PARENTING CONTRIBUTIONS TO SELF-REGULATORY OUTCOMES:
THE ROLE OF CHILD TEMPERAMENT AND CONTEXTS OF MEASUREMENT

A Dissertation in
Human Development and Family Studies

by

Mairin E. Augustine

© 2016 Mairin E. Augustine

Submitted in Partial Fulfillment
of the Requirements
for the Degree of

Doctor of Philosophy

December 2016
The dissertation of Mairin E. Augustine was reviewed and approved* by the following:

Cynthia A. Stifter  
Professor of Human Development and Family Studies and Psychology  
Dissertation Advisor  
Chair of Committee  

Douglas M. Teti  
Professor of Human Development and Family Studies, Psychology, and Pediatrics  
Department Head, Human Development and Family Studies  

Lisa M. Gatzke-Kopp  
Associate Professor of Human Development and Family Studies  
Graduate Professor-in-Charge, Human Development and Family Studies  

Kristin M. Buss  
Professor of Psychology  
Director of Graduate Training, Developmental Psychology  

*Signatures are on file in the Graduate School
ABSTRACT

Understanding precursors to children’s development of self-regulation is an important task for researchers wishing to promote many positive socioemotional outcomes in children. The current dissertation project focused on the role of child temperament, parenting, and interactive context on outcomes related to the development of approach-withdrawal tendencies and behavioral self-regulation and conscience. The overarching goal was to contribute to the developmental literature on how parenting interacts with child temperamental characteristics to predict outcomes relevant to child self-regulatory capabilities, specifically, by exploring various means through which contexts of measurement affect patterns of influence. These patterns were examined in a longitudinal sample of mothers and children who were observed when the child was 12 months, 18 months, and 4.5 years of age.

The goal of the first study was to examine whether mothers’ behavior when introducing infants to low- and high-intensity novel objects (12 months) predicted children’s approach-withdrawal responses in two contexts in toddlerhood (18 months) based on their infants’ early approach to novelty. For high-approach infants, maternal positive affect with a high-intensity novel toy predicted more toddler approach during a low-intensity novel situation. For low-approach infants, maternal stimulation with a low-intensity novel toy predicted less toddler approach during a high-intensity novel situation. Maternal sensitivity did not relate to toddler approach-withdrawal for low- or high-approach infants. Thus, certain maternal behaviors may lead to stronger associations between earlier and later measures of approach-withdrawal, but the effects are tied to contexts of socialization and outcomes.

The goal of the second study was to observe mothers’ and children’s positive affect, responsiveness, and control behavior in two contexts in toddlerhood (18 months), one involving
no regulatory structure (free play) and one involving a specific regulatory goal (clean-up).

Temperament differences were examined based on inhibited, exuberant, and average approach temperament groups created from a latent profile analysis of toddler affective and behavioral responses to novelty. There were few mean differences in mother and child behavior based on child temperament. However, mothers displayed more control in the structured task compared to the unstructured task, and children displayed less positive affect, less responsiveness, and more attempts to control mother behavior. Additionally, there were several significant relations between child and mother behavior in each task across temperament group, but there were additional relations between child behavior and mother behavior only for the exuberant and/or average approach groups. These results suggest that mother and child behaviors do in fact differ across unstructured and structured contexts, and that mothers of exuberant and average-approach children may potentially adjust their parenting to child responses relatively more than mothers of inhibited children; both of these factors may affect temperament- and context-based contributions of parenting behavior on children’s regulatory development.

The third study examined child temperament group and mother-child interactions during the unstructured and structured tasks in toddlerhood (18 months) as longitudinal predictors of child behavioral self-regulation and conscience at preschool age (4.5 years). Based on past research, it was hypothesized that exuberant children’s regulatory outcomes would be most strongly predicted by parent-child mutual positivity/responsiveness observed in the unstructured context, and inhibited children’s regulatory outcomes would be most strongly predicted by mothers’ control/structuring behavior in the structured context. Contrary to expectations, mother control/structuring behavior in both contexts related to better behavioral self-regulation in the exuberant group. Further, mother control/structuring behavior in free play related to poorer
behavioral self-regulation in the average approach group, and mother control/structuring behavior in clean-up related to poorer behavioral self-regulation in the inhibited group. Mother control may provide generally-beneficial self-regulatory guidance to exuberant children, but could serve a disruptive effect for children of other temperament types when displayed in certain contexts.

In conclusion, the results of this dissertation project demonstrated that parent and child behavior varies across interactive contexts, as do temperament-by-parenting interaction patterns predicting children’s regulatory outcomes. Early self-regulatory development thus appears to involve a complex interplay of temperament and parenting across different interactive contexts. Specific patterns of influence such as those that emerged from these studies may offer meaningful insight to researchers and clinicians about how parent-child relationships promote various regulatory outcomes in children with different temperamental characteristics.
TABLE OF CONTENTS

LIST OF TABLES.................................................................................................................................viii
LIST OF FIGURES.................................................................................................................................ix
ACKNOWLEDGEMENTS............................................................................................................................x
INTRODUCTION........................................................................................................................................1

  Temperament and Self-Regulation................................................................................................. 3
  Parenting and Self-Regulation........................................................................................................... 6
  Temperament-by-Parenting Influences on Self-Regulation............................................................... 11
    Influences on Regulation of Approach-Withdrawal to Novelty.................................................... 12
    Influences on Behavioral Self-Regulation and Conscience........................................................ 16
  The Role of Contextual Variation in Socialization Research......................................................... 19
  Aims of the Dissertation Project..................................................................................................... 24
  The Back to Baby Basics / B2BB Kids Project................................................................................ 26
  References............................................................................................................................................. 30

STUDY 1. Predicting Toddler Temperamental Approach-Withdrawal: Contributions of Early Approach Tendencies, Parenting Behavior, and Contextual Novelty.........................................................49

  Introduction.........................................................................................................................................49
  Method..................................................................................................................................................56
    Participants.......................................................................................................................................56
    Procedure..........................................................................................................................................57
    Behavioral Coding........................................................................................................................... 59
    Analytic Approach.......................................................................................................................... 62
  Results..................................................................................................................................................63
    Preliminary Analyses......................................................................................................................... 63
    Primary Analyses............................................................................................................................ 65
  Discussion............................................................................................................................................66
  References.............................................................................................................................................72

STUDY 2. The Role of Child Temperament and Contextual Regulatory Goals in Mother-Child Interactions: Implications for Early Self-Regulatory Development..................................................84

  Introduction.........................................................................................................................................84
  Method..................................................................................................................................................92
    Participants.......................................................................................................................................92
    Procedure..........................................................................................................................................93
    Behavioral Coding........................................................................................................................... 95
    Temperament Group Formation.......................................................................................................101
    Analytic Plan....................................................................................................................................103
  Results................................................................................................................................................105
Aim 1.......................................................................................................................... 105
Aim 2.......................................................................................................................... 106
Aim 3.......................................................................................................................... 107
Discussion................................................................................................................. 112
References.............................................................................................................. 121

Based on Temperament, Parenting, and Parenting Context.......................................... 138

Introduction.................................................................................................................. 138
Method......................................................................................................................... 146
Participants.................................................................................................................. 146
Procedure..................................................................................................................... 147
Behavioral Coding....................................................................................................... 151
Temperament Group Formation.................................................................................. 159
Analytic Plan............................................................................................................... 162
Results......................................................................................................................... 163
Behavioral Self-Regulation......................................................................................... 164
Conscience.................................................................................................................. 165
Discussion................................................................................................................... 166
References................................................................................................................. 173

GENERAL CONCLUSIONS.......................................................................................... 190
References.................................................................................................................. 201
LIST OF TABLES

Table 1.1 Means and Standard Deviations for Primary Study Variables........................................78
Table 1.2 Correlations Among Study Variables..............................................................................79
Table 1.3 Multiple Regression Model Predicting Toddler Low-Intensity (Risk Room) Context Approach- Withdrawal from Infant Toy Reach Exploration and High-Intensity Novel Toy Maternal Behavior.................................................................80
Table 1.4 Multiple Regression Model Predicting Toddler High-Intensity (Clown) Context Approach- Withdrawal from Infant Toy Reach Exploration and Low-Intensity Novel Toy Maternal Behavior........................................................................................................81
Table 2.1 Descriptions and Examples of Maternal Behavior Codes.................................................127
Table 2.2 Model Fit Indices for 18-Month Temperament Group Latent Profile Analyses........128
Table 2.3 Means and Standard Deviations for Primary Study Variables........................................129
Table 2.4 Correlations among Primary Study Variables...................................................................130
Table 2.5 Multiple Regression Models Predicting Child Behavior during Free Play Based on Child Temperament Group and Mother Behavior.................................................................131
Table 2.6 Multiple Regression Models Predicting Child Behavior during Clean-up Based on Child Temperament Group and Mother Behavior........................................................................132
Table 2.7 Multiple Regression Models Predicting Mother Behavior during Free Play Based on Child Temperament Group and Child Behavior........................................................................133
Table 2.8 Multiple Regression Models Predicting Mother Behavior during Clean-up Based on Child Temperament Group and Child Behavior........................................................................134
Table 2.9 Summary of Significant Simple Slopes of Mother Behavior Predicting Child Behavior by Temperament Group and Context.................................................................135
Table 2.10 Summary of Significant Simple Slopes of Child Behavior Predicting Mother Behavior by Temperament Group and Context........................................................................136
Table 3.1 Descriptions and Examples of Maternal Behavior Codes.................................................180
Table 3.2 Model Fit Indices for 18-Month Temperament Group Latent Profile Analyses........181
Table 3.3 Means and Standard Deviations for Primary Study Variables........................................182
Table 3.4 Correlations among Primary Study Variables...................................................................183
Table 3.5 Multiple Regression Models Predicting Child Behavioral Self-Regulation Composite Based on Child Temperament Group and 18M Free Play and Clean-up Variables.................................................................184
Table 3.6 Multiple Regression Models Predicting Child Conscience Composite Based on Child Temperament Group and 18M Free Play and Clean-up Variables.................................................................185
LIST OF FIGURES

Figure 1 Basic conceptual model of dissertation project constructs of interest and study aims....48

Figure 1.1 Effect of maternal positive affect with high-intense novel toy on risk room approach-withdrawal based on toy reach exploration.................................................................................. 82

Figure 1.2 Effect of maternal stimulation with low-intense novel toy on clown approach-withdrawal based on toy reach exploration.................................................................................. 83

Figure 2.1 Temperament group LPA 4-class solution estimated class means and class membership totals, displayed as raw scores (top) and as proportion of total possible score (bottom)................................................................................................................................. 137

Figure 3.1 Temperament group LPA 4-class solution estimated class means and class membership totals, displayed as raw scores (top) and as proportion of total possible score (bottom)................................................................................................................................. 186

Figure 3.2 Effect of maternal control in free play context on child behavioral self-regulation by temperament group................................................................................................................................. 187

Figure 3.3 Effect of maternal control in clean-up context on child behavioral self-regulation by temperament group................................................................................................................................. 188

Figure 3.4 Effect of mother-child mutual positivity/responsiveness in clean-up context on child conscience by temperament group................................................................................................................................. 189
ACKNOWLEDGEMENTS

This dissertation project was made possible first by the many families who graciously participated in the Back to Baby Basics (B2BB) and B2BB Kids project. I am thankful for their willingness to remain involved with the project over the course of several years and for offering so much valuable information about their families and their child’s development. This work was funded by a grant from the National Institutes of Digestive Diseases and Kidney (award number DK081512) and the John Templeton Foundation.

I would like to thank my doctoral advisor and committee chair, Dr. Cynthia Stifter, for offering her knowledge, advice, support, and interest throughout my career at Penn State, and during the time dedicated to this dissertation project. I certainly could not have completed this project and my doctoral degree without your strong dedication to your role as a mentor, your confidence in your students’ abilities, and the many opportunities you offered to me to grow as a researcher and scholar. I would also like to thank the rest of my doctoral committee, Dr. Doug Teti, Dr. Lisa Gatke-Kopp, and Dr. Kristin Buss, for your thoughtful consideration of my work and your many helpful comments and suggestions. I truly enjoyed our discussions and your perspective has given me host of useful ideas to incorporate into this project and my future research.

Secondly, I owe a great deal of gratitude to my friends, labmates, cohort, and other colleagues at Penn State for the remarkable kindness, empathy, and generosity you have provided me. Your support has yielded unbelievable benefits for my well-being and gives me extra hope for the future of academia. Many thanks as well to the dozens of past and present undergraduate research assistants in the Stifter lab who dedicated their time, energy and positive attitudes to all aspects of data collection and coding necessary to conduct these dissertation
studies. I would also like to thank my colleagues from my time at Lehigh University for serving as my first research role models in and for helping me to form a strong foundation for my graduate career.

Lastly, I could not have made it to or through graduate school without the love and encouragement of my family, friends, and other loved ones not mentioned above. I will be forever grateful to the many people in my life who do not always understand my career path or day-to-day experiences, but who have always believed in me and my ability to reach my goals. I hope to keep making you proud!
INTRODUCTION

A major accomplishment in the early years of life, and a major source of individual differences in children, is the development of self-regulation. Self-regulation has been variously defined by researchers, but tends to involve the many strategies and processes through which individuals modulate and control behavior, emotions, and cognitions (see Vohs & Baumeister, 2011). It is generally agreed that self-regulatory capacities and skills evidence large increases through the first three years of life (Kopp, 1982). Early developmental milestones, particularly in cognitive development, set the stage for children’s ability to intentionally shift and control responses, their awareness of self in reference to external input, the capacity for representational thought and memory for expectations and conventions, and the ability to engage in self-monitoring and planning, among other skills. Thus, the capacity for many self-regulatory skills is thought to emerge by about age three, but with individual differences in the emergence of these skills during this time and in later development.

Individual differences in self-regulation have important implications for children’s functioning. Firstly, the ability to appropriately elicit or inhibit approach to novel stimuli has consequences for social and emotional competence. Greater withdrawal and difficulty approaching novel objects and people in non-threatening circumstances may relate to later deficits such as social reticence or internalizing problems (Biederman et al., 1990; Fox, Henderson, Marshall, Nichols, & Ghera, 2005; Hirshfeld-Becker et al., 2007; Kagan, Reznick, Snidman, Gibbons, & Johnson, 1988; Pérez-Edgar & Fox, 2005). Difficulty inhibiting approach to novel stimuli or withdrawing from threat may relate to later risk-taking, disruptive behavior, or externalizing problems (Degnan et al., 2011; Little, 2006; Polak-Toste & Gunnar, 2006; Stifter & Dollar, 2016). More generally, self-regulatory skills that reflect the ability to flexibly...
respond to environmental demands or expectations predict a host of positive developmental outcomes (Blair & Razza, 2007; Eisenberg, Spinrad, & Eggum, 2010; Gartstein, Putnam, & Rothbart, 2012; Sanson, Hemphill, & Smart, 2004). Self-regulatory skills are also widely implicated in moral and conscience development, in that they promote the ability to produce self-regulated responses that align with sociomoral rules and expectations (Eisenberg, 2000; Eisenberg, Hofer, Sulik, & Spinrad, 2014; Kochanska & Aksan, 2006; Kochanska, Murray, & Coy, 1997; Rothbart & Ahadi, 1994). Because of the meaning of these skills for overall developmental success, understanding potential sources of self-regulatory promotion in the early years is one important task for researchers. Key sources of variation highlighted in research on self-regulatory outcomes include child temperament and parental socialization influences.

This review of the literature aims to provide a basis for the current dissertation by highlighting the role of temperament, parenting, and contexts of measurement in the development of two important self-regulatory outcomes: regulation of approach-withdrawal tendencies and the development of behavioral self-regulation and conscience. Following a review of direct influences of temperament and parenting on these outcomes, the subsequent sections will highlight relevant research on parenting-by-temperament interactions, as well as the potential significance of variations in contextual novelty and regulatory structure in testing effects of parental socialization. Limitations of existing research will be discussed throughout. Lastly, three dissertation studies examining contributions of temperament, parenting, and context relevant to self-regulatory development will be proposed.

To guide this introduction, a conceptual model for these primary constructs of interest as they were studied in the current dissertation project is presented in Figure 1. Connecting these studies was the contention that parenting, child temperament, and context differences will all
contribute to differing patterns of child self-regulatory outcomes from infancy to preschool age. Specifically, parenting behavior in different contexts in infancy was used to predict development of toddler approach-withdrawal tendencies (Paper 1). Toddler approach-withdrawal tendencies were used to create temperament types that were examined as correlates of parent and child behavior observed in different contexts (Paper 2). These toddler temperament group and parent-child interaction data were then utilized to predict later self-regulatory outcomes in children (Paper 3).

**Temperament and Self-Regulation**

One major construct relevant to self-regulatory development is temperament, here defined as individual differences in reactivity and self-regulation (Rothbart & Bates, 2006). Inherent in this definition of temperament is the assumption that there exist individual differences in intentional regulatory characteristics and the development thereof. This regulatory component of temperament is termed effortful control, generally defined as the ability to inhibit a dominant response in order to perform a subdominant response, to detect errors, and to engage in planning (Rothbart & Bates, 2006; Rothbart, Ellis, & Posner, 2011; Rueda, 2012). However, temperament theory and research also suggests that reactive components may also play a role in the tendency or ability to develop self-regulatory characteristics.

First, this conception of temperament assumes individual differences in reactivity and approach-withdrawal responses to novelty, or similarly, individual differences in the tendency to approach potential reward or avoid potential threat (Carver, Avivi & Laurenceau, 2008; Corr, 2004; Larsen & Augustine, 2008). Rothbart distinguishes between reactive forms of inhibition and those that are voluntary or effortful. Reactive inhibition reflects the tendency to automatically and involuntarily inhibit behavioral responses in the presence of novelty or threat.
cues (Rothbart & Bates, 2006; Rothbart, Derryberry, & Posner, 1994). A reactive preparedness to inhibit behavior may, however, put a child a step ahead in the ability to effortfully inhibit behavior, and the later-developing ability to effortfully produce behavior (Rothbart, 1989). Punishment-sensitivity may also motivate the child align with external expectations and avoid potential negative outcomes of deviating from these expectations (Kochanska, 1993).

Accordingly, children’s reactive inhibition has been found to relate to later measures of effortful control and conscience development in which children must inhibit or produce behavior in line with instructions (Aksan and Kochanska, 2004; Kochanska & Knaack, 2003). On the other hand, the tendency to display impulsive behavior or to reactively approach novelty or reward cues may challenge children’s developing effortful control abilities (Eisenberg, Eggum, Sallquist, & Edwards, 2010; Spinrad et al., 2012). Reactively approaching novelty or reward with less concern for threat cues in the environment or for the consequences of a failure to produce responses in line with external demands may eventually lead to greater difficulty adhering to social expectations and a greater likelihood of engaging in disruptive or higher-risk behaviors (Byrd, Loeber, & Pardini, 2014; Eisenberg et al., 2005; Frick & Morris, 2004; Little, 2006; Polak-Toste & Gunnar, 2006). Thus, it has been argued that increases in effortful self-regulation may be particularly beneficial for competent functioning in high-approach, impulsive, or reward-sensitive children, but that fostering these skills may require a relatively greater amount of external intervention (Kochanska, 1993; Polak-Toste & Gunnar, 2006; Stifter & Dollar, 2016).

Secondly, the reactive components of temperament include individual differences in emotional reactivity (Rothbart & Bates, 2006). High levels of temperamental fear or distress to novelty relate to inhibition or withdrawal behavior (Rothbart & Bates, 2006; Rothbart, Derryberry, & Posner, 1994), but also relate to greater ability to modulate behavioral responses
(Aksan & Kochanska, 2004). On the other end, low levels of fear may allow for greater engagement and positive responses to novel stimuli, but may also contribute to risk-taking or denote callous-unemotional traits (Frick & Morris, 2004; Morrongiello & Sedore, 2005). High levels of temperamental anger or frustration have often been found to relate to aggression, externalizing problems, and in some cases internalizing problems, perhaps reflecting poor management of responses to blocked or unattainable approach goals (see Stifter & Dollar, 2016).

The tendency to experience positive emotion is thought to promote positive socioemotional outcomes and to lower risk for depression, but intense positive emotional reactivity has been found to relate to poorer effortful control as well as externalizing problems (Kochanska, Murray, & Harlan, 2000; Putnam, 2012; Stifter & Augustine, under review; Stifter & Dollar, 2016). Similar to findings for anger, this may reflect difficulty modulating bold approach to reward.

As may be apparent in the previous discussion, children’s individual differences in temperamental reactive approach-withdrawal, emotional reactivity, and their developmental outcomes tend to fall into somewhat consistent patterns. Specific to the idea that some temperament characteristics may require relatively greater or specialized kinds of self-regulatory capabilities, two relatively extreme temperament types tend to be highlighted in the temperament and psychopathology literature. One represents children who are higher in negative affect, fearfulness or inhibition to novelty, and punishment-sensitivity, often labeled behaviorally inhibited (Fox et al., 2005; Kagan, Reznick, Clarke, Snidman, & Garcia-Coll, 1984; Rothbart & Bates, 2006). Another represents children who are higher in positive affect, activity level, approach to novelty, and reward-sensitivity, often labeled uninhibited, exuberant or surgent (Degnan et al., 2011; Kagan et al., 1984; Polak-Toste & Gunnar, 2006; Putnam & Stifter, 2005; Rothbart & Bates, 2006).
Historically, researchers such as Kagan (e.g., Kagan et al., 1984, Kagan et al., 1988) and Fox (e.g., Fox, Henderson, Rubin, Calkins, & Schmidt, 2001) used an extreme-group approach by measuring variations in reactivity to novelty in a larger sample and then selecting only infants who were most extreme in their responses for further study. A smaller number of researchers (e.g., Putnam & Stifter, 2005, Dollar, Stifter, & Buss, under review) have examined temperament in terms of approach-withdrawal and affective responses to novelty and extracted temperament types utilizing the full sample of children. In these studies, temperament group analyses yielded an inhibited group that displayed relatively higher negative affect, lower positive affect, and lower approach relative to withdrawal; an exuberant group that displayed lower negative affect, higher positive affect, and higher approach relative to withdrawal; a low-reactive or average group that displayed moderate levels of positive affect, negative affect, and approach-withdrawal; and a high-inhibited group that was more extreme in responses than the inhibited group (typically the smallest group in size and thus collapsed with the inhibited group in subsequent analyses). Further research has found that socioemotional outcomes such as problem behavior, conscience, and social interactions also tend to vary somewhat with these temperament types (Dollar, Stifter, & Buss, under review; Putnam & Stifter, 2008; Stifter, Putnam, & Jahromi, 2008; Stifter, Cipriano, Conway, & Kelleher, 2008). Thus, there appears to be merit in studying self-regulatory development and self-regulatory outcomes along the lines of coherent temperament types or profiles and the temperamental characteristics that tend to best distinguish them.

