Previous research has failed to find a relationship between more positive parenting behaviors and children's vagal reactivity in children from more normative populations (e.g., Calkins & Johnson, 1998). However, in children who are from more low-income families, this type of parenting may be beneficial to their ER functioning. Whereas parenting that is negatively controlling may hinder children's ability to sustain attention and behaviors during emotionally challenging situations, parents who engage in positively controlling behaviors may facilitate children's ability to physiologically regulate their behaviors, emotions, and attention. This type of parenting behavior may be especially important for children's ability to physiologically regulate emotions when they are living in less enriched environments.

Surprisingly and contrary to what was expected, the present study revealed that children of mothers who used more warm/positive control during the Duplo task used fewer adaptive ER strategies during the Transparent Box task, whereas, children of mothers who use less warm/positive control used more adaptive ER strategies. Adaptive ER strategies were composed of three behaviors: goal directed, lower distraction, and positive/neutral self-speech. In the present study, distraction was highly negatively correlated with goal-directed behavior and therefore was reversed scored when forming the adaptive ER variable. Post-hoc analyses were conducted to determine whether positive/warm control was associated with each of these three behaviors independently. These analyses revealed that positive/warm control was positively related to one adaptive ER behavior specifically, which was distraction ($r = .36, p < .05$). Children of mothers who used more positive/warm control during the Duplo task showed more distraction during the Transparent Box task. Research has shown that when children use distraction or gaze aversion, it is associated with less frustration (e.g., Grolnick, et al., 1996; Calkins & Johnson, 1998; Calkins, et al., 1998), suggesting that this behaviors may be adaptive when in a frustrating situation. Additionally, previous research has found that children of parent's who use more positive control engaged in more adaptive ER behaviors (e.g., Feldman & Klein, 2003; Putnam, et al., 2002). Parental use of the positive/warm control may promote children's use of distraction which could be adaptive when children are in a context when they have to complete an impossible task. Specifically, this type of parenting may help children learn self-regulating strategies that allow them disengage from a situation and to down-regulate themselves when they are overly aroused or frustrated, and thus enables them to reengage with the task when their frustration is at a more adaptive and manageable level. Despite this speculation, the current study did not sequentially assess whether children's use of distraction was associated with temporal reductions in anger. Research has shown that certain ER strategies were associated with reductions in negative emotions (Buss & Goldsmith, 1998; Gilliom et al., 2000) suggesting that some strategies may be more effective than others. Future research should

assess this in order to understand whether distraction is indeed an adaptive behavioral strategy for children in this task.

Interestingly, no support was revealed for the first goal of the study which was to determine whether children from non-maltreating and maltreating families showed differences in their ER and the quality of parenting they experienced. Previous research has found that maltreated children, compared to non-maltreated children, tend to have poorer ER (e.g., Cicchetti & Rogosch, 2005; Shields & Cicchetti, 1998; Trickett, 1998), which may be largely due to the adverse environments these children grow up in. However, these previous studies primarily assessed ER in middle childhood from parent's and other's reports. The present study was one of the first to observationally and physiologically assess maltreated preschooler's ER functioning. However, contrary to what previous research has shown and what was hypothesized in the present study, the results revealed no significant group differences between maltreated and non-maltreated children on their expressed anger, adaptive ER strategies, maladaptive ER strategies, or vagal suppression. The task used in the present study to measure emotion regulation was the Transparent Box task which was designed to elicit anger in children (Goldsmith et al., 1999). In the current study, most children displayed low to moderate levels of anger. Few children expressed high levels and thus this variable was dropped from analyses. Given that anger is a motivating emotion that helps individuals to achieve their goals (Cole & Hall, 2008; Saarni, 1999), low to moderate levels of anger may actually be adaptive in the Transparent Box task because of the design and nature of the task. Hence, in this context, low to moderate amounts of expressed frustration could be viewed as socially appropriate and adaptive, and the current study did indeed find a positive association between children's use of adaptive ER strategies with anger. It may be more important to assess differences in maltreated and non-maltreated children's anger expression and their ER strategies in contexts where it is considered less appropriate or adaptive, such as disappointing or joy-inducing situations. Although maltreated children show biases toward expressing anger (Pollak et al., 2000), it may be more critical to

understand which contexts they are expressing anger in when it is considered inappropriate and how this leads to less adaptive ER in these children.

It was also hypothesized in the current study that maltreating and non-maltreating mothers would differ on their parenting behaviors. Maltreating mothers were expected to use more negative/hostile control than either positive/warm control or warm autonomy support while interacting with their children in a challenging joint problem solving task. Interestingly, this hypothesis was not supported. Whereas some research has identified differences between CM and non-CM parents on the rates of the parenting behaviors they use while interacting with their children (e.g., Cerezo & D'Ocon, 1995; Lahey et al., 1984; Trickett & Susman, 1988), other studies have failed to find support for this, especially when observing parental usage of more positive or supportive behaviors (e.g., Burgess & Conger, 1978). The assessment of mother's behavior in the present study took place after only a 3-5 minute interaction that was primarily child focused, which was used to represent how she interacted with her child on a daily basis. Given the mothers and their children came to laboratory, which is a new and novel environment where they are being video-recorded, maltreating mothers may have been able to "turn it on" or control themselves for the short interaction. Therefore, their behavior in the 3-5 minute task may not accurately reflect how they interact with their children on a daily basis. Further, the task that parenting was assessed in may not have been perceived as stressful by the parents. Perhaps assessing parenting behavior in a more stressful situation, such as a competing demands task when the parent is given a task to complete yet still has to manage her child, could elicit differences between CM and non-CM mothers, especially in their use of more negatively controlling behaviors. Future research should include observations of parenting in the homes of maltreating families, in addition to laboratory observations, which may better differentiate the parenting maltreated and non-maltreated children are exposed to and provide a better overall picture of the environmental context of children exposed to maltreatment.

Additionally, mothers' behaviors were calculated from proportion scores, which was the number of times a mother engaged in a behavior divided by the total number of speaking turns the

mother engaged in during the task. It is possible that some mothers engaged in less speaking turns overall, and therefore, their proportion scores may have overrepresented their use of certain behaviors. For example, one mother may have engaged in three speaking turns during the interaction and two of those were negative/hostile control, while another mother may have had 60 speaking turns with two that were negative/hostile control. Although these two mothers used the same number of negative/hostile control, the first mother's proportion score is greater than the second mother's because she had less speaking turns, overall. Therefore, it may be better to conceptualize parenting behaviors by how frequently they used the behaviors and not by proportion scores, given that mothers may vary considerably in how much they actually speak during the task.

In the present study, maltreatment represented a marker variable (maltreated vs. non-maltreated), and therefore, only differentiated between exposed and non-exposed children and not necessarily children who were themselves the victims of the maltreatment. Even within maltreated children, there is much heterogeneity in their experiences. Although some research has begun to consider variability in the sub-type (i.e., physical abuse, neglect, or both), chronicity, or severity of maltreatment experienced by children (e.g., Jungmeen, Cicchetti, Rogosch, & Manly, 2009), future research should consider better ways to conceptualize maltreatment in order to better understand how it affects children's ER and the quality of parenting they experience.

Limitations and future directions

It should be noted that there are some limitations in the current study. First, this study was cross-sectional and assessed children's emotion regulation, temperament, and parenting quality concurrently. Even within the preschool age range of the study (3-5 years), children experience developmental changes within this period that could influence their ER development. Longitudinal research is needed in order to better understand the development of ER in maltreated children and to more thoroughly investigate how both individual and environmental level factors contribute to maltreated children's subsequent ER development.

Relatedly, multiple tasks should be used in future research to obtain measures of parenting behaviors, child's temperament, and ER. It is possible that greater variability in behavior will be seen between CM and non-CM mothers and children when their behaviors is observed and measured over multiple situations. For example, the present study found very low rates of children's use of maladaptive ER strategies, which may have contributed to the lack of detection of differences between CM and non-CM children. However, children may show greater use of these types of strategies when they are placed in other contexts in which ER is measured.

Finally, in the analyses that used the SASB coded parenting behaviors, the sample size was very small ($n = 35$) and therefore, power was an issue. It is possible that there will be more power to detect CM and non-CM group differences in parenting quality or surgency X parenting interactions when the sample size is increased.