**Parenting and Self-Regulation**

Another major contributor to self-regulatory development is parental socialization, conveyed through parenting behavior and parent-child relationship quality. Parenting has been
found to have meaningful influences on regulation of approach-withdrawal to novelty in infancy and childhood. First, parental behavior relates to children’s in-the-moment responses to novelty, for example, by helping them regulate distress responses (Crockenberg & Leerkes, 2006) or by encouraging or discouraging engagement through displays of positive or negative affect (Dubi, Rapee, Emerton, & Schniering, 2008; Gerull & Rapee, 2002; Gunnar & Stone, 1984; Hornik, Risenhoover, & Gunnar, 1987). However, few studies have examined how these parenting interactions with novel objects influence children’s patterns of approach-withdrawal over time.

The quality of the parent-child relationship in general is also thought to influence tendencies toward approach or inhibition to novelty. From an attachment standpoint, (Bowlby, 1969; Main, Kaplan & Cassidy, 1985; Shaver, Collins, & Clark, 1996), security in the attachment relationship denotes a sense of trust in the availability of the caregiver to respond in times of distress, and promotes “secure base” behavior in which the child seeks caregiver proximity in times of threat or distress but otherwise willingly explores the environment. Other researchers have drawn from the attachment literature to suggest that felt security in the parent-child relationship may promote less anxiety or withdrawal in approaching future interactions (Rubin, Root, & Bowker, 2010), finding that measures of maternal sensitivity related to lower concurrent fear responses to novelty (Hane & Fox, 2006) and slower growth in fear reactivity (Braungart-Rieker, Hill-Soderland, & Karass, 2010). However, other research found that children who displayed greater fear or inhibition were found to had parents who displayed more support, protection, or acceptance of withdrawal behaviors (Belsky, Rha, & Park, 2000; Kiel & Buss, 2011; Lengua & Kovacs, 2005; Paulussen-Hoogeboom, Stams, Hermanns, & Peetsmam 2007; Rubin, Nelson, Hastings, & Asendorpf, 1999). This suggests that apparently sensitive or responsive parenting behaviors could actually lead to greater fear or inhibition, perhaps by
reinforcing the tendency to withdraw, or by precluding the opportunity for the child to self-regulate fearful responses or develop a sense of mastery in engaging with novelty (Degnan & Fox, 2007; Fox et al., 2005). Unfortunately, these parenting influences on children’s approach-withdrawal has not yet been confirmed by any longitudinal research.

There is also evidence for the importance of parental socialization in promoting general self-regulatory development and effortful control of behavior. Many researchers tout the importance of positive, responsive, and/or reciprocal parent-child relationships for children’s self-regulatory development. Attachment theory posits that children who experience sensitive and responsive caregiving will form positive mental representations of the attachment relationship and the parent as a trustworthy and positive influence, thus serving to increase the likelihood of accepting parental socialization efforts (Bowlby, 1969; Main, Kaplan & Cassidy, 1985; Shaver, Collins, & Clark, 1996). Grusec & Goodnow (1994) also proposed that any given socialization message passed from the parent to the child is subject to the child’s perception and acceptance of the message. Similarly, Kochanska’s (1997b; 2002) mutually responsive orientation (MRO), a dyadic construct encompassing a reciprocal, binding, cooperative, and affectively positive parent-child relationship, has been implicated as a meaningful predictor of children’s internalization of parental requests and subsequent socialization outcomes. It is believed the child will come to develop a “willing stance” toward the parent in a parent-child relationship in which the parent is responsive to the child needs, interactions are infused with positive affect, and the parent and child engage in cooperative exchanges. This willingness to be socialized serves as a backdrop for the child to attend to and embrace the parent’s agenda, and for the child to experience more optimal socialization outcomes. In the realm of conscience development, it has also been suggested that a cooperative or reciprocal parent-child relationship
helps to foster children’s understanding of acceptable behavior, sense of responsibility in the family, as well as respect and care for parents and other people (Dunn, 2014; Eisenberg, Spinrad, & Morris, 2014; Thompson, 2014; Thompson, Meyer, & McGinley, 2006). Similarly, positive and mutual “horizontal” interactions in the parent-child relationship can serve as opportunities for children to learn and practice aspects of reciprocity and responsibility to others (Russell, Pettit, & Mize, 1998).

Research suggests that parenting behaviors that promote positivity and cooperation in the parent-child relationship do in fact increase the likelihood of the child internalizing parental messages and in turn the development of self-control of behavior and emotion in socially and morally acceptable ways. Kochanska’s (Kochanska, 1997b; Kochanska et al., 2000; Kochanska, Barry, Askan, & Boldt, 2008) work has shown that maternal responsiveness or MRO relate to a receptive stance in children, internalization of parental prohibitions and requests, greater effortful control abilities, moral cognition, reluctance to violate normal social rules, and mother-reported moral development. Many other studies have found relations between indicators of positive, responsive, or cooperative parenting and children’s performance and growth on various measures of effortful behavioral and cognitive control (Bernier, Carlson, Deschênes, & Matte-Gagné, 2012; Blair, Raver, Berry, & the Family Life Project Investigators, 2014; Graziano, Keane, & Calkins, 2010; Moilanen, Shaw, Dishion, Gardner, & Wilson, 2010; Roskam, Stievenart, Meunier, & Noël, 2014), as well as moral emotion, behavior, cognition and other forms of conscience development (e.g., Kochanska, Forman, & Coy, 1999; Laible & Thompson, 2000; 2002; Lindsey, Cremeens, Colwell, & Caldera, 2009). Collectively, these findings support the idea that parent-child relationships that foster a sense of positivity and reciprocity are beneficial for the socialization of children’s competent regulatory functioning and alignment with external
Nonetheless, researchers also acknowledge that in order for socialization processes to promote behavioral regulation, parents must in fact provide a sense of external guidance or set clear expectations for child behavior. This line of thought is often associated with typological descriptions of parenting style developed by Baumrind (1966, 1971, 1991) and Maccoby and Martin (1983), in which the greatest child competence is expected to result from parenting marked by high levels of responsiveness but also high levels of demandingness. Responsiveness encompasses aspects of warmth, support, and respect for the child’s independence, similar to parenting qualities described above. Demandingness, however, refers to efforts parents use to align the child with societal expectations, including external regulation of behavior, limit-setting, and monitoring of activities. Thus, higher quality parenting is expected to involve, in part, active guidance of the child’s behavior toward acceptable, well-regulated responses.

Importantly, these and other researchers have emphasized the importance of guiding children’s behavior in a gentle and supportive manner rather than through hostile or dominating control. Researchers have used terms like “autonomy support,” “scaffolding,” or “structure” to describe a range of parenting behaviors or motivational settings that give an individual, in this case the child, the opportunity to make choices about behavior while also offering support, reinforcement, feedback, enforcement of rules and expectations, and encouragement toward appropriate responses (Carlson, 2003; Deci & Ryan, 1987; Grolnick & Pomerantz, 2009; Hughes, 2011; Joussemet, Koestner, Lekes, & Landry, 2005; NICHD ECCRN, 1999; Vygotsky, 1978). Despite being embedded in guided interactions, these behaviors are thought to give children greater perceived control over their intentional behavior, more intrinsic motivation to produce requested behavior, and better practice with successful problem-solving than parental
interventions that overtly or intrusively control child behavior.

Taken together, it appears that parent behavior may have a meaningful influence on children’s display of approach or inhibition to environmental stimuli, and parenting that involves a balance of positivity, reciprocity, and supportive control or structure all contribute to children’s ability to regulate themselves to meet parental and social expectations. However, understanding how these parenting dimensions actually and jointly relate to child regulatory outcomes is not necessarily clear. One major reason for this is that these conceptualizations of parenting effects do not consider the contribution of the child’s temperament to his or her socialization.

**Temperament-by-Parenting Influences on Self-Regulation**

In his early work on reciprocal effects in the parent-child relationship, Bell (1968, 1979) argued that parents do not display rigid or identical behaviors toward their children in every interaction, but instead select behaviors as a response to child behavior and/or in order to motivate changes in child behavior. He believed that to understand parenting influences on child outcomes, one must understand the child characteristics and cues that precede parent responses. Temperament is one major source of individual differences in the child by which parenting may be moderated.

This idea has ties to inferences made by Thomas and Chess (1977), who suggested that positive developmental outcomes result from a “goodness-of-fit” between temperamental characteristics of the child and parenting the child receives. Similarly, Wachs & Gandour (1983) argued against global models of environmental influence on individual outcomes, and instead for a pattern of “organismic specificity” in which different individuals have different reactivity to the same kinds of environmental stimulation. The concept of differential susceptibility (Belsky, Bakermans-Kranenburg, & van Ijzendoorn, 2007; Belsky & Pluess, 2009) also asserts that
particular characteristics of the person, i.e., biological or genetic predispositions, may render them sensitive to environmental input such that they experience the best developmental outcomes when environmental input is high on the positive end, and the worst outcomes when this input is high on the negative end. Each of these views leaves open the possibility that temperament leads not to variations in environment per se, but variations in how environment interacts with the individual.

Extending the arguments above, one might claim that despite differences in temperament, any given child can experience a range of potential parenting environments throughout development, which may in turn promote comparatively better or poorer outcomes. Importantly, however, different temperament traits may lead to relatively greater susceptibility to these differences in quality of parenting environment, or greater susceptibility to specific kinds of parenting. Thus, being at the extreme of a given temperament trait, or having a specific temperament type, may entail greater susceptibility to certain kinds of parenting influences relative to others. In fact, the existence of temperament-by-parenting interactions is implicated by a growing body of research in self-regulatory development.

**Influences on regulation of approach-withdrawal to novelty.** Many researchers have speculated about interactions of parenting and infant/child individual differences in predicting patterns of approach-withdrawal. Much of this research focuses on how parenting may increase or decrease levels of inhibition, anxiety, or social wariness for children higher in inhibited qualities. As mentioned, sensitivity to distress, warmth, and protection may support early inhibited tendencies if these methods of reducing child distress in-the-moment actually support a tendency to disengage from the environment (Degnan & Fox, 2007; Fox et al., 2005). Accordingly, studies have found that for more inhibited children, protective behaviors relate to
greater withdrawal and social difficulties (Kiel & Buss, 2011; Coplan, Arbeau, & Armer, 2008), and very high levels of sensitivity to fear relate to higher levels of anxiety (Mount, Crockenberg, Bárrig Jó, & Wagar, 2010).

Another construct, termed “solicitousness” or “oversolicitousness” has been used to capture parenting behavior that is highly affectionate and warm but also intrusive, controlling, or involves a great deal of spontaneous intervention on the child’s actions (e.g., Degnan, Henderson, Fox, & Rubin, 2008; Rubin, Cheah, & Fox, 2001; Rubin, Hastings, Stewart, Henderson, & Chen, 1997). Frequently interrupting or dominating the child’s attention may represent poor support for the child’s ability to autonomously interact with people and objects in the environment and reduce the child’s opportunities to familiarize and gain competence with these interactions. A sense of competence and mastery over the environment is likely to be particularly crucial for children with inhibited characteristics; thus, over time, solicitous behavior may serve to increase wariness or inhibition. This type of pattern is supported by findings that greater maternal solicitousness related to concurrent and longitudinal consistency in inhibited behavior in fearful or socially reticent toddlers and children (Degnan et al., 2008; Rubin et al., 1997).

Comparatively fewer studies have identified parenting behaviors that relate to decreases in inhibition; however, for children displaying more-inhibited characteristics, positive, sensitive, and supportive parenting in typical mother-child interactions has been found to relate to relatively lower scores in other later measures of inhibition (Coplan et al., 2008; Early et al., 2002; Hane, Cheah, Rubin, & Fox, 2008). In terms of psychobiological responses, observed maternal emotional availability in naturalistic interactions, which across studies included varied ratings of sensitivity, structuring, nonintrusiveness, nonhostility, child responsiveness, and/or
child involvement, related to lower levels of both physiological reactivity via skin conductance to fear-inducing stimuli (Gilissen, Koolstra, van IJzendoorn, Bakermans-Kranenberg, & van der Veer, 2007) and cortisol response to interactions with a novel experimenter (Kertes et al., 2009). Although small, this body of research suggests that high-quality parenting measured naturalistically or in non-distressing contexts may support better regulation of fearful or inhibited responses.

There are several limitations of the present literature examining parental influences on child approach and inhibition that could be addressed in future research. One issue is that very little longitudinal research has examined the effects of parent behavior elicited at the same time as children’s exposure to novel stimuli relative to child temperamental predispositions. Crockenberg and Leerkes (2006) extended their examination of maternal and infant responses to distressing novel stimuli (Crockenberg & Leerkes, 2004) in predicting anxious behaviors in toddlerhood, which included in part the tendency to display timidity or shyness. High distress to the novel stimuli, combined with high activity or a tendency not to look away, was related to later anxious behaviors when mothers displayed lower sensitivity, support, or engagement of the child’s attention away from the stimulus. Kiel and Buss (2011, 2012) found that protective behavior while the child was exposed to novel stimuli mediated associations between child fearful temperament and later shyness/inhibition and social withdrawal, but only when the mother was accurate in predicting their child’s distress or held more parent-centered goals regarding shyness. Further, Kiel, Premo, and Buss (2016) found that mothers’ encouragement of approach during interactions with novel stimuli exhibited a U-shaped relation to social anxiety for extremely inhibited toddlers; displaying either highly protective behavior or highly intrusive or unsupportive encouragement of approach related to greater social anxiety in these children.
These studies suggest that for infants or young children who do display high reactivity and/or distress to novelty, the mother’s supportive or sensitive presence in managing these responses may provide a helpful basis for self-regulating future anxious or fearful responses. However, a tendency to behave protectively or to intrusively encourage approach, and in turn limit the child’s opportunities to engage in well-supported or self-managed interactions with novel stimuli, may help to maintain these inhibited tendencies. Nonetheless, these studies focused more on how parenting relates to putatively problematic sequelae of inhibition rather than inhibited characteristics per se, so it is unclear how parenting behavior with novel stimuli contributes to ordinary temperamental dispositions.

A second limitation is that researchers tend to examine children’s responses to novel stimuli presented spontaneously or introduced by an experimenter, but not introduced by the parent. It appears that no studies have examined variation in parents’ elicited behavior while introducing novel stimuli to their child, and if this has an influence on the child’s approach/withdrawal tendencies over time. Given that parents appear to be important socializers of children’s in-the-moment responses to novelty, this behavior may certainly have meaning for these longitudinal patterns of approach and inhibition.

An additional limitation of developmental studies on children’s (un)inhibited tendencies is that, with the exception of research by Buss and colleagues (Kiel & Buss, 2011; 2012; Kiel et al., 2016), none of the reviewed studies examined parent-by-temperament interactions based on data collected before preschool age. Temperamental and/or early personality characteristics evidence stronger stability starting in the toddler if not preschool years (Neppl et al., 2010; Shiner & Caspi, 2003), thus the way that parents introduce their children to novel stimuli during the first two years of life should be expected to make contributions to children’s developing
approach-withdrawal tendencies that are distinct from those captured by current research.

Lastly, and importantly, much of the research on parenting influences on approach-withdrawal tendencies focuses largely on inhibition, or how parenting behavior may be relatively more impactful for inhibited children, with little attention to how parenting may influence approach-withdrawal patterns in children who are relatively more approach-oriented. Parents’ behavior during approach-oriented children’s interactions with novel stimuli could encourage greater levels of approach over time, or perhaps discourage bold or risky approach. Again, because existing research on the socialization of approach-withdrawal behavior tends not to form and test hypotheses with both inhibited and approach-oriented temperament in mind, there are many parenting behaviors that may be examined to address this issue.

**Influences on effortful behavioral self-regulation and conscience.** Kochanska (1991, 1993, 1995) was among the first researchers to acknowledge the possibility of specificity in temperament and parenting in predicting children’s self-regulated responses in the realm of conscience development. She proposed that conscience involves two separate components that are subject to developmental processes and temperamental influences. An affective discomfort component involves the tendency to experience a sense of anxiety or discomfort in reference to transgressions. It was assumed that relatively more temperamentally anxious or fearful children (characteristics of the inhibited temperament type) might experience the greatest levels of affective discomfort and require fewer cues from parents in order to experience this type of arousal, so harsh or power-assertive discipline in response to transgressions would be thought to lead to over-arousal and prevent internalization of the parent message. It was proposed that gentle discipline deemphasizing power would be a more effective socialization practice for promoting conscience in more fearful children.
The second proposed component of conscience was a behavioral control component that allows the child to comply with parental requests and enact appropriate behavior. This component was thought to be a relatively greater influence on the conscience development of less-anxious or relatively fearless children (characteristics of the exuberant temperament type). Cues of transgression would typically not elicit affective discomfort as easily in these children; however, power-assertive discipline is also presumed ineffective by eliciting angry or noncompliant responses. Instead, a mutually cooperative and affectively positive parent-child relationship (e.g., MRO, secure attachment) was thought to be more predictive of conscience development in relatively fearless children by capitalizing on rewarding parent-child interactions that encourage positive regard for the parent and compliance to parental requests.

This line of thought has been empirically tested, and the results suggest that better conscience development (rule-compliant behavior in absence of supervision, prosocial/nonaggressive responses to hypothetical narratives) is more strongly predicted by gentle discipline behavior for relatively fearful children and by level of MRO or attachment security for relatively fearless children (Kochanska, 1995; 1997a; Fowles & Kochanska, 2000). A later study (Kochanska, Aksan, & Joy, 2007) examining the outcomes of moral self and receptive stance to parents confirmed that the effects of positive relationships were significant only for fearless children, but also found that the negative effects of power assertion (examined in place of gentle discipline) were significant only for fearful children. Together, these studies provided evidence that variations in temperament lead to variations in the influence of specific parenting and parent-child relationship qualities on children’s developing conscience. However, although parenting researchers frequently cite these findings when acknowledging the role of temperament in self-regulatory or conscience socialization (Teti & Candelaria, 2002; Thompson,
2014; Thompson, Meyer, & McGinley, 2006; Putnam, Sanson, & Rothbart, 2002), very few researchers have sought to replicate these effects in other samples or using other measures. Existing research on temperament-based effects of parenting on self-regulatory outcomes tends to instead predict indicators of poor regulatory functioning, such as externalizing problems, aggression, or disruptive behavior. Further, these studies tend to focus mainly on parenting effects that vary with qualities more reflective of temperamental surgency or exuberance, like approach, impulsivity, frustration reactivity, low fearfulness, or low punishment-sensitivity. Negative, harsh, or low-responsive parenting has been found to have stronger relations to externalizing and disruptive behavior problems in children with exuberant qualities (Degnan, Calkins, Keane, & Hill-Soderlund, 2008; Erath, El-Sheikh, & Cummings, 2009; Gilliom & Shaw, 2004; Lahey et al., 2008; Lengua, 2008; Leve, Kim, & Pears, 2005; Root & Stifter, 2010). Studies on parent variables that promote better self-regulation based on temperament are comparatively limited.

Importantly, there are also few studies examining differential socialization effects on conscience or behavioral control outcomes based on more coherent measures of temperament such as temperament profiles or types or, further, that include comparisons among children of inhibited and exuberant temperament types. One exception is a line of research utilizing the inhibited, exuberant, and low-reactive toddler temperament types identified by Putnam and Stifter (2005). Cipriano and Stifter (2010) found that gentle discipline behaviors in a frustration task in toddlerhood had the strongest relations to childhood effortful control for the exuberant temperament group. Command/prohibitive statements spoken with a positive tone of voice related to better observed behavioral control, whereas redirecting/reasoning statements spoken in a neutral tone related to poorer parent-reported effortful control. Augustine and Stifter (2015)
examined these parenting data in predicting later conscience outcomes, and found that effects of different gentle discipline behaviors varied with temperament type. Better-regulated moral behavior in childhood was predicted by maternal commands and redirection behaviors for the exuberant group, and by reasoning and ignoring behaviors for the inhibited group, with no significant effects for the low-reactive group (although these effects further varied with parenting context; see later). Conway and Stifter (2012) examined mothers’ attention-directing behaviors with these children in a problem-solving task also in toddlerhood. Mothers’ tendency to maintain the child’s focus on the task related to greater cognitive effortful control for children classified as inhibited or exuberant, but not low-reactive. Mothers’ tendency to redirect the child’s focus while the child was on-task, however, had significant negative relations with both cognitive and behavioral effortful control for the inhibited group. Importantly, despite the fact that these studies all found temperament-specific outcomes of maternal behavior, they all sought to compare specific expressions of just one form of parenting behavior (e.g., gentle discipline, control of child’s attention), and do not compare contributions of more overarching forms of parenting quality on self-regulatory outcomes. Given motivational differences among children of differing temperament types and the potential for distinct parenting behaviors to differentially appeal to these motivations, comparisons of the effects of higher-order parenting constructs would provide important information about temperament-based socialization of self-regulatory outcomes.

**The Role of Contextual Variation in Socialization Research**

There are compelling reasons to examine contributions of temperament to patterns and outcomes of parental socialization, particularly in making comparisons among the effects of different parenting constructs for children of differing temperament types. However, another
important potential distinction to highlight in socialization research is the fact that the effects of parenting behavior may also vary with the contexts in which they are displayed. This idea has been alluded to by many parent socialization researchers who acknowledge that different situations may involve different goals, motivations, or needs on the part of the child and/or the parent, which may then influence the meaning of these interactions for the child’s internalization of external demands (e.g., Dix, 1991; 1992; Grusec & Davidov, 2010; Grusec & Goodnow, 1994; Grusec, Goodnow, & Kuczynski, 2000). Differences in contextual content or meaning may thus have different meaning for children’s developing self-regulation.

Level of contextual novelty or threat is a factor relevant to developing regulation of approach-withdrawal responses. Different contexts may elicit differing momentary responses in infants and children, and these differing responses may differentially predict later approach-withdrawal behavior. Buss (2011) examined children’s responses to novel tasks of varying threat level, and found that toddlers tended to display higher fear and lower engagement as threat increased. However, a less-common tendency to display higher levels of fear and withdrawal behavior to low-threat compared to high-threat contexts was a significant predictor of concurrent and later anxiety. Dollar and Buss (2014) also examined outcomes of variations in approach and positive affect to contexts varying in threat level, and found that higher approach behavior in non-threat or low-threat contexts related to externalizing problems for toddlers who also displayed higher positive affect, whereas higher approach behavior in moderate-threat contexts related to fewer internalizing problems for toddlers who displayed lower positive affect. Based on these differences, it is possible that parenting behavior in reference to novel stimuli may also have different influences based on the level of intensity or threat indicated by the stimuli. In support of this idea, Kiel and Buss (2012) found that mothers’ displays of protective behavior
while the child was exposed to low-threat, but not high-threat, novel stimuli related to fearful temperament and later social withdrawal. Thus, although research on parenting behavior with novel stimuli is currently limited, contextual variation in novelty is an important factor to incorporate into such research.

Variations in contextual regulatory goals or structure may have meaning for measuring and predicting children’s behavioral control and conscience, though this is also not well-studied. One distinction examined in a few studies is that between “do” and “don’t” contexts, that is, contexts in which the child is asked to sustain a tedious or undesired behavior (“do”) compared to those in which s/he is asked to inhibit a desired but prohibited behavior (“don’t”) (Kochanska & Aksan, 1995; Kochanska, Coy, & Murray, 2001). It is assumed that “do” contexts pose a greater regulatory challenge for young children, and in fact eager or spontaneous compliance to parental requests in “do” tasks is found to be lower and to increase in frequency at a slower rate from toddler to preschool age compared to that in “don’t” tasks. Parenting behaviors may have a differing influence on developing child regulatory skills when assessed in contexts involving different regulatory rules, but this question has not been well-addressed. Kochanska, Aksan, and Nichols (2003) found that power assertive discipline in “don’t” tasks compared to “do” tasks had stronger relations to children’s (poorer) regulatory outcomes. Augustine and Stifter (2015) compared gentle discipline behaviors in “do” and “don’t” tasks when predicting moral behavior based on temperament type. It was assumed that differences in inhibited and exuberant children’s inhibitory tendencies might lead to differences in the effects of parenting based on “do” and “don’t” goals. The previously-mentioned effects of specific gentle discipline behaviors were found to be significant, but only when assessed in the “don’t” context for exuberant children, and in the “do” context for inhibited children.
Another important contextual regulatory distinction to consider is the difference between parent-child interactive contexts that involve specific regulatory goals or expectations, such as waiting tasks, clean-up tasks, or teaching tasks, compared to contexts that involve no inherent structure, such as free play. One might intuitively assume that tasks with clear regulatory demands may afford more opportunity to learn and practice regulatory skills, thus parenting behavior in these contexts might better predict self-regulatory behavior over time. Unstructured tasks, however, may give children the opportunity to engage in more positive interactions with socialization agents that set the stage for receptive, cooperative compliance to external requests. These tasks may also allow the parent to spontaneously scaffold or structure the child’s behavior with less perceived conflict between parent and child agenda by either partner.

Although it is argued that the effects of parenting in different settings could apply to different “domains” of functioning (Grusec & Davidov, 2010), few studies have specifically compared parent-child interactions in structured and unstructured tasks. However, some preliminary evidence suggests that parent and/or child behavior could be affected by contextual differences. Individual parenting or interactive variables like mutual compliance, positive affect, and parent control behavior have been found to correlate with one another within a free play context and a context with a more structured goal, but different variables did not strongly, or in most cases significantly, correlate across-context (Calkins, Smith, Gill, & Johnson, 1998; Dennis, 2006; Lindsey, Cremeens, & Caldera, 2010). Further, studies that examined mean differences in parent-child interaction variables found that higher positive affect, lower negative parenting, more parental scaffolding, and more child engagement were displayed in free play relative to a structured task (Kwon, Bingham, Lewsader, Jeon, & Elicker, 2013; Lindsey et al., 2010). Importantly, with the exception of Dennis (2006), these studies did not examine
structured tasks involving a great deal of regulatory challenge for the child, so context
differences might be even larger as relative challenge increases.

Moreover, based on previous research (e.g., Kochanska, 1995; Augustine & Stifter, 2015)
differences in regulatory structure could also contribute to temperament-based parenting
influences. As mentioned, some research suggests that for exuberant children, parental
socialization goals are perhaps best conveyed in a relationship involving higher levels of
reciprocity and affective positivity. Exuberant children may be especially challenged by
structured tasks with regulatory demands that oppose the child’s own approach goals, and more
likely to react to goal opposition with angry or disruptive responses. Thus, although parents of
exuberant children may end up focusing more on controlling or structuring child behaviors
during structured tasks, they may be less likely to display positivity or cooperation, and their
children may be less likely to be receptive to their control. Unstructured tasks could offer
relatively more opportunity for the expression of mutual positivity and responsiveness, with less
overt conflict between parent and child goals that might undermine these qualities. Further,
because of reduced conflict in parent and child goals, it is possible that the parents’ tendency to
display gentle control or guidance in unstructured contexts may actually have positive
implications for developing self-regulatory skills in exuberant children. Thus, unstructured tasks
may be a more representative context from which to assess the effects of parenting quality for
exuberant children. Conversely, it has been found that for inhibited children, parental gentle
discipline behaviors displayed in relatively more-challenging structured tasks relate more
strongly to later conscience outcomes (Augustine & Stifter, 2015), because these parental
interventions may help inhibited children to build additional skills upon their existing inhibitory
advantages. Thus, structured tasks may still be a more representative context to assess parenting
behaviors that may influence inhibited children’s developing conscience and self-regulatory functioning.

To our knowledge, only one study to date (Dennis, 2006) examined multiple parenting behaviors across unstructured and structured task contexts accounting for differences in child temperament. Relevant to this dissertation, maternal behavior in a free play and waiting task related to concurrent observed emotional self-regulation and mother-reported compliance differently for low- and high-approach children. However, a detailed examination of temperament- and context-based differences of both parent and child behavior was not of interest in this study, thus the relevance of contextual structure for in-the-moment socialization interactions is still unconfirmed. Further, this study did not examine longitudinal outcomes of these differences to also confirm that contextual structure in socialization interactions influences prediction to long-term self-regulatory development. Each of these explorations would provide important information about temperament-based influences of parenting behaviors on developing self-regulation.

**Aims of the Dissertation Project**

Based on this review of the literature, the present dissertation project sought to contribute to the body of research on temperament, parenting, and self-regulatory development by examining novel context-based interactions of parenting and temperament relevant to variations in child regulation of approach-withdrawal, conscience, and behavioral regulation. This project took the form of three empirical papers, each of which examined parenting and context in tandem with temperament utilizing data from infancy, toddlerhood, and/or the preschool years.

Figure 1 presents a basic conceptual and longitudinal model linking the three dissertation studies based on their primary constructs of interest.
The aim of Paper 1 was to explore comparisons of parenting behaviors and assessment contexts in predicting toddlers’ development of approach-withdrawal tendencies in the second year of life. Infant temperamental approach tendencies and parenting behaviors when introducing low- and high-intensity novel toys were assessed in infancy (12 months), and were used to predict toddler (18 months) approach-withdrawal responses to low- and high-intensity novel contexts. This study contributes to the temperament and parenting literatures by exploring how both varying parenting behaviors surrounding novel stimuli as well as variations in contextual novelty influence the development of early regulation of approach-withdrawal responses to novelty.

The aim of Paper 2 was to conduct an in-depth comparison of parent and child responses based on variations in child temperament and parenting context in toddlerhood (18 months), an important time for the emergence of self-regulatory skills. Based on toddler affective and approach-withdrawal responses to novelty, latent profile analysis was used to identify inhibited, exuberant, and average-approach temperament groups. Parent and child affect, responsiveness, and control were observed in an unstructured free play context, followed by a structured clean-up context at the same time point. This study sought to confirm the existence of context-based variation in mother and child behaviors relevant to relationship quality and socialization outcomes. Further, this study examined if contextual variation in and relations between parent and child responses depends on child temperament, with implications for our understanding of children’s internalization of conscience and self-regulatory expectations.

The aim of Paper 3 was to report on a longitudinal examination of context-based maternal socialization effects for children of differing temperament types. Mother-child mutual positivity/responsiveness and maternal control/structuring behavior in the unstructured free play
and structured cleanup tasks in toddlerhood (18 months) were used to predict behavioral measures of self-regulation and conscience in preschool (4.5 years) based on toddler (18 months) temperament group status. This study tested the hypothesis that different socialization behaviors displayed in different contexts will have relatively stronger or weaker relations to these self-regulatory outcomes based on child temperament.

**The Back to Baby Basics / B2BB Kids Project**

The data for this dissertation were drawn from the Back to Baby Basics Project, now B2BB Kids Project, a longitudinal study of temperament and socioemotional and physical development. Families were recruited into the study when the target child was 4-6 months of age. No initial screening process took place with respect to temperament, thus participants were not over-selected for any particular temperamental traits.

**Wave structure and sample sizes.** Recruitment and participation in this study has taken place over two separate waves of data collection. The first wave (Wave 1) of participants includes 103 families, and the second wave (Wave 2) includes 44 additional families who were recruited into the study approximately two years later. Despite this 2-year age difference, Wave 1 and Wave 2 infants and mothers participated in identical procedures during lab visits when the infants were 6, 12, and 18 months of age.

Additional funding was secured to gather follow-up data in preschool and school ages. Relevant to this dissertation, all Wave 1 participants who completed at least two of the three infant lab visits were invited to return for two additional lab visits when the child was 4.5 years of age. Among the 96 eligible families, 82 returned for 4.5-year lab visits. Wave 2 participants have been invited to participate in 4.5-year lab visits in a similar manner; however, these visits are currently ongoing.
Due to the two-wave structure of the study, sample sizes differ across the proposed dissertation papers. Paper 1 focuses on procedures from the 12- and 18-month lab visits, thus data from the full sample of Wave 1 and Wave 2 participants will be utilized. Paper 2 focuses on procedures from the 18-month lab visit, thus data from the full sample of Wave 1 and Wave 2 participants will be utilized. However, Paper 3 focuses on procedures from the 18-month and 4.5-year lab visits, so outcome data from only the Wave 1 participants will be utilized.

**18-month temperament assessment and temperament groups.** Among other measures, all three dissertation papers utilized temperament data collected during the 18-month lab visit, which included emotional and behavioral reactions to novel objects and people.

Paper 1 utilizes responses to a risk room and clown interaction as two outcome measures of responses to novelty based on earlier approach reactivity and parenting measures. Three coded temperament indicators, positive affect, negative affect, and proximity to mother were selected for use based on internal consistency. Each indicator was coded on a continuous scale, and the continuous nature of these indicators was maintained to create continuous composite variables reflecting relative responses. These 18-month temperament composites were then regressed on 12-month predictors.

Papers 2 and 3 utilize a person-oriented temperament assessment conducted using latent profile analysis (LPA; Lazarsfeld & Henry, 1968). LPA is a form of structural equation mixture modeling in which mutually-exclusive and exhaustive classes of a latent variable are estimated from multiple observed indicators measured on a continuous scale using maximum likelihood estimation. A person-oriented approach was selected for this temperament assessment based on the expectation, as summarized in the previous literature review, that children tend to display coherent patterns of temperamental characteristics reflecting specific temperament types. LPA
was selected for this temperament assessment over similar analyses like latent class analysis (e.g., Collins & Lanza, 2010) because continuous response scores were expected to better represent relative differences in temperamental characteristics than discrete response categories. This analysis utilized observations from the risk room context at 18 months. The observed indicators used to represent the latent temperament construct in these studies were positive affect, negative affect, proximity to mother, latency to play, total time playing, level of engagement with the risk room objects, activity level, and spontaneous vocalization scores. Based on previous research (Putnam, Stifter, 2005; Dollar, Stifter, & Buss, under review), it was predicted that the latent temperament variable would fit a three-class solution reflecting an inhibited, exuberant, and average/moderate approach types.

A detailed description of the LPA indicators, fit statistics, model comparison process, and profile size and composition is provided in Studies 2 and 3. A 4-class solution was found to have the best fit to the data, and interpretation of estimated means for the temperament indicators suggested that the profiles conform to high-inhibited (very high negative affect, low positive affect, very high withdrawal), inhibited (higher negative affect, low positive affect, higher withdrawal), average approach (moderate levels of reactivity), and exuberant (low negative affect, higher positive affect, higher approach) patterns. The high-inhibited class had a very small group size and was distinguished from the inhibited group primarily based on differences in negative affect, thus this group was collapsed with the inhibited group for the purposes of statistical analyses. As detailed in Papers 2 and 3, the classified temperament groups used in analyses were found to display significantly different responses from one another in the expected direction on a majority or all observed responses in the risk room task.
**Paper 1 note.** Paper 1 of this dissertation proposal was accepted to a special issue on Child Personality in the *Journal of Research on Personality*. Two earlier versions of this paper underwent peer review and the paper included in this dissertation represents a revised and accepted manuscript that incorporates reviewer and editor feedback.
References


Coplan, R. J., Arbeau, K. A., & Armer, M. (2008). Don’t fret, be supportive! Maternal characteristics linking child shyness to psychosocial and school adjustment in


contributions to children’s acquisition of values. *Child Development, 71*, 205–211.


Science and Practice, 10, 241–257.


Stifter, C. A., & Augustine, M. E. (under review). The role of positive emotions in child
development: A developmental treatment of the broaden and build theory. *Child Development Perspectives.*


applications (2nd ed.). New York, NY: Guilford Press.


Figure 1. Basic conceptual model of dissertation project constructs of interest and study aims.

1Dotted outline indicates construct was observed in multiple interaction contexts.

2Study 2 utilized data on child temperamental responses to novelty from one context only.
STUDY 1:
Predicting toddler temperamental approach-withdrawal: Contributions of early approach tendencies, parenting behavior, and contextual novelty

Temperamental characteristics in infancy and childhood are believed to be a core basis for later personality development (Rothbart & Ahadi, 1994; Rothbart & Bates, 2006). Temperament, here defined as individual differences in reactivity and self-regulation, involves patterns of behavior and emotion that show relative consistency over time. One quality implicated throughout development is the tendency to approach or withdraw from novel stimuli. Researchers studying infants’ responses to novel objects (Putnam & Stifter, 2002, 2005; Rothbart, 1988) have found that infants display increasing inhibition of approach to novelty in the second half of the first year of life. Specifically, infants’ inhibition of approach (i.e., latency to reach or grasp) to high-intensity novel objects (i.e., objects involving high stimulation such as flashing lights, movement, or sounds) tends to increase over this time period, as does the amount of variation in responses across infants. In addition, these individual differences in responses to novel objects have been related to later approach-withdrawal behaviors. For example, Putnam and Stifter (2005) showed that individual differences in latency to reach for novel objects at the end of the first year of life related to patterns of approach-withdrawal as well as positive and negative emotional responses to novelty in toddlerhood, indicating some consistency across the second year of life. It is important to consider, however, that these significant relations from infancy to toddlerhood were modest (rs = .21-.33), suggesting that infants do not maintain an identical rank-order distribution from early to later measures of approach-withdrawal.

One potential explanation for this inconsistency is that early individual differences in temperamental approach to novel stimuli are better-reflected by other temporal responses. For
example, the tendency to quickly approach novel stimuli is distinct from the tendency to also persist in exploring and engaging with novel stimuli. Active exploration of novel stimuli and environments is also thought to reflect greater approach tendencies (e.g., Rothbart & Ahadi, 1994), and exploration or manipulation of novel objects within reach is considered a separate marker of positive behavioral response in other observational measures of temperament (e.g., Goldsmith & Rothbart, 1999). Exploration may perhaps generate more instances of enjoyable interaction with stimuli in the environment over time, thus better maintaining approach motivation. Exploration thus appears to be an additionally valuable marker of early temperamental approach to consider in relation to developmental outcomes.

Another explanation is that infants have the potential for change in their temperamental predispositions. Research in early personality suggests that stability coefficients tend to increase through early development, with relatively greater stability found after the preschool years (Neppl et al., 2010; Shiner & Caspi, 2003). Infants may thus evidence some changes in their developing expression of early temperamental approach-withdrawal based on early experiences. Environmental influences and temperament-by-environment interactions have often been implicated in models of temperament through development (see Kiff, Lengua, & Zalewski, 2011; Putnam, Sanson, & Rothbart, 2002; Rothbart & Bates, 2006). Parenting may be one major extrinsic contribution to this variation, due to either direct or temperament-specific influences.

First, parent behavior is found to have direct associations with infants’ concurrent and later responses to novelty. Infants and children are found to make attempts to involve the parent in their interactions with novel objects (Mayes, Carter, & Stubbe, 1993), including objects intended to elicit fearful approach-withdrawal responses (Diener & Mangelsdorf, 1999). Because of this, the manner in which parents introduce infants to novel objects may be important to
consider when understanding developing patterns of approach-withdrawal in infancy. Past research highlights parental sensitivity, positive affect, and stimulation as three major patterns of behavior relevant to this outcome.

High maternal sensitivity/non-intrusiveness in naturalistic parenting contexts has been found to relate to lower levels of child fear or withdrawal to novelty (Hane & Fox, 2006) and slower growth in fear reactivity in infancy (Braungart-Rieker, Hill-Soderland, & Karrass, 2010). Particular to parent-child interactions surrounding novel stimuli, Crockenberg and Leerkes (2004) showed that in a task in which 6-month-old infants were exposed to novel toys that were highly-stimulating and might easily elicit infant distress, mothers’ putative regulatory behaviors (e.g., distraction, support while infant engaged with object) related to in-the-moment reductions in infant distress responses. Together these findings suggest that parents’ ability to respond contingently and appropriately to infant cues surrounding novel stimuli could help infants to have more positive or engaged responses, but no study has examined longitudinal relations between maternal sensitivity in novel contexts and later approach-withdrawal responses.

Several studies have found that parents’ positive affective displays when introducing novel objects related to their infants’ and children’s tendency to engage with these objects in the immediate or near future (Dubi, Rapee, Emerton, & Schniering, 2008; Gerull & Rapee, 2002; Gunnar & Stone, 1984; Hornik, Risenhoover, & Gunnar, 1987). However, it is not clear if displays of positive affect with novel stimuli relate to infants’ patterns of behavior over greater periods of time.

There is also evidence that mothers’ stimulating behaviors and attempts to engage their child with novel objects, such as demonstrating movement, sound, or tactile features of the object in order to facilitate interactions between the object and child, may influence subsequent
child responses. Mothers appear to structure their behavior in specialized ways when introducing infants to novel objects (Brand, Baldwin, & Ashburn, 2002). Compared to behavior with adult partners, they put objects closer to infants, made larger movements, and displayed more enthusiastic, interactive, simplistic, and repetitive behavior. Joint engagement with novel objects has also been shown to relate to the tendency for the infant to then engage in solitary object play (Bakeman & Adamson, 1984). Maternal stimulating behavior thus appears to facilitate infant interest with novel objects, and in turn may increase approach behavior.

Secondly, beyond direct effects, these parenting behaviors may relate to approach-withdrawal in ways that vary with temperament-relevant child characteristics. Research examining the influence of parental sensitivity on infant temperamental approach-withdrawal based on early infant individual differences has produced more mixed findings than studies looking at direct effects of sensitivity (Fox, Henderson, Marshall, Nichols, & Ghera, 2005), but the effects may differ with the type of sensitivity measured. Some studies have found that sensitivity specifically in non-distressing tasks relates to less-inhibited behavior in later novel situations for children higher in temperamental inhibition (Early et al., 2002; Panela, Henderson, Hane, Ghera, & Fox, 2012). However, it is important to consider that these studies examined parenting in naturalistic contexts, not specific to novel objects or to situations designed to elicit individual differences in approach-withdrawal. Instead, researchers imply that maternal sensitivity to infants’ distress or withdrawal reactions to novelty could predict stable or increased inhibition, as it may send an implicit message that withdrawal responses are acceptable (Degnan & Fox, 2007; Fox et al., 2005). Conversely, sensitivity for approach-oriented infants may involve reinforcing the tendency to approach novel stimuli. However, to our knowledge, no study has addressed this specific pattern of parental influence.
To date, no longitudinal research has examined temperament-specific associations between maternal positive affect displays and variations in temperamental approach-withdrawal. Positive affective influences may be particularly salient for more approach-oriented infants, as children with higher approach tendencies are thought to have greater sensitivity to reward cues (Carver, Avivi & Laurenceau, 2008; Corr, 2004; Larsen & Augustine, 2008), and accordingly, greater susceptibility to reinforcing parent-child relationship qualities such as mutual positivity (e.g., Kochanska, Akan, & Joy, 2007). Thus, positive affect may relate to even greater approach for these infants, whereas it may not have a meaningful influence on the behavior of low-approach infants.