Despite these limitations, the present study provides some interesting avenues for next step research. First, the interactions between the mother and her child should be assessed in a more bidirectional manner at a micro-analytic level given that both the parent and child are active participants in their interactions with one another. The present study only considered the mother's behavior during the Duplo task, and did not assess how the child's behavior and responses within those interactions affected how the mother responded to the child. Although the rates of behaviors between CM and non-CM mothers did not differ in the current study, it is possible that CM and non-CM mother-child dyads displayed different interaction patterns within the Duplo task. For example, does the mother complement her child's negative and aversive behavior by responding to her child in a negative or hostile way? Or, does she try to respond warm and positively with her child in order to bring her child back to a more positive state? It is possible that CM mothers may be less adept, compared to non-CM mothers, at engaging in warm autonomy supportive and positively controlling behavior when their child is being whiney, sulky, or difficult. Thus, maltreating mothers may be more likely to respond aversively when their child is engaging in aversive behaviors, compared to non-maltreating mothers, and this pattern of responding between the mother and child could be

problematic for both their overall relationship and the child's subsequent ER development. For example, Patterson (1981) found that children's rates of daily, aversive behavior were directly associated with mother's aversive acts lending evidence that the parent's behavior can influence children's and vice versa. Therefore, micro-analytically assessing the bidirectional interaction between maltreating and non-maltreating mother-child dyads may better illuminate differences in their parenting and the effect it has on the child's functioning.

Further, it is important to understand how patterns of interactions between mothers and their children may differentially impact maltreated children's ER development depending on their surgency, especially in the ways in which mothers respond to their children's more negative or frustrated behavior. For example, when mothers of high surgent children respond in a positively controlling way when their children are being negative, it may help to bring the children back to a more positive state, convey love and warmth to the child, and thus help these children to develop better ER capacities. On the other hand, mothers of low surgent children who respond in a warm and autonomy supportive way to their children when they are negative or frustrated, may help children feel supported and loved by the mother and promote ER in these children.

A second avenue for future research would be to consider the link between genes and temperament and how it impacts maltreated children's subsequent development. Research has begun to establish linkages between children's temperament and their genetic propensities while a separate line of research has found linkages between maltreatment and genes. Given this, future work should integrate these two areas of research to investigate the relationship between CM children's temperament with their genetics in order to more fully understand their pathways to adaptive or maladaptive development. Those exploring the linkage between temperament and genes have found that individuals with the 5-HTTLPR polymorphism, a gene associated with serotonin, was related to greater fear and distress (i.e., low surgency) in infants and adults (Auerbach, et al. 1999; Ebstein, Levine, Geller, Aurebach, Gritsenko, & Belmaker, 1998), whereas those with the 7-repeat allele of DRD4, a gene related to dopamine, has been associated with greater novelty and sensation seeking in

adults (Benjamin, Ebstein, & Belmaker, 1996) and lower negative emotionality and fear in infants (i.e., high surgency; Auerbach et al., 1999). Researchers have found that children exposed to maltreatment appear to be at greater risk of developing later pathology when they also have polymorphisms in two genes involved in the regulation of serotonin (i.e., MAOA & 5-HTTLPR; Caspi & Moffitt, 2006; Jaffe, Caspi, Moffitt, & Taylor, 2004). Therefore, it is possible that certain genetic polymorphisms or combinations of polymorphisms in maltreated children with certain temperamental characteristics may either exacerbate or attenuate negative outcomes in children. For example, a maltreated child identified as highly surgent may be at greater risk for poor outcomes, especially those related to externalizing or conduct problems, when they show the 7-repeat allele of DRD4. On the other hand, a low surgent maltreated child may be at greater risk for manifesting pathology related to fear or anxiety when they have the 5-HTTLPR polymorphism. Given this, future research should work to bridge these two lines of research involving genetics to further understand the role of maltreated children's temperament and how its expression might vary depending on their genetic propensities.