Temperament-based influences of parents’ tendencies to encourage infant interaction with novel objects through stimulation has also not received much attention in the literature. For infants higher in approach, stimulation may elicit approach tendencies by demonstrating more interesting aspects of the object, and thus serve to increase approach motivations over time. Similarly, it may encourage more approach to novelty for initially low-approach infants by intentionally fostering and guiding interactions between the infant and the novel object. However, researchers have highlighted a construct called maternal solicitousness in studies of infant inhibition or withdrawal that might suggest opposite effects of stimulation for low-approach infants (e.g., Degnan, Henderson, Fox, & Rubin, 2008; Rubin, Cheah, & Fox, 2001; Rubin, Hastings, Stewart, Henderson, & Chen, 1997). Solicitousness includes behaviors like facilitating, controlling, or spontaneously intervening by parents (Degnan et al., 2008; Rubin et al., 1997, 2001), which may create fewer opportunities for the child to practice self-controlled responding. The mother’s control of the novel object in order to encourage child engagement may serve a function similar to solicitous behavior, in that it disrupts self-initiated attempts to
approach or engage with the object for infants not prone to approach, thus predicting less approach over time. More research on this particular behavior is warranted.

Lastly, the effects of parenting may be tied to contexts of measurement. Specifically, because little research on parenting behaviors with novel objects exists, it is also unclear if intensity of novelty of these objects plays a role in the prediction of approach-withdrawal patterns. Much of the research on contextual differences in parenting behavior suggests that children may require less support from parents in tasks involving lower levels of contextual threat or stress, thus parental interventions in low-intensity tasks may actually lead to greater inhibition for low-approach children than interventions in high-intensity tasks. For example, Kiel and Buss (2012) found that maternal protective behavior in low-threat contexts explained the relation between early and later toddler inhibition, whereas protective behavior in a high-threat context was not related to inhibition. Similarly, Rubin et al. (2001) found that higher maternal solicitousness displayed in a low-stress (free play) task related to greater child social reticence (a measure of social inhibition), whereas there was no significant relation from solicitousness in a higher-stress (teaching) context.

As described, parental stimulation may serve a similar role as solicitousness for low-approach infants, so mothers’ tendency to display this behavior when introducing a low-intensity object may predict less approach over time, while displaying the same behaviors with a higher-intensity object may be less meaningful. For high-approach infants, however, mothers’ positive affect and stimulation with a low-intensity toy may actually predict greater approach than that with a high-intensity toy. Although these infants are less likely to display withdrawal responses, they may become bored with objects of low-intensity. Thus positive affect and stimulation may serve to make low-intensity objects more appealing to these infants and increase the likelihood of
approach behavior over time. However, given previous speculation about parental sensitivity as a potential reinforcer of infant approach-withdrawal tendencies in either direction (i.e., reinforcing approach or reinforcing withdrawal), this behavior may have a more significant moderating influence when displayed by mothers while introducing high-intensity objects. These objects may pull for greater differences in approach-withdrawal responses among infants, thus providing more extreme responses that sensitivity may serve to reinforce.

Another important contextual variation to consider is variations in intensity of the outcome measure of approach-withdrawal. As higher-intensity novel objects and situations are found to pull for more variability in approach-withdrawal, it may be the case that the moderating influences of maternal behavior on infant approach-withdrawal are stronger overall when predicting later behavior in a novel context with greater ambiguity or threat compared to one with fewer threat cues. No research to date has considered variation in novelty of both predictor parenting contexts and outcome contexts when examining parenting as a moderator of approach-withdrawal-related behavior.

Taken together, early infant temperament, parent-child interactions with novel objects, and variations in contextual novelty all play a role in predicting approach-withdrawal tendencies throughout infancy. However, very little research has specifically explored these patterns of moderation. This study extends previous research on the development of approach-withdrawal by examining the role of two measures of infant temperamental approach, as well as maternal behaviors during two mother-child interactive contexts that vary in intensity of novelty, in predicting toddler approach-withdrawal tendencies exhibited during two novel contexts that also vary in intensity of novelty. Based on previous research, it was hypothesized that maternal positive affect, stimulation, and sensitivity with novel objects would each relate to more
withdrawal in toddlerhood for low-approach infants, and greater approach for high-approach infants. Further, the moderating effects of maternal positive affect and stimulation were expected to be stronger when observed with a low-intensity novel object, whereas the effects of maternal sensitivity would be stronger when observed with a high-intensity novel object. Lastly, it was hypothesized that all direct and moderating influences would be stronger when predicting toddler approach-withdrawal behavior observed in a higher-intensity novel context compared to a lower-intensity novel context.

Method

Participants

Participants for this study were 146 infants and their mothers recruited for a longitudinal study of emotional development in children. The larger study followed infants from 6 months of age with data collection ongoing to the present; the current study utilized observations of children and mothers when the child was 12 months old and 18 months old. Infants in the original sample were equally distributed by gender (53% male) and primarily Caucasian (95%). Mothers averaged 29.67 years of age at the time of the child’s birth (SD = 4.79 years) with an average of 14.85 years of education (SD = 2.03 years). The majority of mothers (81.8%) were married to the infant’s father. Median annual family income in this sample fell in a category of $40,000-$60,000. All study procedures were approved by the institutional review board and informed consent was obtained from all participants (mothers provided consent on behalf of their infants).

A total of 14 families from the original sample did not participate in the 12- and/or 18-month visits. Compared to the full sample, these mothers tended to have fewer years of education ($t(144)=2.06, p = .04$), but did not differ on other demographic characteristics.
Additionally, due to task administration issues (1 infant) and a request by the parent not to complete the task (1 infant), 2 infants did not have usable data for the clown task. Thus, the final sample size for models examining the risk room (low-intensity) outcome is 132 and the final sample size for the clown (high-intensity) outcomes is 130.

**Procedure**

**12 month assessment.** Mothers and infants participated in a laboratory visit within approximately two weeks of the child’s first birthday (12 months of age). Relevant to this study, infants participated in a temperamental approach assessment, and mothers and infants participated in a joint novel toy interaction.

**Toy reach task.** To assess infant temperamental approach, infants took part in a toy reach task (Rothbart, 1988; Putnam & Stifter, 2002). Infants were seated in a high chair, and were presented with trays from behind that contained low intensity novel objects (plastic teacup, plastic saucer, wooden block) and high-intensity novel objects (flashing light toy, plastic musical-playing toy bottle, and wind-up butterfly toy). Each tray was presented twice, in a low-high-low-high alternating pattern. Each presentation lasted 30 seconds. Infant behavior in response to the high-intensity trays was utilized as a measure of individual differences in early approach to novelty.

**Novel toy interaction.** To assess maternal behavior with novel objects, mothers and infants participated in a novel toy interaction (following Fish, Stifter, & Belsky, 1993; Gunnar & Stone, 1984) with one low-intensity object (stuffed snail toy), and one high-intensity object (shaking bumble ball toy). The mother and infant sat on the floor of a laboratory play room; for each interaction the experimenter handed the mother the toy, asked her to play with her child and this toy for about one minute with no further instructions, left the room, and returned after one
minute. They interacted with the low-intensity toy prior to the high-intensity toy, and between toy interactions the experimenter took away the current toy before handing the next toy to the mother.

**18 month assessment.** Mothers and infants participated in a second laboratory visit 6 months later (within two weeks of when the infant turned 18 months of age). Relevant to this study, infants participated in a risk room and clown interaction in order to observe later approach-withdrawal in two separate contexts. Both tasks were adapted from the Laboratory Temperament Assessment Battery (Lab-TAB; Goldsmith, Reilly, Lemery, Longley, & Prescott, 1994) and other observational assessments of infant and child temperament (e.g., Buss, 2011; Calkins & Fox, 1992). Because of the young age of participants, the mother was present in the room during each of these interactions.

**Risk room.** In this task, the infant and mother were invited to enter a laboratory room filled with a number of novel objects, including a small pop-up tunnel, a set of steps, a black box with “teeth,” and a gorilla mask on a table. The mother was asked to sit in a chair in the corner of the room and allow the infant to interact with the room. After 3 minutes of free exploration, an unfamiliar experimenter entered the room; s/he asked the mother to sit back but did not intentionally approach the infant. Speaking in a positive tone of voice, the experimenter then asked the child to engage with each object (climb through the tunnel, jump from the steps to a small mattress below, put a hand in the black box, pet the gorilla mask). The experimenter-present portion of the task was observed as a comparatively low-intensity novel context due to the child’s previous opportunity to warm-up to the room prior to the experimenter interaction and the normal appearance of the experimenter.
**Clown interaction.** At the beginning of this task, the infant and mother were alone in the lab room and the mother was seated in a chair in the same location as the risk room task. An experimenter dressed as a clown (wearing a clown suit, wig, and glasses with a large rubber nose) entered the room and sat on the floor approximately 3 feet from the mother’s chair. The clown sat silently and looked at the floor for 1 minute, initiated a conversation with the mother for 1 minute, then began to blow bubbles and asked the child to pop the bubbles for 2 minutes. The entire clown task was observed for approach-withdrawal behavior due to the immediate introduction of the novel person. Further, this task was considered a high-intensity novel context due to the atypical appearance and behavior of the novel person.

**Infant language assessment.** Due to possible differences in understanding of verbal requests for behavior by the experimenter in the risk room and clown interactions, infants’ receptive vocabulary was assessed using the Bayley Scales of Infant and Toddler Development, Third Edition (Bayley, 2006). Scaled receptive vocabulary scores were created for each infant ($M = 10.33, SD = 3.20$).

**Behavioral Coding**

**12 month assessment.**

**Infant approach to novelty.** Two infant temperamental approach behaviors were coded from the high-intensity toy reach task by trained coders. Following Rothbart (1988) and Putnam and Stifter (2002) latency to reach was coded in seconds, defined as the latency to make intentional forward movements toward the toy. The additional variable of exploration was also coded in seconds, defined as time spent visually engaged with and manipulating (e.g., rotating, sliding, picking up, actively mouthing, banging on the tray). Drift reliability was assessed on 20% of recordings, ICC = .99 for latency, ICC = .97 for exploration. Henceforth, these variables
will be referred to as “infant toy reach latency” and “infant toy reach exploration.”

_Mother behavior with novel objects._ Three mother behaviors were coded throughout both novel toy interactions. These behaviors were coded separately by different teams of trained coders.

Maternal sensitivity was coded following Fish and Stifter (1995). Coders rated the frequency and/or intensity of mothers’ sensitive and contingent responding in 10-second intervals on a 4-point scale from $0 = \text{“None; no response to the infant’s actions or does not attend to the infant’s actions for the majority of the interval,”}$ to $3 = \text{“High/Active; very aware of the infant and contingently responsive to the infant’s interests and affect and/or responds to the infant’s actions with vocalizations or other behaviors showing much greater than minimal attunement with the infant.”}$ Drift reliability was assessed on 22% of recordings, ICC = .81. Maternal sensitivity scores were calculated for each toy interaction as the mean sensitivity level across intervals.

Coders rated the peak level of mothers’ positive affect from their facial affect and vocal tone in 10-second intervals on a 4-point scale from $0 = \text{“None; the mother shows no positive affect, a neutral or blank expression with no smile, and no positive intonation in her voice”}$ to $3 = \text{“High; smile with mouth open widely or intense, loud laugh.”}$ Drift reliability was assessed on 21% of recordings, ICC = .96. Maternal positive affect scores were calculated for each toy interaction as the mean positive affect level across intervals.

Mothers’ level of stimulation with the toy was coded on a second-by-second basis on a 4-point scale from $0 = \text{“No stimulation; not engaging with the toy, or in contact with the toy but not moving it in any way”}$ to $3 = \text{“High stimulation; the mother’s actions with the toy are very intense, with a lot of energy behind them.”}$ Drift reliability was assessed on 22% of recordings,
ICC = .98. Maternal level of stimulation scores were calculated for each toy interaction as the mean stimulation level across total seconds.

As maternal behavior in this task may have been influenced in part by the infant’s willingness to engage or not with the objects, differences in infant behavior was controlled for in the statistical models. Presence of infant engagement with the toy (defined as looking at the toy while manipulating it) was coded in 5-second intervals through each toy interaction. Drift reliability was assessed on 21% of recordings with an average kappa of .90. Infant novel toy engagement scores were calculated for each toy interaction as the proportion of intervals in which the behavior was observed; low-intensity novel toy (snail) $M = .26$, $SD = .20$; high-intensity novel toy (bumble ball) $M = .47$, $SD = .25$.

**18 month assessment.**

**Toddler approach-withdrawal to novelty.** Toddler approach-withdrawal responses to the risk room and clown are expressed through both an affective and behavioral manner (Putnam & Stifter, 2005). To represent the affective response, toddler positive and negative affect were coded from facial affect and vocalizations in 5-second intervals through both tasks by teams of trained coders. Positive affect was coded on a 4-point scale from 0 = “No positive; no indication of positive facial affect and no positive intonation in voice” to 3 = “High positive; highly positive affect such as a smile with mouth open widely, intense laughing, or squealing with delight.” Negative affect was also coded on a 4-point scale from 0 = “No negative: no indication of negative facial affect and no positive intonation in voice” to 3 = “High negative; highly negative affect such as a large grimace with mouth open, extreme crying, or screaming.” Separate teams of coders observed each task. Drift reliability was assessed on 20% of recordings, with an ICC = .98 for risk room and ICC = .98 for clown. Toddler positive and negative affect scores were
calculated for each task as the mean affect level across intervals.

To represent the behavioral response, specifically willingness to approach the novel person, proximity to the mother was coded second-by-second through both tasks by trained teams of coders on a 5-point scale from 1 = “Both hands or a significant part of the body is touching mother” to 5 = “More than two arm lengths from mother.” As such, a high score on this measure represented a greater distance from the mother. Separate teams of coders observed each task. Drift reliability was assessed on 20% of recordings with an ICC = .99 for risk room and ICC = .99 for clown. Toddler proximity scores were calculated for each task as the mean level of proximity to the mother across total seconds.

Because the clown interaction appeared to pull for additional activation of the Fight-Flight-Freeze system (see Corr, 2004), an additional behavior of freezing was coded during this task following Buss (2011). Presence or absence of freezing was coded across the clown interaction in 5-second intervals, defined as being still or rigid in response to stimuli (e.g., child sits completely still, perhaps with stiff limbs, and stillness is not due to a natural orienting response) for more than 2 seconds during the interval. Drift reliability was assessed on 21% of recordings, average kappa = .66. Infant freezing behavior scores were calculated as the proportion of intervals in which freezing behavior was observed.

Analytic Approach

Hierarchical multiple regression models were conducted to test the study hypotheses. All models controlled for infant engagement with the novel toy and 18-month receptive vocabulary.

In each model the control variables (receptive vocabulary and infant novel toy engagement) were entered on the first step, infant toy reach approach behavior (latency to reach or exploration) and the three novel toy maternal behaviors (sensitivity, positive affect,
stimulation) were entered on the second step, and three interaction terms (toy reach task behavior by novel toy maternal behavior) were entered on the third step. Because statistical interactions between toy reach task behaviors, within-toy maternal behaviors, and across-toy maternal behaviors were not of specific interest in this study, these models were kept distinct and three-way and four-way interactions were not examined. Significant interactions were probed by testing the simple slope of maternal behavior at one standard deviation above and below the mean on infant toy reach behavior, and alternatively, the simple slope of toy reach behavior at one standard deviation above and below the mean on maternal behavior.

**Results**

**Preliminary Analyses**

Means and standard deviations of infant (12 month) toy reach behaviors, novel toy maternal behaviors, and toddler (18 month) risk room and clown behaviors are reported in Table 1.1. To confirm the relevance of contextual differences for infant and child behavior, *t*-tests were conducted to compare mean maternal behavior levels in the low-intensity toy interaction and high-intensity toy interaction, as well as mean toddler behavior levels in the risk room and clown tasks. As can be seen in Table 1.1, significant cross-context differences were found for all behaviors of interest.

Prior to examining correlations among the central variables of the study, within-context correlations for toddler behaviors in the risk room and clown task were examined. Consistent with previous research (e.g., Putnam & Stifter, 2005) positive affect and negative affect displays were not significantly related to each other within-context (risk room \( r = -0.07, p = .44 \); clown \( r = -0.14, p = .10 \)). Similarly, freezing and negative affect responses appeared to be independent reflections of withdrawal or inhibition in the clown task \( (r = 0.04, p = .68) \). However, each of these
variables was significantly related to proximity within-task in the expected directions \((rs = \pm .20-.30 \ p \leq .02)\) and positive affect was negatively related to freezing in the clown task \((r = -.32, p < .001)\). Given the correlational patterns within-task, a composite approach-withdrawal variable was created by standardizing the scores of each of these measures (negative affect and freezing were reversed before standardizing), and calculating a mean score for each task. Higher scores represented relatively greater affective and/or behavioral approach displayed in the given task (risk room \(M = 0, SD = .69, range\ -2.66\)-1.66; clown \(M = 0, SD = .63, range\ -2.50\)-1.77).

Correlations among 12-month infant and mother behavior and 18-month risk room and clown approach-withdrawal scores are presented in Table 1.2. Toy reach latency and exploration were highly but not perfectly correlated. Greater toy reach latency and less toy exploration were both related to greater maternal stimulation with the high-intensity novel toy. Maternal positive affect and stimulation were consistent across low- and high-intensity toy interactions but sensitivity was not. Similarly, maternal behaviors were significantly interrelated in the low-intensity novel toy interaction but not in the high-intensity novel toy interaction. Risk room approach-withdrawal and clown approach-withdrawal were significantly related. Infant toy reach latency and toy exploration were not related to toddler risk room and clown approach-withdrawal; however, infant toy exploration was significantly and inversely related to toddler clown approach-withdrawal. No maternal novel toy interaction behavior was significantly related to toddler outcomes; however, there were marginally significant correlations \((p = .07-.08)\) between maternal positive affect with either novel toy and risk room approach-withdrawal, and between maternal sensitivity with the high-intense novel toy and clown approach-withdrawal.
Primary Analyses

**Low-intensity (Risk Room) approach-withdrawal.** Neither of the multiple regression models predicting toddler risk room approach-withdrawal based on toy reach latency and its interaction with maternal behavior were significant. The model predicting toddler risk room approach-withdrawal from infant toy reach exploration and maternal behavior with the low-intensity toy was also not significant. Except for effects of receptive vocabulary, no single predictor accounted for significant unique variance in the outcome in any of these models. However, the model predicting risk room approach-withdrawal from infant toy reach exploration and maternal behavior with the high-intensity toy was significant. Toy reach exploration and maternal behavior did not make a significant contribution to the model, but the interaction of exploration and maternal positive affect was significant (see Table 1.3 for final model).

Probing of this interaction for the simple effects of maternal behavior revealed that for infants who displayed more toy reach exploration, higher maternal positive affect during the high-intensity novel toy interaction related to significantly higher risk room approach in toddlerhood, $B = .35, t = 2.30, p = .02$ (see Figure 1.1). The simple effect of maternal positive affect was not significant for infants who displayed less toy reach exploration, $B = -.09, t = - .63, p = .53$. Further, alternate probing of the interaction revealed that more toy reach exploration related to significantly higher risk room approach at higher levels of maternal positive affect ($B = .03, t = 2.22, p = .03$) but not at lower levels ($B = -.01, t = - .74, p = .46$).

**3.2.2 High-intensity (Clown) approach.** Neither of the multiple regression models predicting toddler clown approach-withdrawal based on toy reach latency and its interaction with maternal behavior were significant. The model predicting toddler clown approach-withdrawal from infant toy reach exploration and maternal behavior with the high-intensity toy was also not
significant. No single predictor accounted for significant unique variance in the outcome in any of these models. However, the model predicting toddler clown approach-withdrawal from infant toy reach exploration and maternal behavior with the low-intensity toy was significant. A significant main effect of maternal stimulation was qualified by a significant interaction of toy reach exploration and maternal stimulation (see Table 1.4 for final model).

Probing of this interaction revealed that for infants who displayed less toy reach exploration, higher maternal stimulation during the low-intensity novel toy interaction related to significantly more clown withdrawal in toddlerhood, $B = -1.54$, $t = -2.89$, $p = .005$ (see Figure 1.2). The simple effect of stimulation was not significant for infants who displayed more exploration, $B = 0.33$, $t = .98$, $p = .33$. Further, alternate probing of the interaction revealed that less toy reach exploration related to significantly more clown withdrawal at higher levels of maternal stimulation ($B = -.05$, $t = 3.54$, $p < .001$) but not at lower levels ($B = .02$, $t = 1.25$, $p = .21$).

**Addressing Type II error risk.** Due to the large number of predictors in each model relative to sample size, there is a risk for Type II error in detecting effects of single behaviors or interaction terms. To address this risk, models were re-examined separately by maternal behavior. The results were unchanged from the full models.

**Discussion**

This study is the first to examine moderating influences of specific maternal behaviors when introducing novel objects on longitudinal patterns of approach-withdrawal, as well as context-specificity in these patterns of effects. Based on previous research, it was predicted that maternal sensitivity, positive affect, and stimulation with novel toys would relate to more toddler withdrawal behavior for low-approach infants, and perhaps greater toddler approach behavior for
high-approach infants. However, it was expected that the effect of maternal positive affect and stimulation would be stronger when observed in a low-intensity context, while the effects of maternal sensitivity would be stronger when observed in a high-intensity context. Lastly, it was expected that these patterns of moderation would be more predictive of toddler approach-withdrawal observed in a high-intensity novel context compared to a low-intensity novel context. The results are largely consistent with the prediction that there would be specific effects based on temperament, maternal behavior, and context, though with some important distinctions.

There were relatively weak relations between infant and toddler measures of approach-withdrawal. Among the two infant temperamental approach measures, toy reach latency to reach and exploration, only the amount of time infants explored novel objects was correlated with either toddler approach-withdrawal outcome, and only this behavior significantly interacted with maternal behavior to predict toddler approach-withdrawal. Whereas latency to reach represents a willingness to readily initiate approach to novel stimuli, these results support the idea that a tendency to persist in observing and manipulating highly stimulating novel objects may better predict a motivation to approach novel stimuli in the future, even if weakly. This speaks to the importance of examining multiple indicators of early temperament. Further, based on the findings relative to maternal behavior, individual differences in exploration of novel objects may be more relevant to parent-child interactions involving sustained joint engagement with a novel stimulus than the latency to approach novel objects. Taken together, results from the present study indicate that that early indicators of temperament may not evidence rank-order consistency with later measures. Instead, environmental influences such as parenting behavior may help to strengthen these associations over time.

Maternal behavior was found to have a differing pattern of effects for infants relatively
higher and lower in temperamental approach. First, maternal positive affect with the high-intensity toy related to greater approach in the risk room in toddlerhood only for infants higher in approach. This effect is consistent with research suggesting that infants higher in approach tendencies are relatively more susceptible to socialization influences when they experience high levels of mutual positivity in the parent-child relationship (e.g., Kochanska, Akan, & Joy, 2007). Mothers’ positive affect in interactions with novel objects may reinforce high-approach infants’ engagement and enjoyment with novelty and thus predict even greater approach over time. It was tentatively hypothesized that these effects would emerge from mother behavior with the low-intensity novel toy because it may encourage interest even in less-arousing novel stimuli; however, this finding suggests that an interaction with a higher-intensity stimulus is a more salient context of socialization in regard to novelty for high-approach infants. High-approach infants likely experience greater interest or enthusiasm with higher-intensity stimuli, so maternal behaviors that coincide with this interest may be more influential than those with low-intensity stimuli. On the other hand, positive affect appears not to function as such a potent influence on responses for low-approach infants, and thus does not serve to significantly reinforce (or discourage) approach behavior.

Secondly, and consistent with expectations, greater maternal stimulation in the low-intensity novel toy interaction was associated with more withdrawal from the clown for low-approach infants. Somewhat parallel to findings regarding maternal solicitousness in a low-stress context (Rubin et al., 2001), mothers’ tendency to introduce a low-intensity novel object with high levels of stimulation may disrupt a low-approach infant’s opportunity to otherwise self-initiate engagement with the object. This may also prevent opportunities to form a sense of competence in managing interactions with novel stimuli, and discourage the tendency to
approach in future interactions. Maternal stimulation did not have any influence on outcomes for the high-approach infants. The models examining maternal behaviors controlled for infant engagement with the novel toy because it may have precluded opportunities for mother stimulation. Thus, it may be that instances of maternal stimulation simply do not have such a disrupting influence for high-approach infants, who more readily accept or even self-initiate interaction with novel objects.

In terms of outcomes, it was hypothesized infant approach and maternal behaviors would relate more strongly to toddler behavior elicited within a high-intensity novel context. This hypothesis was supported, but only for low-approach infants. As evidenced by the significant mean differences in infant behavior across these two contexts (Table 1.1), the high-intensity (clown) task did appear to pose greater novelty and uncertainty compared to the risk room, and thus may have served as a better context in which to observe how parenting behavior can lead to relatively greater withdrawal in low-approach infants. For high-approach infants, mother interactive behavior was only related to toddler approach-withdrawal during the low-intensity (risk room) task. Because it was less challenging, the risk room may have pulled for experiences of positivity and enjoyment with novelty, and thus captured how parenting behavior can reinforce approach responses for high-approach infants over time. Thus, different forms of maternal behavior explained behavioral variation in each novel context in toddlerhood based on infant approach. This suggests the importance of contexts of measurement in examining approach-withdrawal processes from infancy to toddlerhood.

Maternal behavior had only weak direct relations with the outcome measures of toddler approach-withdrawal. These results were not unexpected given that we hypothesized that effects of maternal behavior during interactions around novelty would vary according to infant
temperamental approach. Importantly, our findings support this expectation. Whereas many studies of parenting influences on approach-withdrawal tend to focus on inhibited tendencies (e.g., Degnan et al., 2008; Kiel & Buss, 2012; Rubin et al., 1997, 2001), the findings of this study also point to parenting influences specific to high-approach or uninhibited infants. Researchers should continue to explore ways in which both low- and high-approach (or inhibited and uninhibited) children develop different approach-withdrawal patterns based on various parenting experiences. Effects of maternal sensitivity, however, were not apparent in these results. No studies have examined maternal sensitivity within a novel toy interaction like that in the present study, in which novel stimuli were introduced by the mother and were expected to elicit a wide range of behavioral responses in infants, rather than consistently high or low levels of distress. Clearer effects of maternal sensitivity may emerge from mother-infant interactions involving more consistent infant responses, particularly distress, to novelty.

This study has a number of strengths, including a longitudinal design, use of observational methods, as well as multiple measures of parenting and temperament across contexts and ages. This study is not without limitations, however. First, mothers were given few instructions for behavior in the novel toy interaction in order to observe more natural responses, but this also led to a somewhat restricted range of observed behaviors. Similarly, these models do not fully account for differences in real-time infant behavior in the novel toy interaction. Future studies should address more intensive examinations of the dynamics of parent and infant behavior within this interactive context. Secondly, because it was necessary to assess the development of approach-withdrawal using age-appropriate measures of temperament, this study does not address responses to identical measures over time. Lastly, this study did not address any experimental manipulations of parenting behavior, limiting the ability to draw causal
conclusions.

In terms of future directions, an appropriate next step would be to examine underlying motivators of mothers’ behavior during mother-infant interactions with novel toys. Both maternal characteristics (Coplan et al., 2008; Hastings, Nuselovici, Rubin, & Cheah, 2010; Kochanska, Friesenborg, Lange, & Martel, 2004) and maternal perceptions of child temperament (Hastings & Rubin, 1999; Kiel & Buss, 2010) have been found to relate to interactive behaviors such as protection, comfort, or shared positivity. Similarly, the elicitation and impact of mother behavior may vary with the degree of shared characteristics among mother and infant. Exploring these patterns of influence may help to further clarify parenting contributions to developing approach-withdrawal tendencies.

Conclusions

In conclusion, the present study explored the influence of mother-infant interactions with novel objects on patterns of temperamental approach-withdrawal from infancy to toddlerhood, addressing previously unexamined influences of multiple parenting behaviors and varying levels of contextual intensity in both parenting and child outcomes. We found that specific parenting behaviors during interactions encompassing novel objects related to individual differences in toddler approach-withdrawal that were relatively more consistent with individual differences in early temperamental approach. These results suggest that parenting behaviors may serve to strengthen, rather than weaken, relations between early and later measures of approach-withdrawal.
References


Review of Psychology, 56, 235-262.


Table 1.1

*Means and Standard Deviations for Primary Study Variables*

<table>
<thead>
<tr>
<th>12-Month Approach</th>
<th></th>
<th></th>
<th></th>
</tr>
</thead>
<tbody>
<tr>
<td></td>
<td>M</td>
<td>SD</td>
<td>Range</td>
</tr>
<tr>
<td>Toy reach latency</td>
<td>5.84</td>
<td>5.48</td>
<td>0-30.00</td>
</tr>
<tr>
<td>Toy reach exploration</td>
<td>22.66</td>
<td>6.67</td>
<td>0-30.00</td>
</tr>
</tbody>
</table>

<table>
<thead>
<tr>
<th>12-Month Novel Toy Interaction Maternal Behaviors</th>
<th>Low-Intensity Toy (Snail)</th>
<th>High-Intensity Toy (Bumble Ball)</th>
<th>Difference t, p-value</th>
</tr>
</thead>
<tbody>
<tr>
<td></td>
<td>M</td>
<td>SD</td>
<td>Range</td>
</tr>
<tr>
<td>Sensitivity</td>
<td>2.20</td>
<td>.27</td>
<td>1.57-2.86</td>
</tr>
<tr>
<td>Positive affect</td>
<td>.64</td>
<td>.53</td>
<td>0-2.00</td>
</tr>
<tr>
<td>Stimulation</td>
<td>.64</td>
<td>.23</td>
<td>.08-1.15</td>
</tr>
</tbody>
</table>

<table>
<thead>
<tr>
<th>18-Month Approach-Withdrawal</th>
<th>Low-Intensity Context (Risk Room)</th>
<th>High-Intensity Context (Clown)</th>
<th>Difference t, p-value</th>
</tr>
</thead>
<tbody>
<tr>
<td></td>
<td>M</td>
<td>SD</td>
<td>Range</td>
</tr>
<tr>
<td>Positive affect</td>
<td>.25</td>
<td>.31</td>
<td>0-1.41</td>
</tr>
<tr>
<td>Negative affect</td>
<td>.04</td>
<td>.11</td>
<td>0-.76</td>
</tr>
<tr>
<td>Proximity</td>
<td>3.85</td>
<td>1.27</td>
<td>1.00-5.00</td>
</tr>
<tr>
<td>Freezing behavior (Clown only)</td>
<td>-</td>
<td>-</td>
<td>-</td>
</tr>
</tbody>
</table>
Table 1.2

*Correlations Among Study Variables*

<table>
<thead>
<tr>
<th>Variable</th>
<th>1</th>
<th>2</th>
<th>3</th>
<th>4</th>
<th>5</th>
<th>6</th>
<th>7</th>
<th>8</th>
<th>9</th>
<th>10</th>
</tr>
</thead>
<tbody>
<tr>
<td>1. Infant toy reach latency to reach</td>
<td>---</td>
<td>- .73**</td>
<td>.02</td>
<td>.07</td>
<td>.06</td>
<td>.07</td>
<td>.11</td>
<td>.24**</td>
<td>- .11</td>
<td>- .12</td>
</tr>
<tr>
<td>2. Infant toy reach exploration</td>
<td>---</td>
<td>.01</td>
<td>-.11</td>
<td>-.09</td>
<td>-.004</td>
<td>-.08</td>
<td>-.22*</td>
<td>.08</td>
<td>.18*</td>
<td></td>
</tr>
<tr>
<td>3. Maternal sensitivity, low-intensity toy</td>
<td>---</td>
<td>.05</td>
<td>.22**</td>
<td>-.003</td>
<td>.24**</td>
<td>.14</td>
<td>- .08</td>
<td>-.02</td>
<td></td>
<td></td>
</tr>
<tr>
<td>4. Maternal sensitivity, high-intensity toy</td>
<td>---</td>
<td>.03</td>
<td>.10</td>
<td>-.03</td>
<td>.10</td>
<td>.11</td>
<td>-.16*</td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>5. Maternal positive affect, low-intensity toy</td>
<td>---</td>
<td>.35**</td>
<td>.18**</td>
<td>-.04</td>
<td>.16*</td>
<td>.08</td>
<td></td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>6. Maternal positive affect, high-intensity toy</td>
<td>---</td>
<td>-.09</td>
<td>-.04</td>
<td>.16*</td>
<td>.03</td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>7. Maternal stimulation, low-intensity toy</td>
<td>---</td>
<td>.19*</td>
<td>-.04</td>
<td>-.08</td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>8. Maternal stimulation, high-intensity toy</td>
<td>---</td>
<td>-.02</td>
<td>-.07</td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>9. Toddler low-intensity (Risk Room) approach-withdrawal</td>
<td>---</td>
<td>.33**</td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>10. Toddler high-intensity (Clown) approach-withdrawal</td>
<td>---</td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
</tr>
</tbody>
</table>

*p < .10; *p < .05, **p < .01
Table 1.3

Multiple Regression Model Predicting Toddler Low-Intensity (Risk Room) Context Approach-Withdrawal from Infant Toy Reach Exploration and High-Intensity Novel Toy Maternal Behavior

<table>
<thead>
<tr>
<th>Step</th>
<th>Variables</th>
<th>B</th>
<th>SE(B)</th>
<th>β</th>
<th>F</th>
<th>R²</th>
</tr>
</thead>
<tbody>
<tr>
<td>1.</td>
<td>Receptive vocabulary</td>
<td>.04</td>
<td>.02</td>
<td>.20*</td>
<td>1.98*</td>
<td>.13</td>
</tr>
<tr>
<td></td>
<td>Low-intensity novel toy infant engagement</td>
<td>.43</td>
<td>.25</td>
<td>.16+</td>
<td></td>
<td></td>
</tr>
<tr>
<td>2.</td>
<td>Toy reach exploration</td>
<td>.01</td>
<td>.01</td>
<td>.09</td>
<td></td>
<td></td>
</tr>
<tr>
<td></td>
<td>Low-intensity novel toy sensitivity</td>
<td>.47</td>
<td>.36</td>
<td>.12</td>
<td></td>
<td></td>
</tr>
<tr>
<td></td>
<td>Low-intensity novel toy positive affect</td>
<td>.13</td>
<td>.10</td>
<td>.12</td>
<td></td>
<td></td>
</tr>
<tr>
<td></td>
<td>Low-intensity novel stimulation</td>
<td>-.06</td>
<td>.45</td>
<td>-.01</td>
<td></td>
<td></td>
</tr>
<tr>
<td>3.</td>
<td>Exploration X Low-intensity sensitivity</td>
<td>-.04</td>
<td>.06</td>
<td>-.06</td>
<td></td>
<td></td>
</tr>
<tr>
<td></td>
<td>Exploration X Low-intensity positive affect</td>
<td>.03</td>
<td>.02</td>
<td>.19*</td>
<td></td>
<td></td>
</tr>
<tr>
<td></td>
<td>Exploration X Low-intensity stimulation</td>
<td>-.02</td>
<td>.04</td>
<td>-.06</td>
<td></td>
<td></td>
</tr>
</tbody>
</table>

+p < .10; *p < .05; **p < .01
Table 1.4

*Multiple Regression Model Predicting Toddler High-Intensity (Clown) Context Approach-Withdrawal from Infant Toy Reach Exploration and Low-Intensity Novel Toy Maternal Behavior*

<table>
<thead>
<tr>
<th>Step</th>
<th>Variables</th>
<th>B</th>
<th>SE(B)</th>
<th>β</th>
<th>F</th>
<th>R²</th>
</tr>
</thead>
<tbody>
<tr>
<td>1.</td>
<td>Receptive vocabulary</td>
<td>.02</td>
<td>.02</td>
<td>.10</td>
<td>2.12*</td>
<td>.14</td>
</tr>
<tr>
<td></td>
<td>Low-intensity novel toy infant engagement</td>
<td>-.16</td>
<td>.31</td>
<td>-.05</td>
<td></td>
<td></td>
</tr>
<tr>
<td>2.</td>
<td>Toy reach exploration</td>
<td>.01</td>
<td>.01</td>
<td>.13</td>
<td></td>
<td></td>
</tr>
<tr>
<td></td>
<td>Low-intensity novel toy sensitivity</td>
<td>-.02</td>
<td>.22</td>
<td>-.01</td>
<td></td>
<td></td>
</tr>
<tr>
<td></td>
<td>Low-intensity novel toy positive affect</td>
<td>.14</td>
<td>.11</td>
<td>.11</td>
<td></td>
<td></td>
</tr>
<tr>
<td></td>
<td>Low-intensity novel stimulation</td>
<td>-.60</td>
<td>.29</td>
<td>-.22*</td>
<td></td>
<td></td>
</tr>
<tr>
<td>3.</td>
<td>Exploration X Low-intensity sensitivity</td>
<td>.04</td>
<td>.04</td>
<td>.10</td>
<td></td>
<td></td>
</tr>
<tr>
<td></td>
<td>Exploration X Low-intensity positive affect</td>
<td>-.02</td>
<td>.03</td>
<td>-.08</td>
<td></td>
<td></td>
</tr>
<tr>
<td></td>
<td>Exploration X Low-intensity stimulation</td>
<td>.14</td>
<td>.05</td>
<td>.29**</td>
<td></td>
<td></td>
</tr>
</tbody>
</table>

*p < .05; **p < .01
Figure 1.1. Effect of maternal positive affect with high-intense novel toy on risk room approach-withdrawal based on toy reach exploration.
**Figure 1.2.** Effect of maternal stimulation with low-intense novel toy on clown approach-withdrawal based on toy reach exploration.
STUDY 2:

The role of child temperament and contextual regulatory goals in mother-child interactions: Implications for early self-regulatory development

Parent-child interactions are a primary source of external support for children’s developing self-regulation, or the ability to enact various strategies and processes to modulate and control behavior, emotions, and cognitions (Vohs & Baumeister, 2011). Parents can provide children with information about acceptable responses, understanding of others’ needs and requests, and support as they learn to apply regulatory skills and competencies (Dunn, 2014; Eisenberg, Smith, & Spinrad, 2014; Kopp, 1982; Laible & Thompson, 2007). Thus, the parent’s ability to forge an effective parent-child relationship bolsters the parent’s ability to socialize the child toward well-regulated responses.

It has been suggested that frequent exchanges of positive affect as well as reciprocal or responsive interactions in the parent-child relationship create a socialization environment in which the child willingly accepts the parental agenda, is more receptive to the parents’ influence over time, and develops a greater sense of cooperation and responsibility to others (Kochanska, 1997b; Russell, Pettit, & Mize, 1998; Thompson, Meyer, & McGinley, 2006). These qualities have been incorporated into the construct of mutually responsive orientation (Kochanska, 1997b; Kochanska, 2002), a dyadic measure of parent-child interaction involving mutual positivity and responsiveness. However, displays of positive affect and responsiveness or reciprocity have also been found to relate in their own right to child behavior indicating better regulatory skills, internalization of external expectations, and concern for other’s needs. For example, mother-child positive affect exchanges related to children’s compliance and responsiveness to maternal requests, adherence to regulatory rules without supervision (internalized conduct), and lower
levels of externalizing problems (Kochanska, Forman, & Coy, 1999; Laible & Thompson, 2000; Lindsey, Cremeens, Colwell, & Caldera, 2009; Lunkenheimer, Olson, Hollenstein, Sameroff, & Winter, 2011; Olson, & Lunkenheimer, 2009). Measures of mother-child responsiveness and mutuality were also related to internalized conduct and empathic responses toward the mother (Kochanska et al., 1999; Lindsey et al., 2009).

The parent’s presence as a source of external control or structure has also been consistently implicated in research on the development of self-regulatory skills or internalization of parental standards (Baumrind, 1966, 1971, 1991; Hoffman, 1975; Kopp, 1982; Maccoby & Martin, 1983). Parents can promote children’s self-regulation of responses by providing consistent guidance about what responses are acceptable and expected from them. Importantly, researchers have demonstrated the effectiveness of gentle or supportive control that deemphasizes power over the child (Hoffman, 1970; Kochanska & Aksan, 1995; Thompson, et al., 2006). More recently it has been suggested that the term “structure” be applied to this type of parenting behavior, as enforcing expectations with supervision and gentle feedback imposes structure on child behavior but does not attempt to control it at all costs (Grolnick & Pomerantz, 2009). Instead, children are able to practice regulatory skills and build competence in controlling their own responses based on the information they receive from parents.

The ways in which these positive, responsive/reciprocal, or control/structuring behaviors manifest to promote better regulatory development at any given time and within any given parent-child dyad is, however, not entirely clear. One major reason for this is that few researchers address the degree to which parenting is tied to interactive contexts. Researchers acknowledge that any given parenting message is subject to the child’s perception of its intent and meaning, that parents may hold different goals for the child in different situations, and that
parenting in different situations may be more or less relevant to different types of functioning in the child (Dix, 1992; Grusec & Davidov, 2010; Grusec & Goodnow, 1994). Accordingly, most studies include observations of parent and child behavior in tasks expected to pull for behavior related to the constructs of interest, or across a range of tasks. Fewer studies intentionally compare parent and child responses across situations that differ in some sort of specific interactive goal.

Relevant to the development of self-regulation, variations in contextual regulatory goals or expectations are worthy of further study. Contexts that require the parent to hold a specific regulatory goal for the child’s behavior could lead to a greater parental motivation to structure child behavior and encourage appropriate responses. Further, when the contextual goal held by the parent requires the child to produce behavior counter to a preferred response, this conflict in goals may lead to higher negativity and non-compliance in the child, more attempts by the child to change the parent’s behavior, and perhaps lower mean levels of positivity and responsive or reciprocal behaviors in the parent. In contrast, situations such as a free play, which involve little overt structure and less perceived conflict between parent and child goals, may encourage fewer parental attempts to structure child behavior, and also allow for greater average displays of positivity and responsive or reciprocal behavior in both parent and child. Presumed context-based elicitations of parent and child responses may factor into the socialization process at large; however, research must first establish what differences exist.

Differences in contextual regulatory structure have been investigated in some studies of self-regulatory development. Kochanska and colleagues (Kochanska & Askan 1995; Kochanska, Aksan & Nichols, 2003; Kochanska, Coy, & Murray, 2001) examined relations between maternal behavior and child regulated behavior in “don’t” tasks, in which the child is instructed
to inhibit a desired or attractive response, and “do” tasks, in which the child is instructed to produce an undesired or tedious response. These studies confirmed that children tend to display greater compliance to external expectations in “don’t” contexts than “do” contexts, as the ability to inhibit approach behavior is thought to precede the ability to intentionally produce behavior. However, results indicated that parental mutuality, gentle control, and power assertion were relatively consistent across these contexts, perhaps because they both involved a regulatory goal.