In conclusion, the present study was informed by a developmental psychopathology framework and was one of the first to consider the interplay between children's temperamental characteristics and the parenting they experience and how this influences children's emotion regulation in a sample of primarily low-income children exposed to maltreatment. The present study found that surgency influenced non-maltreated children's emotion regulation, and that parenting quality had a greater impact on children's emotion regulation than both maltreatment status and temperament. The present study provides some interesting avenues for next step research including: (1) assessing the bidirectional nature of parent-child interactions at a micro-analytic level to better elucidate differences between maltreating and non-maltreating dyads and how these patterns of interactions may differentially influence children's ER depending on their level of surgency, and (2) to integrate genetic work to better understand the temperament-genetic linkage in maltreated children. In general, the current study highlights the need to further understand the role of both

children's characteristics and the parenting they experience in maltreated children's emotion regulation development given the variability in maltreatment experienced by children and the complex nature of their interactions with their parents.

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Appendix A

Tables

Table 1. *Descriptives of study variables.*

	Non-CM Group				CM Group				Total			
	N	Mean	SD	Range	N	Mean	SD	Range	N	Mean	SD	Range
^a Surgency	44	.13	1.7	- 2.82-3.20	41	- .15	1.66	- 4.22-2.80	85	0	1.68	- 4.22-3.20
^b Negative/Hostile Control (Cluster 6)	10	.03	.05	0-.11	25	.02	.03	0-.11	35	.02	.03	0-.11
^b Positive/Warm Control (Cluster 4)	10	.56	.16	.36-.84	25	.58	.16	.19-.93	35	.57	.16	.19-.93
^b Warm Autonomy Support (Cluster 2)	10	.20	.13	.06-.48	25	.15	.13	0-.53	35	.16	.13	0-.53
^c Expressed Anger	42	.23	.21	.02-.79	36	.17	.20	0-.90	78	.21	.20	0-.90
^d Adaptive ER	40	.39	.55	- .75-1.25	37	.35	.54	- .94-2.50	77	.37	.54	- .94-1.52
^e Maladaptive ER	40	.05	.10	0-.56	37	.05	.11	0-.49	77	.05	.10	0-.56
^f RSA _{baseline}	37	6.12	1.29	3.55-8.86	37	6.14	1.36	3.23-8.18	74	6.13	1.31	3.23-8.86
^g RSA _{change} Transparent Box	34	.79	.96	- 2.30-3.05	34	.57	.88	- .94-2.50	68	.68	.92	- 2.30-3.05
^h Objective SES	44	.53	.71	- .81-2.37	41	- .62	.58	- 1.40-.53	85	0	.87	- 1.40-2.37
Child Age	44	3.75	.72	3-5	41	3.74	.78	3-5	85	3.75	.74	3-5

Note: ^asum of standardized scores on CBQ Surgency and OCTS Surgency; ^bproportion scores for number of times parent used each the behavior divided by total number of parent speaking turns in Duplo task; ^cproportion of expressed anger during Transparent Box task; ^dsum of goal directed/task persistence, positive/neutral self-speech, and reversed scored distraction; ^esum of giving up, physical venting, and negative self-speech; ^fmean baseline RSA during the neutral video; ^gbaseline RSA-task RSA during the Transparent Box; ^hstandardization and mean of mother's education, household income, and occupation.

Table 2. *Correlations between study variables and covariates.*

	1	2	3	4	5	6	7	8	9	10	11
1. Surgency		.24	-.11	.22	-.14	.02	.16	.10	.02	-.04	.12
2. Negative/Hostile Control (Cluster 6)			-.52**	-.16	.12	.08	-.15	-.52**	-.64**	.04	-.04
3. Positive/ Warm Control (Cluster 4)				-.34*	-.04	-.34	.31	.44**	.51**	-.01	-.05
4. Warm Autonomy Support (Cluster 2)					.07	.23	-.08	.15	.19	.23	.30
5. Expressed Anger						.35**	.23*	-.01	.09	.09	.09
6. Adaptive ER							.10	-.01	.17	-.09	.30**
7. Maladaptive ER								-.12	.03	.01	.00
8. RSA _{baseline}									.64**	-.09	-.14
9. RSA _{change} Transparent Box										.18	-.11
10. Objective SES											-.05
11. Child Age											

* $p < .05$ ** $p < .01$

Table 3. *Maltreatment group X surgency multiple regression analyses*

	B	SE (B)	B	F	ΔR^2
I. Expressed Anger				2.43+	10
Objective SES	-.02	.04	-.07		
CM group	-.09	.06	-.22		
Surgency	-.05*	.02	-.38		
CM group X Surgency	.05*	.03	.31		
II. Adaptive ER				.79	13
Objective SES	-.14	.10	-.22		
Child Age	.22**	.08	.29		
CM group	-.22	.16	-.21		
Surgency	-.04	.05	-.14		
CM group X Surgency	.06	.07	.13		
III. Maladaptive ER				.81	03
Objective SES	.01	.02	.07		
CM group	.02	.03	.09		
Surgency	.01	.01	.15		
CM group X Surgency	.00	.01	.04		
IV. RSA_{change}				1.56	51
Objective SES	.25	.14	.24		
RSA _{baseline}	.45**	.06	.67		
CM group	.13	.24	.07		
Surgency	-.12+	.07	-.21		
CM group X Surgency	.20+	.11	.24		

+ $p < .10$ * $p < .05$ ** $p < .01$

Appendix B

Figures

Figure 1. The Structural Analysis of Social Behavior (SASB) simplified cluster model. **Bold**, underlined, and *italicized* labels represent transitive, intransitive, and introject behaviors, respectively. From *Interpersonal diagnosis and treatment of personality disorders* (2nd ed., p. 55) by L.S. Benjamin, 1996, New York: The Guilford Press. Copyright 1996 by The Guilford Press. Reprinted with permission.

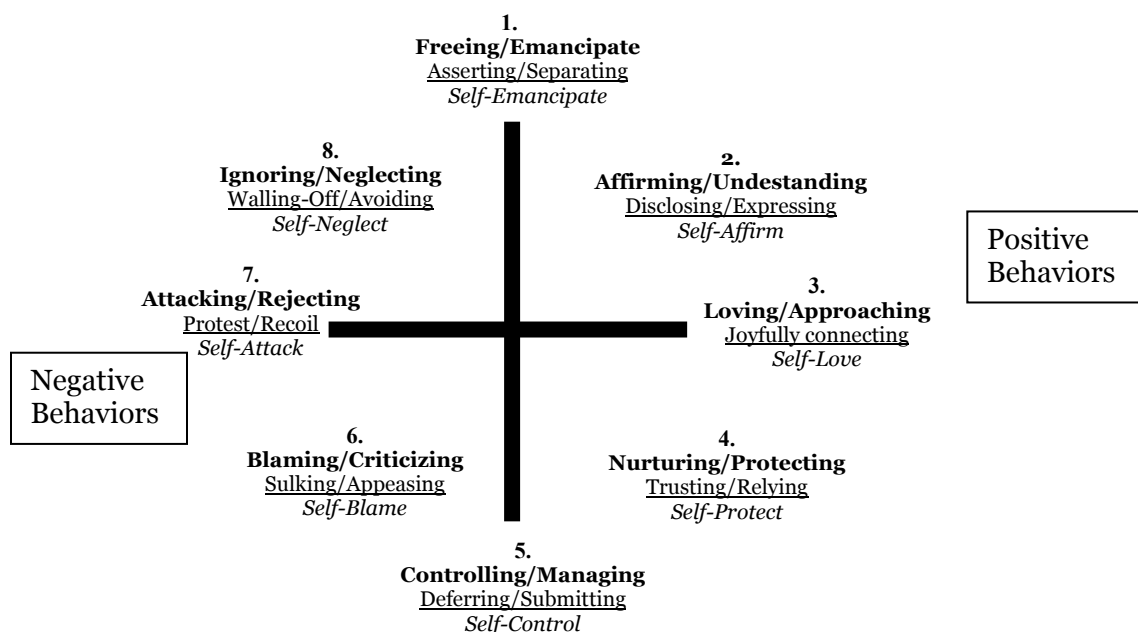


Figure 2. Maltreatment status moderates the relationship between surgency and expressed anger.