A few studies have compared mother and child behavior in a context with little regulatory structure, free play, to that in situations with some form of added structure, such as caregiving, teaching, problem-solving, or delay. Individual parenting or interactive variables like positive affect, mutual compliance, and parent control behavior were found to correlate with one another within-context, but different parenting variables did not strongly, or in most cases significantly, correlate across-context (Calkins, Smith, Gill, & Johnson, 1998; Dennis, 2006; Lindsey, Cremeens, & Caldera, 2010). For example, Dennis (2006) found that maternal warmth was positively correlated with maternal control within both a free play task and a delay task, but warmth in one context did not significantly relate to control in the other context. Studies that examined mean differences in parent/child behavior across contexts found that higher shared positive affect, mutual compliance, and child engagement (similar to responsiveness) was displayed in free play relative to a structured task (Kwon, Bingham, Lewsader, Jeon, & Elicker, 2013; Lindsey et al., 2010), though parental responsiveness did not significantly differ in one study (Kwon et al., 2013). This suggests that different configurations of parenting and child behavior may be displayed based on a difference in contextual regulatory structure. Additionally, with the exception of Dennis (2006), these studies did not examine structured tasks specifically intended to challenge children’s self-regulatory skills, so context differences might be even more
apparent with increases in relative regulatory challenge.

Another potential source of variation in the socialization process is child temperament, or individual differences in reactivity and self-regulation (Rothbart & Bates, 2006). Children who display higher temperamental fearfulness, inhibition to novelty, or punishment-sensitivity, typically labeled inhibited (Fox, Henderson, Marshall, Nichols, & Ghera, 2005; Kagan, Reznick, Clarke, Snidman, & Garcia-Coll, 1984; Rothbart & Bates, 2006), may be more likely to adjust behavior to meet external expectations relative to other temperament types. This is explained in part by the fact that their tendency to inhibit responses in the presence of novelty appears to generalize to the ability to intentionally control behavior in other contexts (Aksan and Kochanska, 2004; Kochanska & Knaack, 2003), but also because they are expected to be relatively more concerned about avoiding punishment or discomfort following transgressions (Kochanska, 1993). Compared to children of other temperament types, inhibited children may thus display the highest level of responsiveness to parental requests and fewer negative emotional responses in a structured/regulatory context in general, and parental control behavior may most strongly relate to responsive behaviors in these children (Kochanska, 1997a). In an unstructured context, however, inhibited children may not differ in responses from children of other temperament types.

Alternatively, children who display higher temperamental positive emotionality, fearlessness, activity level, approach to novelty, and reward-sensitivity, typically labeled uninhibited or exuberant (Degnan et al., 2011; Kagan et al., 1984; Polak-Toste & Gunnar, 2006; Putnam & Stifter, 2005; Rothbart & Bates, 2006), may be less likely to self-monitor behavior and self-initiate appropriate responses that conflict with their own goals. Exuberant children are expected to pursue rewarding stimuli and experiences with less focus on the potential
consequences of unacceptable behavior, and may instead tend to react with anger when they sense that their approach goals are blocked (Kochanska, 1993; Polak-Toste & Gunnar, 2006). However, reward-sensitivity may make them particularly likely to seek out and respond to positive, and thus rewarding, parent-child interactions (Kochanska, 1997b). Exuberant children may thus display the highest levels of negative affect, non-compliance, and attempts to change mother behavior when faced with contextual structure/regulatory demands that impose a conflict in parental and child goals, but the highest levels of positive affect and responsiveness to the mother when contextual structure is absent.

Temperament-based differences in child responses could also relate to differences in parenting responses. Differential influences of parenting based on child temperament is a somewhat common topic (see Kiff, Lengua, Zalewski, 2011), so it is important to clarify if parenting or parent-child interactions are also influenced by child temperament. Parents of inhibited children may display fewer control/structuring behaviors in a regulatory context if these children more readily align with expectations, whereas parents of exuberant children may tend to display relatively more control/structuring behaviors and relatively less positive affect or responsive/reciprocal behaviors if these children do not display compliance. However, parents of exuberant children may instead display the highest levels of positive affect and responsive/reciprocal behaviors in unstructured tasks. On the other hand, it is possible that temperament-based differences in child responses do not relate to differences in parent responses. In other words, parents may evidence individual differences in their tendencies to display positive affect and responsiveness/reciprocity or to impose gentle structure on the child’s behavior in a manner that is not tied to child temperament or differences in child responses based on temperament. Augustine and Stifter (2015) observed several maternal gentle control
behaviors in “do” and “don’t” frustration task episodes and found that the level of each control behavior was related to the child’s tendency to engage the mother during the task, but did not differ by child temperament type. Thus, observing parent responses in structured and unstructured contexts provides some meaningful clarification about the nature of parent-child interactions, and specifically, the comparability of parenting behavior displayed in different contexts and with different types of children.

To our knowledge, only Dennis (2006) incorporated child temperament into a study of parent responses in an unstructured (free play) and structured (delay) task. As mentioned, the results of this study suggested that maternal positive affect and control behaviors were not significantly related across these contexts. Child temperament related to differences in behavior in regulatory tasks, such that avoidance (similar to inhibition) related to greater persistence toward task goals, whereas approach tendencies related to greater frustration. However, mean differences in parenting behaviors across tasks were not explicitly tested. Observations of parent and child behavior in the same interactive context were also not of interest in this study, so context- and temperament-based variations in responses in parent and child were not confirmed prior to examining relations across differing parenting and child tasks.

**Current Study**

Research suggests that differences in temperament and contextual regulatory structure could motivate children, and perhaps parents, to behave differently, such that parenting may operate differently in different contexts with different children. However, exploring if and what differences in parent and child behaviors actually exist based on these factors is a significant step to take before exploring the implications of these differences for the development of child self-regulation.
In order to accomplish this goal, we will explore three parent variables: positive affect, responsiveness/reciprocity, and structure/control, in two different interactive contexts varying in regulatory structure: an unstructured free play interaction, and a structured clean-up interaction. We will also explore children’s corresponding affect, responsive behavior, and control behavior in each context. These observations took place when the child was 18 months old; this age was considered appropriate for these observations, because children should have the capacity to comprehend basic maternal expectations and to display goal-directed behavior, but do not yet have solid self-control abilities (Kopp, 1982).

Child temperament, defined as individual differences in responses to novel stimuli, was assessed separately at the same time point. Latent profile analysis was used to classify infants to temperament profiles. Based on previous research (Dollar, Stifter & Buss, under review; Putnam & Stifter, 2005), we predicted that three qualitative temperament groups would emerge: an inhibited, exuberant, and average approach group.

Based on these observations, three different study aims will be addressed. The first aim of the study will be to explore associations between individual behaviors in mothers and in children within and across the free play and clean-up task. Based on previous research, we predict that parent and child behaviors will each be interrelated within-task, but only the same type of behavior will be correlated across task. The second aim of the study will be to examine if child and parent behaviors vary with context, child temperament, or the interaction of these factors. We predict that based on context, children will display more-positive affect, more responsive behaviors, and fewer attempts to control mother behavior in the free play relative to the clean-up task. If differences exist in parent behavior, we predict that mothers will display more-positive affect, more responsive/reciprocal behaviors, and fewer control/structuring behaviors in the free
play relative to the clean-up. Incorporating temperament, we expect that inhibited children will display the greatest responsiveness and most-positive affect in the clean-up, whereas exuberant children will display the least-positive affect and least responsiveness. However, exuberant children will display the most-positive affect and responsiveness in the free play. If maternal responses differ by temperament, we tentatively predict that mothers of inhibited children will display the fewest control/structuring behaviors in the clean-up, whereas mothers of exuberant children will display the most control/structuring behaviors and the least positive affect and responsive/reciprocal behaviors. However, mothers of exuberant children will display the highest positive affect and responsive/reciprocal behaviors in free play. The third aim of the study will be to examine if concurrent associations between mother and child behaviors differ by child temperament group. We predict that mother control/structuring behaviors in clean-up will relate to less-positive affect or less-responsive behavior in exuberant children compared to children of other temperament types, and more responsive behavior in inhibited children compared to other temperament types. However, mother positive affect and responsive/reciprocal behaviors in free play will relate to more-positive affect and responsive behaviors in exuberant children compared to children of other temperament types.

Method

Participants

Participants for this study were 147 infants and their mothers recruited for a longitudinal study of emotional development in children. The larger study followed infants from 6 months of age with data collection ongoing to the present; the current study utilized observations of children and mothers when the child was 18 months old. Infants in the original sample were equally distributed by gender (53% male) and primarily Caucasian (93%). Mothers averaged
29.66 years of age at the time of the child’s birth (SD = 4.77 years) and 55% had at least a college education. The majority of mothers (81.9%) were married to the infant’s father. Median annual family income in this sample fell in a category of $40,000-$60,000. All study procedures were approved by the institutional review board and informed consent was obtained from all participants (mothers provided consent on behalf of their infants).

A total of 13 families from the original sample did not participate in the 18-month visit. Compared to the full sample, these mothers tended to have fewer years of education ($t(145) = 2.16, p = .04$), but did not differ on other demographic characteristics. Two mothers spoke a language other than English during the mother-child interaction tasks, so among the mother variables, only positive affect was coded for these mothers. Additionally, difficulties with task administration led to unusable temperament assessment data for one child and unusable child control data for one other child. Thus, the final sample size ranged from 130-134 across analyses.

**Procedure**

Mothers and infants participated in a laboratory visit within two weeks of when the infant turned 18 months of age. Relevant to this study, infants’ participated in a risk room task at the beginning of the lab visit to assess infant temperament. Later in the visit, mothers and infants participated in a free play session to assess mother and child behavior in an unstructured socialization context, followed by a clean-up task to assess mother and child behavior in a structured socialization context.

**Risk Room.** In this task, adapted from the Laboratory Temperament Assessment Battery (Lab-TAB; Goldsmith, Reilly, Lemery, Longley, & Prescott, 1994), the infant and mother were invited to enter a laboratory room filled with a number of novel objects, including a small pop-up
tunnel, a set of steps, a black box with “teeth,” and a gorilla mask on a table. The mother was asked to sit in a chair in the corner of the room and allow the infant to roam the room and interact with the novel objects. After 3 minutes of free exploration, an unfamiliar experimenter entered the room; s/he asked the mother to sit back but did not intentionally approach the infant. Speaking in a positive tone of voice, the experimenter then asked the child to engage with each object (climb through the tunnel, jump from the steps to a small mattress below, put a hand in the black box, pet the gorilla mask). Toddler responses during the experimenter-present portion of the task were coded for infant temperamental reactions to novelty.

**Free Play and Clean-up.** The mother and child were provided with a basket of age-appropriate toys and were asked to sit together on the laboratory floor to play. Mothers were not given any specific instructions for their behavior during the free play except to play as they normally would at home, and to try to remove as many toys as possible from the basket throughout the interaction to prepare for the clean-up task. The experimenter also explained that she would return in several minutes to cue the mother to begin the clean-up task. During the clean-up the mother was asked to do her best to get the child to return all the toys to the basket independently and to avoid cleaning up for the child. After this set of instructions, the experimenter exited the laboratory and the mother and child were left alone to play for 5 minutes. The experimenter then opened the laboratory door briefly to cue the mother to initiate the clean-up and remind her of the instructions. The mother and child were then again left alone for up to 3 minutes or until all toys were returned to the basket.

**Child language assessment.** Due to possible differences in understanding of the mother’s verbal requests and statements, infants’ receptive vocabulary was assessed using the Bayley Scales of Infant and Toddler Development, Third Edition (Bayley, 2006). Scaled
receptive vocabulary scores were created for each infant \((M = 10.33, SD = 3.20)\).

Three children refused to complete this measure (e.g., refused to sit in highchair or mother’s lap for extended period); however, they completed the cognitive subtest of this same assessment (Bayley, 2006) with scores near the mean/median. Cognitive subtest scores were significantly related to receptive language scores in this sample \((r = .46, p = .001)\); thus the median receptive language score of 10 was assigned for these participants.

**Behavioral Coding**

**Temperament assessment.** Following previous research (Putnam & Stifter, 2005) temperament was assessed through affective and approach-withdrawal responses to the risk room; all measures were coded by trained teams of undergraduate coders.

Child *positive affect* and *negative affect* were coded from facial affect and vocalizations in 5-second intervals through both tasks by teams of trained coders. Positive affect was coded on a 4-point scale from 0 = “No positive; no indication of positive facial affect and no positive intonation in voice” to 3 = “High positive; highly positive affect such as a smile with mouth open widely, intense laughing, or squealing with delight.” Negative affect was also coded on a 4-point scale from 0 = “No negative: no indication of negative facial affect and no positive intonation in voice” to 3 = “High negative; highly negative affect such as a large grimace with mouth open, extreme crying, or screaming.” Drift reliability was assessed on 20% of recordings, with an ICC = .98. Positive and negative affect scores were calculated as the mean affect level across intervals.

Approach-withdrawal responses were assessed through measures of proximity to the mother, latency to play, total time playing, engagement with the novel objects, activity level, and spontaneous vocalizations. *Proximity to the mother* was coded second-by-second on a 5-point
scale from 1 = “Both hands or a significant part of the body is touching mother” to 5 = “More than two arm lengths from mother.” As such, a high score on this measure represented a greater distance from the mother. Drift reliability was assessed on 21% of recordings with an ICC = .99. Proximity scores were calculated as the mean level of proximity to the mother across total seconds. Latency to play was coded as the length of time in seconds until the child first engaged with one of the risk room objects. Drift reliability was assessed on 21% of recordings with an ICC = .92. Total time playing was coded as the length of time in seconds that the child interacted with any risk room object during the episode. Drift reliability was assessed on 21% of recordings with an ICC = .97. Due to slight task length differences, latency to play and total time playing scores were calculated as the proportion of total task length. Engagement with the risk room was coded in 5-second intervals on a 6-point scale from 0 = “No engagement with any risk room object” to 5 = “High active engagement; engages with a toy in an appropriate way (e.g., crawls through tunnel, jumps off steps) with high energy level.” Drift reliability was assessed on 21% of recordings with an ICC = .99. Engagement scores were calculated as the mean engagement level across intervals. Activity level was coded in 5-second intervals on a 4-point scale from 0 = “No activity; child is completely, or nearly completely, still” to 3 = “High activity; vigorous, exuberant activity.” Drift reliability was assessed on 20% of recordings with an ICC = .97. Activity level scores were calculated as the mean activity level across intervals. Spontaneous vocalizations were coded in 5-second intervals, defined as the presence of a child-initiated, non-distressed attempt at vocal communication at any time during the interval. Drift reliability was assessed on 20% of recordings with an average kappa = .70. Spontaneous vocalization scores were calculated as the proportion of intervals in which a spontaneous vocalization was observed.
Maternal interactive behaviors in free play and clean-up. To observe comparable parenting measures in the free play and clean-up task, maternal behaviors were coded in a relatively task-neutral manner using similar definitions for each construct. All measures were coded by trained teams of undergraduate coders.

Maternal affect was coded in 10-second intervals in each task using a scheme adapted from Kochanska and Aksan (1995). A “high positive” code was assigned if the mother displayed clear positive affect at least once during the interval, defined as a clear smile, positive vocalization (laugh or chuckle), or positive (playful or joyful) intonation while speaking. “Neutral/positive” was coded if the mother did not display high positive affect as defined above, but the mood was pleasant or neutral throughout the interval. Although positive affect was of primary interest, a “neutral/negative” code was assigned if at any point in the interval the mother displayed mildly negative affect indicating irritation, impatience, boredom, or otherwise infusing the interaction with mild negativity (no mothers displayed negative affect more extreme than this level). Intervals coded as high positive were assigned a score of 2, neutral/positive a score of 1, and if an interval contained a neutral/negative code it was assigned a score of 0. Drift reliability was assessed on 21% of recording, with an ICC = .80 for risk room and ICC = .80 for clean-up. Maternal affect scores were calculated for each task as the mean affect level across intervals.

Responsive/reciprocal behavior and control/structuring behavior codes were adapted from past research (Cipriano & Stifter, 2010; Kochanska, Coy, & Murray, 2001; Lindsey, Cremeens, and Caldera, 2010), and developed to reflect behaviors that could be observed in either socialization context. As such, these behaviors were defined by their general function or intent in reference to the child, not specific to the regulatory structure of the task. Descriptions and examples of the codes observed for each construct are presented in Table 2.1.
Responsive/reciprocal behaviors were those behaviors indicating willingness on the mothers’ part to endorse the child’s choices, follow the child’s agenda, comply with the child’s requests, and/or provide reasoning about behavior to the child. Each task was coded in 10-second intervals for the presence of any of these behaviors; otherwise a “none” code was applied. Drift reliability was assessed on 21% of recordings, with an average kappa for encouragement, compliance, reasoning, and observation, respectively, of 0.76, 0.79, 0.94, 0.88 for free play, and 0.84, 0.88, 0.82, 0.75 for clean-up. Responsive/reciprocal behavior scores were calculated as the proportion of total behaviors (i.e., all responsive codes and “none” codes) that were coded as a responsive/reciprocal behavior.

Control/structuring behaviors were those behaviors used by the mother in an attempt to change, redirect, or elicit child behavior or attention, request verbal responses, or otherwise attempt to enact alteration in the child’s behavior. Importantly, all of these behaviors must have been displayed with neutral/positive affect, suggesting gentle control on the part of the mother. Additionally, the behavior labeled “decision request” was coded only in free play, as this behavior was rarely observed in clean-up. Each task was coded in 10-second intervals for the presence of any of these behaviors; otherwise a “none” code was applied. Drift reliability will be assessed on 21% of recordings, with an average kappa for command, prohibition, redirection, scaffolding, behavior request, and knowledge request, respectively, of 0.84, 0.89, 0.83, 0.88, 0.95, 0.92 for clean-up, and .95, 1.00, .88, .95, .97, and .95 for free play, and .97 in addition for decision request in free play. Control/structuring behavior scores were calculated as the proportion of total behaviors (i.e., all control codes and “none” codes) that were coded as a control/structuring behavior.
**Child interactive behaviors in free play and clean-up.** Coding schemes were developed to capture interactive behaviors in the child that were roughly analogous to those coded in mothers. All measures were coded by trained teams of undergraduate coders.

*Affect responses* were coded from facial affect and vocalizations in 10-second intervals through both tasks. As children tended to display negative affect with greater frequency than mothers, both positive and negative responses were coded. Positive affect was coded on a 3-point scale from 0 = “No positive; no smiles or vocalizations that indicate positive affect” to 2 = “High positive; child displays a clear smile, clear positive vocalization, or exuberant body movement.” Drift reliability was assessed on 21% of recordings, with an ICC = .97 for free play and ICC = .83 for clean-up. Negative affect was also coded on a 3-point scale from 0 = “No negative: no frowns or vocalizations that indicate negative affect,” to 2 = “High negative; child displays a clear frown or upset facial expression, a high negative vocalization (e.g., crying, screaming), or a highly negative body movement (e.g., stomping, hitting).” Drift reliability was assessed on 21% of recording, with an ICC = .94 for free play and ICC = .96 for clean-up. Positive and negative affect scores were calculated for each task as the mean affect level across intervals. Examination of score distributions indicated that a majority of children did not have a negative affect score above 0 in free play (N = 98) or clean-up (N = 78), leading to little variability in distinct negative affect scores. To account for this issue, an overall affect score for each task was calculated as the mean of positive and negative affect scores across the task. Thus, a score above 0 indicated that the child displayed relatively higher positive relative to negative affect, whereas a score below 0 indicated that the child displayed relatively higher negative relative to positive affect.

Child responsive/compliance behavior and control behavior were also coded in 10-second intervals, using more global codes than those for mother behavior due to limitations in child
verbal fluency. Additionally, responsive behavior was defined slightly differently in each task. Mother behavior in the clean-up task was almost exclusively tied to the child’s progress at cleaning up the toys and mothers provided consistent guidance to pick up and put away the toys, thus the child’s responsiveness to the parent was generally represented by compliance to the mother’s requests to put away the toys or engage in behavior related to the clean-up task. Conversely, in the free play task, child responsiveness tended to be displayed either as compliance to specific maternal requests or by spontaneous shifts in behavior or attention to align with the mother’s activity. Accordingly, free play responsive behavior was defined as the presence of an intentional shift in behavior or attention in response to the mother or accepting changes to his/her behavior enacted by the mother. Additionally, due to the mentioned apparent differences in mothers’ attempts to structure child behavior, coders could indicate if the mother did not provide a cue that could enact a child response during the interval. Drift reliability was assessed on 21% of recordings with an ICC = .78 for responsive behavior and ICC = .82 for no cue to respond. Clean-up compliance was defined as the presence of behavior directed toward the goal of cleaning up or otherwise in line with the mother’s request to clean up. Drift reliability was assessed on 21% of recordings, with an ICC = .93. Responsive behavior scores were calculated for each task as the proportion of total intervals in which responsive behavior was coded (and in the case of free play, this score was based on the total number of intervals in which a cue to respond was present).

Control behavior was coded similarly across the free play and clean-up task, defined as the presence of behavior that is clearly directed at the mother and clearly intended to enact a change in the mother’s behavior or attentional focus, or to enact a change in the joint interaction. Drift reliability was assessed on 21% of recordings, with an average kappa of .83.
Control/structuring behavior scores were calculated for each task as the proportion of total intervals in which responsive behavior was coded.

**Temperament Group Formation**

Temperament groups were formed based on child responses in the risk room using latent profile analysis (LPA; Lazarsfeld & Henry, 1968). LPA is a form of structural equation mixture modeling in which mutually-exclusive and exhaustive classes of a latent variable, in this case temperament, are estimated from multiple observed indicators measured on a continuous scale using maximum likelihood estimation. The LPA approach was used because continuous relative scores were thought to provide a more accurate representation of conceptual differences in temperament compared to discrete response categories. Risk room positive affect, negative affect, proximity to mother, latency to play, total time playing, engagement, activity level, and spontaneous vocalization scores were entered into the analysis as observed indicators. The LPA was conducted in Mplus version 7.4.

One- to five-class solutions were compared using the Bayesian information criteria (BIC) and sample-size adjusted BIC (a-BIC), on which a lower value suggests better fit, and the Lo-Mendell-Rubin likelihood ratio test (LMR LRT; Lo, Mendell, & Rubin, 2001), which tests the difference in model -2 log-likelihood when each new class is added. Fit statistics are reported in Table 2.2 along with model entropy, which indicates the certainty of membership classification. As can be seen in the table, BIC and aBIC improved as number of classes increased. However, the LMR LRT test suggested that there was a significant improvement in fit when adding a fourth class to the model, but not when adding a third or fifth class. Thus, the four-class solution was selected for the latent temperament variable.

Estimated means of each observed variable for each class and class membership totals are
plotted in Figure 2.1, first by raw scores and then, to account for scale differences, by proportion of total possible score. Interpretation of these levels suggested that the profiles conformed to high-inhibited (very high negative affect, low positive affect, very high withdrawal), inhibited (higher negative affect, low positive affect, higher withdrawal), average approach (moderate levels of reactivity), and exuberant (low negative affect, higher positive affect, higher approach) patterns. Entropy for the 4-class solution was .94, and posterior probabilities of membership in classes were generally very high, with 90% of children classified with a probability above .90. Thus, posterior probabilities were used to assign each child to an observed temperament group for use in subsequent analyses. The high-inhibited class had very small group size (n = 4) and was distinguished from the inhibited group primarily based on differences in negative affect.\(^1\) This 4-class solution with small extremely inhibited group has been found in previous studies (Dollar, Stifter, & Buss, under review; Putnam & Stifter, 2005), and consistent with these studies, the extremely inhibited group was collapsed with the inhibited group for the purposes of statistical analyses.

In order to confirm the distinctness of the classified temperament groups used in study analyses, each classified group was compared to the others with regard to the risk room temperamental response indicators using \(t\)-tests. The inhibited group differed significantly from the exuberant group on all indicators in the expected direction (\(ts = [2.73-24.07], ps < .001-.009\)). The inhibited group differed significantly from the average approach group on nearly all indicators in the expected direction (\(ts = [2.25-13.03], ps < .001-.009\)) but not on positive affect.

---

\(^1\) To confirm the robustness of the latent classes and the decision to collapse the observed inhibited and high inhibited group, the LPA was re-run in 2 ways. First, the LPA was re-run on the full sample with all observed indicators except negative affect, and a three-class (inhibited, average approach, exuberant) with similar group sizes and variable means had the best fit. Second, the LPA was re-run excluding data from the participants who would be classified to the extremely inhibited class (all had a posterior probability of 1) and a similar three-class solution again had the best fit.
The exuberant group differed significantly from the average approach group on positive affect, proximity to mother, latency to play, total time playing, and engagement, all in the expected direction ($t$s = [3.06-12.80], $p$s = <.001-.003) and was marginally higher on spontaneous vocalizations ($t$(88) = 1.75, $p$ = .08); these groups did not differ significantly on negative affect ($t$(88) = .62, $p$ = .54) or activity level ($t$(57.5) = 1.22, $p$ = .22).

**Analytic Plan**

Prior to conducting primary study analyses, differences in the central variables of the study based on demographic information (e.g., child gender, maternal age, maternal education, family income) or child receptive language score were examined. It was found that mother education, specifically having a college degree, as well as child receptive vocabulary had marginal or significant correlations with multiple mother and child behaviors. Thus, the models addressing study aims 2 and 3 controlled for these two variables.

For the purposes of clarity, throughout the reported results mother positive affect and child affect (with higher score reflecting more positive affect) in each context are referred to as “mother positive affect” and “child positive affect,” respectively. The proportions of mother control/structuring behaviors and child control behaviors in each context are collectively referred to as “mother control,” and “child control,” respectively. The proportions of mother responsive/reciprocal behaviors in each context are collectively referred to as “mother responsiveness.” Due to differences in the nature of child responsive behavior, the proportion of child responsive behavior in free play is referred to as “child [free play] responsiveness,” and in clean-up is referred to as “child [clean-up] compliance.” Additionally, although the coded mother and child variables capture both affective and behavioral responses, they are referred to collectively as “behaviors.”
The first study aim was addressed by examining correlations between maternal behaviors and child behaviors across tasks to test if a) maternal behaviors and child behaviors were intercorrelated within each task, b) if same behaviors were correlated across tasks, and c) if different behaviors were associated across tasks.

The second study aim was addressed using a multivariate 2 (context: free play, clean-up) × 3 (child temperament group: inhibited, balanced, exuberant) repeated-measures analysis of variance (ANOVA) predicting all maternal and child behaviors. This allowed the model to account for relations among mother and child behaviors within and across contexts. The two main effects in each model indicated 1) if the level of the given behavior differed significantly based on context, and 2) if this behavior differed based on child temperament group. Interactions in this model indicated if context differences depended on child temperament group classification. Significant main effects and interactions were probed using t-tests.

The third study aim was addressed with a series of multiple regression models. Due to the concurrent nature of the data, models were built to predict both the three child behaviors and the three mother behaviors, run separately by interactive context (a total of 12 models). These models included two temperament group dummy codes allowing one group to serve as the reference group for simple effects and interactions. In the models predicting each child behavior, the predictors included control variables, two temperament group dummy codes, each of the three maternal behavior variables, and interactions between the two temperament group dummy codes and each of the mother behavior variables. In the models predicting each mother behavior, the predictors included control variables, two temperament group dummy codes, each of the three child behavior variables, and interactions between the two temperament group dummy codes and each of the mother behavior variables.
Because one temperament group serves as a reference group in these models, the slope of the temperament group dummy codes represents the overall difference in the outcome variable between that temperament group and the reference group. The slope of each of the three predictor behaviors (e.g., mother behaviors, child behaviors) represents the simple slope of that behavior on the outcome variable for the temperament reference group. Interactions between a temperament group dummy code and a predictor behavior indicates if the simple slope of that behavior differs between that temperament group and the reference group. These models were run with each temperament group as the reference group to capture all temperament group effects.

**Results**

Descriptive statistics for mother and child behaviors in free play and clean-up, as well as simple $t$-tests comparing values for each individual behavior across these contexts, are reported in Table 2.3. These $t$-tests indicated that, without accounting for other mother/child behaviors, there existed significant context differences in maternal control and positive affect, and child control and responsiveness.

**Aim 1**

The first study aim was to examine relations between individual mother behaviors and relations between individual child behaviors across and within the free play and clean-up context. Correlations between these variables are reported in Table 2.4.

**Within-context relations.** In free play, mother responsiveness and positive affect had a significant positive correlation, whereas they did not significantly relate to control. In contrast, child behaviors did not significantly relate to one another in free play. In clean-up, mother responsiveness and positive affect again had a marginally significant positive correlation;
additionally, mother responsiveness had a significant negative correlation with mother control. Similarly, child compliance and positive affect had a significant positive correlation and compliance had a significant negative correlation with control in clean-up. Taken together, these results suggest that mother behaviors were relatively interrelated in both free play in clean-up. In comparison, child behaviors were more interrelated in clean-up compared to free play.

**Across-context relations.** Mother positive affect was significantly and positively correlated across free play and clean-up, as was control behavior, whereas responsive behavior was not. Child positive affect, responsive behavior, and control behavior were all significantly correlated across free play and clean-up. However, differing mother behaviors were generally not correlated across free play and clean-up except for a significant positive correlation between responsive behavior in free play and positive affect in clean-up. Similarly, different child behaviors were generally not correlated across free play and clean-up except for a significant negative correlation between child responsive behavior in free play and control in clean-up. Taken together, these data suggest that behaviors in free play generally did not predict behavior in clean-up, except for behaviors that were the same.

**Aim 2**

The second study aim was to examine if child and parent behaviors varied with context, child temperament, or the interaction of these factors. The multivariate repeated-measures ANOVA revealed no significant interaction of temperament and context predicting any mother or child behavior, but several main effects based on context and temperament did emerge.

The within-person context effects indicated significant context differences in all child behaviors (child positive affect $F = 8.43, p = .004$, child responsiveness/compliance, $F = 54.84, p < .001$, child control $F = 6.03, p = .02$). As expected, controlling for other mother/child
behaviors, children displayed more-positive affect, more responsiveness, and less control in free play compared to clean-up. The within-person effects also indicated significant context differences in mother control ($F = 6.65, p = .01$), but not mother positive affect ($F = .95, p = .33$), or mother responsiveness ($F = .01, p = .98$). As expected, controlling for other mother/child behaviors, mothers displayed less control in free play compared to clean-up.

The between-person temperament group effects indicated significant temperament differences in child control ($F = 6.65, p = .01$), but not child positive affect ($F = .95, p = .33$) or child responsiveness ($F = .01, p = .98$). Pairwise comparisons suggested that children in the inhibited group displayed more control overall than children in the average approach group, but neither group differed from the exuberant group. Similarly, the between-person effects indicated significant temperament differences in mother control ($F = 6.65, p = .01$), but not mother positive affect ($F = .95, p = .33$) or mother responsiveness ($F = .01, p = .98$). Pairwise comparisons suggested that mothers of children in the exuberant temperament group displayed less control overall than mothers of children in the average approach group, but neither group differed from mothers of children in the inhibited group.

**Aim 3**

The third study aim was to examine the prediction of each of the coded child and mother behaviors in free play and clean-up based on the other’s behavior. Significant models for each partner within each context are reported in Tables 2.5-2.8. These tables include parameters for models run with the exuberant group as the reference group; however, additional effects revealed in models with a different temperament reference group are noted, and significant interactions and simple slopes for all temperament groups are reported below. Results are reported for the models predicting positive affect, then responsiveness, then control; within these models, results
are reported for the predictors of positive affect, then responsiveness, then control.

**Child behavior.**

**Free play.** The models predicting child positive affect and child responsiveness in free play were not significant, suggesting no systematic relations to any mother behavior in any temperament group for these child behaviors.

The models predicting child control in free play indicated that mother positive affect had a marginally significant simple slope only for the exuberant group, but the nonsignificant interaction terms indicated that this slope did not differ from the nonsignificant slopes for the other temperament groups. These models did, however, indicate that mother responsiveness had a significant positive simple slope predicting child control for each temperament group (see Table 2.5; slope for inhibited group $B = 0.20, SE = 0.10, p = 0.05$; slope for average approach group $B = 0.21, SE = 0.08, p = 0.01$), suggesting that more mother responsiveness related to more child control in all temperament groups. Mother control did not have a significant simple slope predicting child control for any group.

**Clean-up.** The models predicting child positive affect in clean-up were not significant, suggesting no systematic relations to any mother behavior in any temperament group.

The models predicting child compliance in clean-up indicated that mother positive affect had a marginally significant simple slope only for the exuberant group and average approach group (slope for inhibited group $B = 0.07, SE = 0.42, p = 0.87$; slope for average approach group $B = 0.39, SE = 0.20, p = 0.06$), but the nonsignificant interaction terms indicated that these slopes did not differ from the nonsignificant slope for the inhibited group. These models did, however, indicate that mother responsiveness had a marginal or significant positive simple slope predicting child compliance for each temperament group (see Table 2.6; slope for inhibited group $B = 0.77, SE = 0.21$; slope for average approach group $B = 0.51, SE = 0.18$, $p = 0.01$).
.20, \( p < .001 \); slope for average approach group \( B = .65, SE = .15, p < .001 \), suggesting that more mother responsiveness related to more child compliance in all temperament groups. Mother control did not have a significant simple slope predicting child compliance for any group.

The models predicting child control were not significant, suggesting no systematic relations to any mother behavior in any temperament group.

Mother behavior.

Free play. The models predicting mother positive affect in free play were not significant, suggesting no systematic relations to any child behavior in any temperament group.

The models predicting mother responsiveness in free play indicated that child positive affect had a significant positive simple slope only for the average approach group (see Table 2.7; slope for inhibited group \( B = .05, SE = .09, p = .54 \); slope for average approach group \( B = .28, SE = .11, p = .01 \), suggesting that higher child positive affect related to more mother responsiveness only in the average approach group. The interaction term comparing the slope for the average approach group to that for the inhibited group was marginally significant (\( B = -.26, SE = .14, p = .06 \)), but not that comparing to the slope for the exuberant group. Further, child responsiveness had a marginal or significant negative simple slope predicting mother responsiveness only for the exuberant and average approach groups (see Table 2.7; slope for inhibited group \( B = -.17, SE = .11, p = .11 \); slope for average approach group \( B = -.19, SE = .10, p = .07 \), suggesting that less child responsiveness related to more mother responsive behavior for children in the exuberant and average approach groups. Interaction terms comparing the slopes for these groups to that for the inhibited group were either marginal or significant (interaction for average group \( B = -.26, SE = .14, p = .06 \)). Lastly, child control had a significant positive simple slope predicting mother responsiveness for each temperament group (see Table 2.7; slope for
inhibited group $B = .55, SE = .27, p = .05$; slope for average approach group $B = .62, SE = .24, p = .01$), suggesting that more child control related to more mother responsiveness in all temperament groups.

The models predicting mother control in free play included a significant interaction for child positive affect suggesting a difference in the slope for the exuberant group compared to the average approach group, but the simple slope of child positive affect was not significant for any temperament group. However, child responsiveness had a significant positive simple slope predicting mother control for each temperament group (see Table 2.7; slope for inhibited group $B = .72, SE = .08, p < .001$; slope for average approach group $B = .59, SE = .08, p < .001$), suggesting that more child responsiveness related to more mother control. Child control did not have a significant simple slope predicting mother control for any group.

**Clean-up.** The models predicting mother positive affect in clean-up indicated that mothers displayed more positive affect with the average group compared to the exuberant and inhibited group (see Table 2.8; slope compared to inhibited group $B = .06, SE = .03, p = .02$). Further, child compliance had a marginal or significant positive simple slope predicting mother positive affect only for the exuberant and average approach groups (see Table 2.8; slope for inhibited group $B = .02, SE = .08, p = .81$; slope for average approach group $B = .19, SE = .07, p = .01$), suggesting that less child responsiveness related to more mother positive affect for children in the exuberant and average approach groups. Interaction terms comparing the slopes for the average approach group to the inhibited group was marginally significant ($B = .18, SE = .10, p = .09$), but not that comparing the exuberant group to the inhibited group. These models also indicated that child positive affect had a significant simple slope predicting mother positive affect only for the average group ($B = .27, SE = .13, p = .04$); however, the nonsignificant
interaction terms indicated that this slope did not differ from the nonsignificant slopes for the exuberant and inhibited groups. Child control did not have a significant simple slope predicting mother positive affect for any group.

The models predicting mother responsiveness in clean-up indicated that child positive affect did not have a significant simple slope for any group. However, child compliance had a significant positive simple slope predicting mother responsiveness for each temperament group (see Table 2.8; slope for inhibited group $B = .40, SE = .09, p < .001$; slope for average approach group $B = .56, SE = .09, p < .001$), suggesting that more child compliance related to more mother responsiveness. These models also indicated that child control behavior had a significant simple slope predicting mother responsiveness only for the exuberant group; however, the nonsignificant interaction terms indicated that this slope did not differ from the nonsignificant slopes for the exuberant and inhibited groups.

The models predicting mother control in clean-up indicated that (consistent with the repeated-measures ANOVA) mothers displayed more control with the average group compared to the exuberant group (see Table 2.8). Child positive affect did not have a significant simple slope predicting mother control for any group. Child compliance had a significant negative simple slope only for the exuberant group (see Table 2.8; slope for inhibited group $B = -.07, SE = .07, p = .33$; slope for average approach group $B = -.03, SE = .06, p = .66$), suggesting that less child compliance was associated with more mother control only for children in the exuberant group. The interaction term comparing the slope for the exuberant group to the average group was significant, but not that comparing this group to the inhibited group.

**Summary.** Significant effects for children or mothers of each temperament group are summarized in Tables 2.9-2.10. These tables include either a) effects that were significant for all
temperament groups, or b) group-specific effects that included at least one significant interaction term suggesting a significant difference in slope compared to another temperament group.

Discussion

Whereas mother positive affect, responsive/reciprocal behavior, and control/structuring behavior have been highlighted as parenting constructs relevant to the development of positive self-regulatory capacities in the child, comparatively less research has explored how the elicitation or effect of these parenting behaviors may vary with the structure or goals of the context(s) in which they are displayed, and by the temperament of the child with whom the parent is interacting. Similarly, contextual structure and child temperament may have important meaning for the types of behaviors children display both in general and based on parental behavior. The current study explored interrelations and levels of differing parent and child interactive behaviors, as well as relations between parent and child behaviors, based on contextual structure and child temperament group.

The first aim of the study was to examine the coherence of mother and child behaviors within and across tasks. We hypothesized that different types of behaviors would be interrelated within-task, but only the same behaviors would be related across-task, whereas different behaviors would not. Consistent with this prediction, and with previous research (e.g., Calkins, Smith, Gill, & Johnson, 1998; Dennis, 2006; Lindsey, Cremeens, & Caldera, 2010), maternal behavior evidenced many within-context correlations, as well as cross-context correlations for positive affect and control behavior. However, different types of behaviors tended not to correlate across context. Child behavior evidenced somewhat similar patterns, in that child compliance related to child positive affect and (less) child control in clean-up, and child positive affect, responsiveness, and control were each significantly related across-context.
However, there were some interesting deviations from the stated hypothesis. First, a non-significant cross-context correlation for mother responsive behavior suggests that mothers’ tendency to display greater responsive/reciprocal behavior in free play did not necessarily relate to a tendency to do so during clean-up. This lack of stability may reflect differences in the targets of maternal responsive/reciprocal behavior across tasks, as parents typically adjust their goal-relevant behaviors in light of both situational concerns and ongoing child behavior (Dix, 1992; Grusec & Davidov, 2010). This adjustment is certainly relevant in the toddler years, when parents must balance responsiveness to the child with an increasing motivation to also control and shape child behavior (Teti & Huang 2005). Likewise, the unstructured nature of free play may have led mothers to feel free to support many forms of child play and skill demonstration and to comply to child requests; however, in the clean-up task mother responsive/reciprocal behavior appeared to be more closely tied to child compliance (see regression results). Because child responsive/compliant behavior levels were only modestly correlated (albeit significantly) and decreased from free play to clean-up, mothers may not necessarily show strong consistency in the tendency to display responsive, reciprocal reactions to child behavior at an individual level.

Secondly, child behaviors appeared be more strongly interrelated in clean-up compared to free play. Again, this finding speaks to the importance of context in determining patterns of behavior in the child, with a more diffuse or inconsistent configuration of behaviors displayed by children in free play compared to clean-up. For example, it is understandable that in clean-up, when mothers largely focused the interaction on compliance to the clean-up goal, children who displayed greater compliance would also display more-positive (or less-negative) affect as well as make fewer attempts to change the mothers’ behavior that was itself consistently focused on
encouraging compliance to the goal. However, given the lack of a unified goal in the free play interaction, and the fact that mothers appeared somewhat more receptive to child control (see regression results), a child showing higher responsiveness may have largely followed the mothers’ cues, or have been engaged in a more reciprocal interaction also involving more child control behavior; a child displaying low responsiveness may have actively refused mother cues or just have preferred to focus on independent play. Thus, it makes sense that child control and compliance may not be as consistently intertwined, and that neither behavior would be consistently associated with positive or negative child affective responses.

The second aim of the study was to examine context- and temperament-based differences in mother and child behavior. In terms of context differences, we hypothesized that children, and perhaps mothers, would display more-positive affect, more responsive behavior, and less control behavior in free play compared to clean-up. This hypothesis was largely supported in the results for the multivariate repeated-measures ANOVA for all child behaviors and for mother control; however, mother positive affect and responsive behavior levels did not significantly differ across these contexts. Thus, differences in contextual structure and goals do in fact appear to motivate differences in parents’ attempts to control or structure child behavior, as well as differences in child behaviors, with a free play context including relatively fewer exchanges of control behavior, as well as more positive affect and responsive behaviors in the child, compared to a clean-up context. Mean levels of mother positive affect and responsive/reciprocal behavior, however, did not significantly differ across free play and clean-up. This result is consistent with Kwon et al. (2013), who found no mean differences across a free play and structured task in a composite parenting measure that included elements of responsiveness and positivity. Mothers’ positive affect was significantly correlated across tasks in the current study, so it appears that
mothers maintained relatively similar levels and variability in their affect responses regardless of contextual structure. However, because mother responsive/reciprocal behavior was not significantly correlated across-task, and appeared to be more tied to child compliance in clean-up (see regression results), a mother who displayed a relatively high number of responsive behaviors in free play may not have done so in clean-up. Nevertheless, mothers may have had many opportunities to display responsive/reciprocal behavior, even if it was not the same mothers doing so in each context. Thus, taking into account all other parent and child behavior as this analysis did, mothers displayed relatively similar amounts of responsive/reciprocal behavior across-context despite a lack of strong stability in individual mothers’ behavior.

The expectation that contextual differences would lead to mean differences in behavior based on temperament was largely not supported in these results. That is, children in the exuberant temperament group were not found to have the highest positive affect and responsive behavior in free play, as had been expected, and those in the inhibited group were not found to have the highest positive affect and responsive behavior in clean-up. Two important factors may have contributed to this lack of effects. First, these interactions were intentionally observed at ages at which children were expected to be developing many early capacities for self-regulation (Kopp, 1982). Language development emerged as a meaningful covariate in the analyses, but it is possible that at this age, individual differences in other cognitive or motor skills not measured in this study may take precedence over temperamental characteristics or motivations in determining child behavior in each context. Secondly, these interactions were observed at an age when children’s control abilities are aided by external input from parents and other adults (Kopp, 1982), and research has shown that parents demonstrate increased efforts to guide children toward acceptable responses (Teti & Huang, 2005). As indicated by the present findings,
children’s behavior may have been as strongly influenced by their mothers’ behavior as by their temperamental motivations, and mothers generally did not appear to show temperament-based mean differences in their behavior. These two sources of additional variability may have obscured potential systematic temperament differences in child behavior.