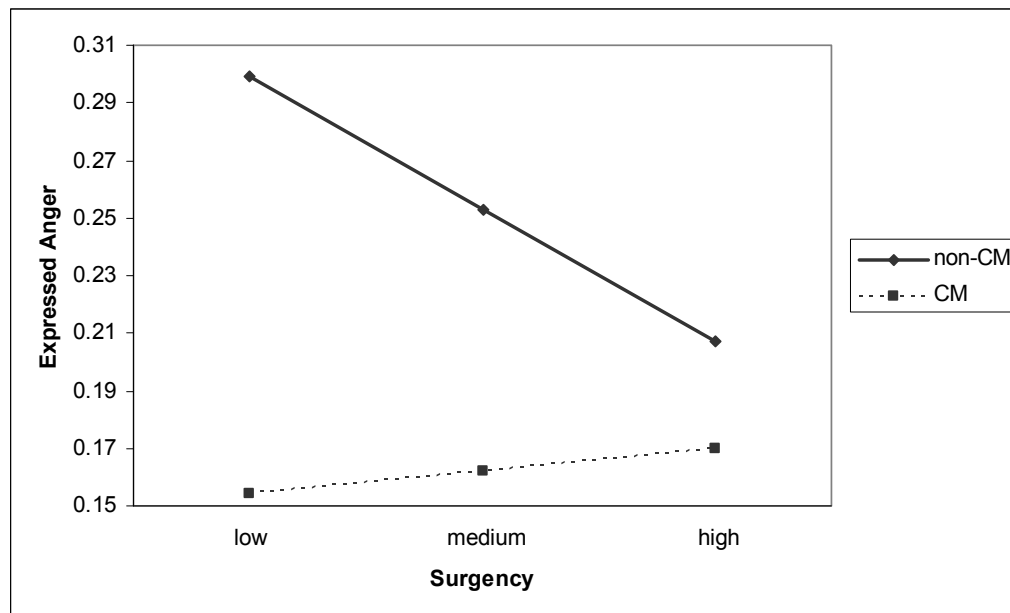
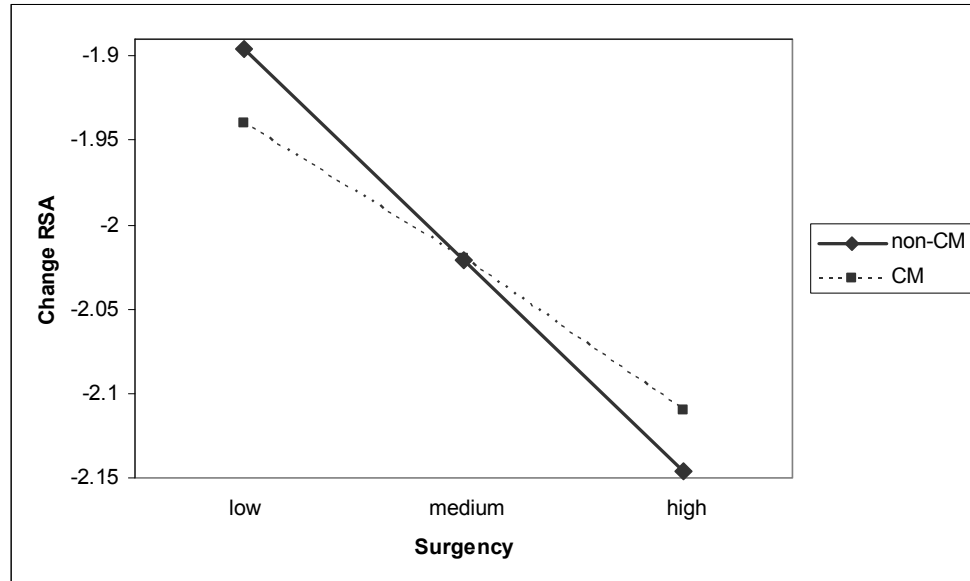


Figure 3. Maltreatment status moderates the relationship between surgency and RSA change.



VITA

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III. PUBLICATIONS

Skowron, E. A., Gatzke-Kopp, L. M., **Cipriano, E.A.**, & Porges, S. W. (in preparation). Does maternal differentiation of self mediate relations between mother and child cardiovascular reactivity and regulation?

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