The third aim of the study was to examine temperament-based relations between mother and child behavior in each context. This aim was intended to better understand whether behaviors in one partner related to behaviors in the other partner differently based on child temperament. The models predicting child behavior did not include significant temperament group differences in these relations, but each context included one significant effect that spanned temperament group. Specifically it was found that mother responsive behavior related to greater child control behavior in free play, but greater child compliance in clean-up. This finding speaks to the importance of regulatory structure for determining patterns of behavior in children (e.g., Dennis, 2006; Kochanska et al., 2001; Kwon et al., 2013; Lindsey et al., 2010). Specifically, controlling for other maternal behaviors, mothers’ tendency to support, comply or respond to the child in an unstructured context related to the child’s attempts to enact changes in the mother’s behavior. This relation between mother and child behavior suggests that given little contextual structure, children might take advantage of the opportunity to engage in more “horizontal” interactions with the mother when she displays more supportive or responsive reactions to the child. However, in a structured, goal-oriented context, mother responsiveness appears to instead more closely relate to the child’s tendency to comply with contextual, and possibly maternal, goals. Previous studies have found significant within-task associations between putatively positive or responsive parenting behavior and children’s compliance in regulatory tasks (e.g., Crockenberg & Litman, 1990; Kochanska & Askan, 1995), as well as weak associations between
mother commands and child compliance in a play session (Londerville & Main, 1981), but to our knowledge no study has explored these associations in both structured and unstructured contexts. Considering the current results, maternal responsive behavior could be an effective motivator of mutually responsive interactions between parent and child in a larger sense, but in ways that differ across unstructured and structured contexts and/or the domain of socialization most elicited by a given parenting context (e.g., reciprocity vs. control; Grusec & Davidov, 2010).

The models predicting mother behavior included a number of effects that were significant for all temperament groups, as well as some temperament group differences. Complementing the findings for child control and across temperament group, child control behavior exhibited during free play predicted mother responsive behavior, and child responsive behavior during free play predicted mother control behavior. In this way, children’s attempts to control mother behavior appeared to be systematically met with mother responsive behavior in this context, but mothers may too have capitalized on the opportunity to impose structure on the interaction when their child displayed more responsiveness to her. However, child responsive behavior in free play also related negatively to responsive behavior in the parent for the exuberant and average approach groups. It is possible that this was an eliciting effect, such that when less-inhibited (exuberant or average approach) children displayed less responsive behavior, their mothers tended to display more responsive behavior, perhaps in an attempt to forge positive, reciprocal interactions. Alternatively, it may be that mothers of less-inhibited children chose to display both less responsive behavior and more control behavior when their children displayed more responsive behavior in an unstructured context. Moreover, the child’s tendency to display positive affect only related to more responsive behavior for mothers of the average-approach group, but not the exuberant (or inhibited) group. This pattern of responses might be particularly adaptive for
exuberant children in the longer term; mothers who choose to make the most of exuberant children’s (that is, all children’s) higher responsive behavior in more unstructured, horizontal contexts in toddlerhood by successfully introducing straightforward control/structuring behavior may more-successfully encourage self-regulated responses in the child.

The patterns of relations were somewhat different in clean-up. Most remarkably, child compliance was the most consistent predictor of mother behavior in this context. Again complementary to mother responsive behavior predicting child compliance, child compliance understandably appeared to elicit responsive behaviors in mothers. Further, child compliance in clean-up appeared to elicit more mother positive affect for children in the exuberant and average approach groups, and less mother control for exuberant children (or, alternatively, less child compliance related to less mother positive affect for the exuberant and average approach groups and more mother control for the exuberant group). Again, this finding might reflect differentially effective mother behavior patterns specific to exuberant children. Whereas all mothers displayed systematically more responsive behavior with children who showed more compliance, mothers also appeared to adjust their control and positive affect responses with exuberant children. These mother behaviors may have been displayed in an attempt to better-facilitate their goal-related messages to exuberant children, showing more reinforcing and positive responses with children who displayed more compliance, and perhaps taking a more “no-nonsense” approach with children who displayed less compliance. Again, although exuberant children did not necessarily display the least compliance in clean-up, their mothers may have more consistently adjusted their behavior in an attempt to support and reinforce compliance.

Taken together, the results of the present study might also shed some light on the nature of temperament and context in parent-child interactions. Research on temperament and parenting
involves considerations of both interactions and transactions between parent and child behavior and characteristics (Kiff, Lengua, & Zalewski, 2011; Putnam, Sanson, & Rothbart, 2002). Though strong causal conclusions cannot be drawn from these concurrent and correlational analyses of parent-child interactions, they did appear to explain relatively more nuanced variation in mother behavior than in child behavior, and temperament-based effects emerged not at the group level but based on the behaviors that children actually displayed in each context. Thus, consistent with previous arguments about the nature of parent-child interactions (e.g., Bell, 1968; 1979; Dix, 1992; Grusec & Goodnow, 1994) variations in child behavior may certainly play a role in the types of behaviors parents display in different observational contexts, and further, may contribute to apparent temperament-by-parenting interactions in studies of self-regulatory development.

**Limitation and Future Directions**

This study examined relatively in-depth observations of mothers and child behavior based on two major factors: child temperament group (exuberant, inhibited, and average), and interactive context (an unstructured free play context and structured clean-up context), examining the relevance of temperament and contextual structure for patterns of responding and parent-child interactions in early self-regulatory development. This study had a number of strengths, particularly the fact that a host of observationally-coded data were utilized both for the temperament assessment and to examine patterns of mother and child behavior in these contexts. Secondly, analyses examined each behavior in light of other behaviors in the mother and/or child, which helped to reveal relatively unique patterns or effects with other behaviors of each interactive partner taken into account.

In terms of limitations, it should be acknowledged that this study utilized observations
taken during a single laboratory visit in order to examine patterns of interactive behavior in toddlers. Thus, although the analytic approach included predicting child behavior from mother behavior and mother behavior from child behavior, relations between the two must necessarily be considered as indicators of concurrent interactive patterns. This study also utilized mean levels or proportions of behavior as an initial examination of these complex relations. Future research may extend the results of this study to examine interactive patterns through the course of these tasks using more intensive time-series analyses. Additionally, the findings of this study suggest that although temperament largely did not appear to motivate mean differences in mother and child behavior, contextual structure did appear to be an important motivator of responses, particularly in children, and that both temperament and context motivated differences in relations between child and mother behavior. Future research should continue to explore how contextual goals or structure alter patterns of mother and child behavior, and how differences in parent-child interactions within and across interactive contexts may lead to differing regulatory outcomes for children of differing temperament types.
References


Kochanska (1997b). Mutually responsive orientation between mothers and their young children:


207–224.


Table 2.1

*Description and Examples of Maternal Behavior Codes*

<table>
<thead>
<tr>
<th>Responsive/ Reciprocal</th>
<th>Definition</th>
<th>Example(s)</th>
</tr>
</thead>
<tbody>
<tr>
<td><strong>Encouragement</strong></td>
<td>Mother responds or reacts to child’s behavior by providing verbal encouragement or support or by mirroring the child’s action.</td>
<td>Says “good job” or “thank you;” compliments child on behavior, mirrors child behavior (e.g., dancing) or verbalizations.</td>
</tr>
<tr>
<td><strong>Compliance</strong></td>
<td>Mother responds to a request or control attempt from child by providing assistance or behavior in line with child’s request.</td>
<td>Hands a requested toy to child, takes a toy offered by child, allows child to sit in her lap.</td>
</tr>
<tr>
<td><strong>Reasoning</strong></td>
<td>Mother responds to a request or control attempt from child with verbal reasoning.</td>
<td>Child vocalizes to her while struggling with toy and she explains how to use it; child whines to her and she explains that s/he must clean-up to move on to the next task.</td>
</tr>
<tr>
<td><strong>Observation</strong></td>
<td>Mother actively attends to and accepts child’s ongoing behavior without intervening in any way.</td>
<td>Observes child for the majority of the interval without interrupting or engaging in independent behavior.</td>
</tr>
</tbody>
</table>

<table>
<thead>
<tr>
<th>Control/ Structuring</th>
<th>Definition</th>
<th>Example(s)</th>
</tr>
</thead>
<tbody>
<tr>
<td><strong>Command</strong></td>
<td>The mother tells child to do something or produce some kind of behavior.</td>
<td>“Hug the baby,” “Show me where the cow goes,” “Come back here,” “Put the toys in the basket.”</td>
</tr>
<tr>
<td><strong>Prohibition</strong></td>
<td>The mother tells child to not do something or to stop some kind of behavior.</td>
<td>“No, you can’t get in the basket,” “Don’t put that in your mouth.”</td>
</tr>
<tr>
<td><strong>Redirection</strong></td>
<td>The mother attempts to redirect child’s attention to her, to a toy, or to the task while the child is looking away from her.</td>
<td>Calls child’s name, says “Look at the..!,” intentionally makes a noise with a toy while looking at child.</td>
</tr>
<tr>
<td><strong>Scaffolding</strong></td>
<td>The mother attempts to change child’s behavior by modeling a different behavior or by physically guiding child’s behavior.</td>
<td>Intervenes in child’s play by demonstrating how to use a toy or suggesting a new way to play with it; demonstrates putting a toy in the basket; hands child a toy to put away.</td>
</tr>
<tr>
<td><strong>Behavior request</strong></td>
<td>The mother requests that the child change behavior in some way, phrased as a question.</td>
<td>“Can you feed the baby?” “Can you hit the drum?” “Can you put the toys away?” “Can you clean-up for mommy?”</td>
</tr>
<tr>
<td><strong>Knowledge request</strong></td>
<td>The mother requests some sort of knowledge from child, phrased as a question.</td>
<td>“Where is the pig?” “Who is that?” “Where do the blocks go?”</td>
</tr>
<tr>
<td><strong>Decision request</strong></td>
<td>The mother asks child to make a decision or express a preference about the interaction; typically phrased as a question.</td>
<td>“What do you want to play with?” “Does the baby want to eat now?”</td>
</tr>
</tbody>
</table>
Table 2.2

*Model Fit Indices for 18-Month Temperament Group Latent Profile Analyses*

<table>
<thead>
<tr>
<th>Solution</th>
<th>BIC</th>
<th>saBIC</th>
<th>LMR LRT Value</th>
<th>LMR LRT p-value</th>
<th>Entropy</th>
</tr>
</thead>
<tbody>
<tr>
<td>1-class</td>
<td>787.62</td>
<td>737.01</td>
<td>-</td>
<td>-</td>
<td>-</td>
</tr>
<tr>
<td>2-class</td>
<td>467.80</td>
<td>388.72</td>
<td>355.82</td>
<td>.01</td>
<td>0.94</td>
</tr>
<tr>
<td>3-class</td>
<td>332.95</td>
<td>225.40</td>
<td>174.97</td>
<td>.25</td>
<td>0.95</td>
</tr>
<tr>
<td>4-class</td>
<td>262.11</td>
<td>126.10</td>
<td>112.62</td>
<td>.03</td>
<td>0.94</td>
</tr>
<tr>
<td>5-class</td>
<td>240.98</td>
<td>76.50</td>
<td>63.91</td>
<td>.42</td>
<td>0.93</td>
</tr>
</tbody>
</table>

BIC = Bayesian information criterion; saBIC = Sample-Size Adjusted BIC; LMR LRT = Lo-Mendell-Rubin Adjusted Likelihood Ratio Test
Table 2.3

*Means and Standard Deviations for Primary Study Variables*

<table>
<thead>
<tr>
<th>Mother Behavior</th>
<th>Free Play</th>
<th>Clean-up</th>
<th>Difference $t$, $p$-value</th>
</tr>
</thead>
<tbody>
<tr>
<td></td>
<td>$M$</td>
<td>$SD$</td>
<td>Range</td>
</tr>
<tr>
<td>Positive affect</td>
<td>1.16</td>
<td>.13</td>
<td>1.00-1.78</td>
</tr>
<tr>
<td>Responsiveness</td>
<td>.44</td>
<td>.14</td>
<td>.13-.82</td>
</tr>
<tr>
<td>Control</td>
<td>.81</td>
<td>.12</td>
<td>.39-1.00</td>
</tr>
</tbody>
</table>

<table>
<thead>
<tr>
<th>Child Behavior</th>
<th>Free Play</th>
<th>Clean-up</th>
<th>Difference $t$, $p$-value</th>
</tr>
</thead>
<tbody>
<tr>
<td></td>
<td>$M$</td>
<td>$SD$</td>
<td>Range</td>
</tr>
<tr>
<td>Affect</td>
<td>.16</td>
<td>.18</td>
<td>-.29-.83</td>
</tr>
<tr>
<td>Responsiveness/compliance</td>
<td>.85</td>
<td>.10</td>
<td>.50-1.00</td>
</tr>
<tr>
<td>Control</td>
<td>.09</td>
<td>.08</td>
<td>0-.33</td>
</tr>
</tbody>
</table>
Table 2.4

Correlations among Primary Study Variables

<table>
<thead>
<tr>
<th>Variable</th>
<th>1</th>
<th>2</th>
<th>3</th>
<th>4</th>
<th>5</th>
<th>6</th>
<th>7</th>
<th>8</th>
<th>9</th>
<th>10</th>
<th>11</th>
<th>12</th>
</tr>
</thead>
<tbody>
<tr>
<td>1. Mom positive affect, Free Play</td>
<td>---</td>
<td>.35**</td>
<td>-.13</td>
<td>.42**</td>
<td>.02</td>
<td>-.04</td>
<td>.15*</td>
<td>.03</td>
<td>-.01</td>
<td>.18*</td>
<td>.11</td>
<td>.03</td>
</tr>
<tr>
<td>2. Mom responsiveness, Free Play</td>
<td>---</td>
<td>-.13</td>
<td>.22*</td>
<td>.11</td>
<td>-.14</td>
<td>.19*</td>
<td>.21*</td>
<td>.38**</td>
<td>.15*</td>
<td>.08</td>
<td>.01</td>
<td></td>
</tr>
<tr>
<td>3. Mom control, Free Play</td>
<td>---</td>
<td>-.02</td>
<td>-.10</td>
<td>.29**</td>
<td>-.02</td>
<td>-.01</td>
<td>-.04</td>
<td>-.06</td>
<td>-.02</td>
<td>-.02</td>
<td>-.03</td>
<td></td>
</tr>
<tr>
<td>4. Mom positive affect, Clean-up</td>
<td>---</td>
<td>.16*</td>
<td>-.05</td>
<td>.05</td>
<td>.07</td>
<td>.05</td>
<td>.20*</td>
<td>.27**</td>
<td>-.07</td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>5. Mom responsiveness, Clean-up</td>
<td>---</td>
<td>-.37**</td>
<td>.03</td>
<td>.20*</td>
<td>.28**</td>
<td>.25**</td>
<td>.59**</td>
<td>.07</td>
<td></td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>6. Mom control, Clean-up</td>
<td>---</td>
<td>-.05</td>
<td>-.09</td>
<td>-.06</td>
<td>-.21*</td>
<td>-.26**</td>
<td>.07</td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>7. Child positive affect, Free Play</td>
<td>---</td>
<td>.13</td>
<td>-.002</td>
<td>.33*</td>
<td>.07</td>
<td>.09</td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>8. Child responsiveness, Free Play</td>
<td>---</td>
<td>.05</td>
<td>.08</td>
<td>.21*</td>
<td>-.21*</td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>9. Child control, Free Play</td>
<td>---</td>
<td>.09</td>
<td>.10</td>
<td>.19*</td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>10. Child positive affect, Clean-up</td>
<td>---</td>
<td>.21*</td>
<td>-.08</td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>11. Child responsiveness, Clean-up</td>
<td>---</td>
<td>-.26**</td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>12. Child control, Clean-up</td>
<td>---</td>
<td>---</td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
</tr>
</tbody>
</table>

*p < .10, *p < .05, **p < .01
Table 2.5

*Multiple Regression Models Predicting Child Behavior during Free Play Based on Child Temperament Group and Mother Behavior*

<table>
<thead>
<tr>
<th>Variables</th>
<th>B</th>
<th>SE(B)</th>
<th>β</th>
<th>F</th>
<th>R²</th>
</tr>
</thead>
<tbody>
<tr>
<td><strong>I. Positive Affect – model ns.</strong></td>
<td>.93</td>
<td>.10</td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td><strong>II. Responsiveness – model ns.</strong></td>
<td>1.78</td>
<td>.17</td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td><strong>III. Control</strong></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>Child Receptive Vocabulary</td>
<td>.003</td>
<td>.02</td>
<td>.11</td>
<td></td>
<td></td>
</tr>
<tr>
<td>Maternal Education</td>
<td>-.01</td>
<td>.01</td>
<td>-.09</td>
<td></td>
<td></td>
</tr>
<tr>
<td>Inhibited</td>
<td>-.002</td>
<td>.02</td>
<td>-.01</td>
<td></td>
<td></td>
</tr>
<tr>
<td>Average Approach</td>
<td>-.02</td>
<td>.02</td>
<td>-.15</td>
<td></td>
<td></td>
</tr>
<tr>
<td>Mother Positive Affect</td>
<td>-.15</td>
<td>.09</td>
<td>-.28*</td>
<td></td>
<td></td>
</tr>
<tr>
<td>Mother Responsiveness</td>
<td>.28</td>
<td>.09</td>
<td>.50**†</td>
<td></td>
<td></td>
</tr>
<tr>
<td>Mother Control</td>
<td>-.05</td>
<td>.10</td>
<td>-.08</td>
<td></td>
<td></td>
</tr>
<tr>
<td>Affect X Inhibited</td>
<td>.14</td>
<td>.13</td>
<td>.14</td>
<td></td>
<td></td>
</tr>
<tr>
<td>Affect X Average</td>
<td>.08</td>
<td>.12</td>
<td>.09</td>
<td></td>
<td></td>
</tr>
<tr>
<td>Responsiveness X Inhibited</td>
<td>-.08</td>
<td>.14</td>
<td>-.07</td>
<td></td>
<td></td>
</tr>
<tr>
<td>Responsiveness X Average</td>
<td>-.07</td>
<td>.12</td>
<td>-.08</td>
<td></td>
<td></td>
</tr>
<tr>
<td>Control X Inhibited</td>
<td>.08</td>
<td>.14</td>
<td>.07</td>
<td></td>
<td></td>
</tr>
<tr>
<td>Control X Average</td>
<td>.04</td>
<td>.13</td>
<td>.04</td>
<td></td>
<td></td>
</tr>
</tbody>
</table>

*†p < .05; *p < .01; **p < .01
†p < .05-.10 in a model run with other temperament group as reference group*
Table 2.6

Multiple Regression Models Predicting Child Behavior during Clean-up Based on Child Temperament Group and Mother Behavior

<table>
<thead>
<tr>
<th>Variables</th>
<th>B</th>
<th>SE(B)</th>
<th>β</th>
<th>F</th>
<th>R²</th>
</tr>
</thead>
<tbody>
<tr>
<td>I. Positive Affect – model ns.</td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>II. Compliance</td>
<td>1.32</td>
<td>.32</td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>Child Receptive Vocabulary</td>
<td>.01</td>
<td>.01</td>
<td>.15†</td>
<td></td>
<td></td>
</tr>
<tr>
<td>Maternal Education</td>
<td>.05</td>
<td>.04</td>
<td>.08</td>
<td></td>
<td></td>
</tr>
<tr>
<td>Inhibited</td>
<td>-.05</td>
<td>.05</td>
<td>-.08</td>
<td></td>
<td></td>
</tr>
<tr>
<td>Average Approach</td>
<td>-.02</td>
<td>.05</td>
<td>-.03</td>
<td></td>
<td></td>
</tr>
<tr>
<td>Mother Positive Affect</td>
<td>.51</td>
<td>.28</td>
<td>.25*†</td>
<td></td>
<td></td>
</tr>
<tr>
<td>Mother Responsiveness</td>
<td>.49</td>
<td>.27</td>
<td>.36*†</td>
<td></td>
<td></td>
</tr>
<tr>
<td>Mother Control</td>
<td>-.44</td>
<td>.32</td>
<td>-.19</td>
<td></td>
<td></td>
</tr>
<tr>
<td>Affect X Inhibited</td>
<td>-.44</td>
<td>.51</td>
<td>-.08</td>
<td></td>
<td></td>
</tr>
<tr>
<td>Affect X Average</td>
<td>-.12</td>
<td>.34</td>
<td>-.04</td>
<td></td>
<td></td>
</tr>
<tr>
<td>Control X Inhibited</td>
<td>.48</td>
<td>.46</td>
<td>.11</td>
<td></td>
<td></td>
</tr>
<tr>
<td>Control X Average</td>
<td>.61</td>
<td>.48</td>
<td>.13</td>
<td></td>
<td></td>
</tr>
<tr>
<td>Responsiveness X Inhibited</td>
<td>.38</td>
<td>.33</td>
<td>.15</td>
<td></td>
<td></td>
</tr>
<tr>
<td>Responsiveness X Average</td>
<td>.15</td>
<td>.31</td>
<td>.08</td>
<td></td>
<td></td>
</tr>
<tr>
<td>III. Control – model ns.</td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td></td>
<td>1.05</td>
<td>.11</td>
<td></td>
<td></td>
<td></td>
</tr>
</tbody>
</table>

†p < .10; *p < .05; **p < .01
†p < .05-.10 in a model run with other temperament group as reference group
Table 2.7

**Multiple Regression Models Predicting Mother Behavior during Free Play Based on Child Temperament Group and Child Behavior**

<table>
<thead>
<tr>
<th>Variables</th>
<th>B</th>
<th>SE(B)</th>
<th>β</th>
<th>F</th>
<th>R²</th>
</tr>
</thead>
<tbody>
<tr>
<td>I. <strong>Positive Affect – model ns.</strong></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td></td>
<td>.83</td>
<td></td>
<td>.09</td>
<td></td>
<td></td>
</tr>
<tr>
<td>II. <strong>Responsiveness</strong></td>
<td>3.37**</td>
<td>.28</td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>Child Receptive Vocabulary</td>
<td>.002</td>
<td>.004</td>
<td>.04</td>
<td></td>
<td></td>
</tr>
<tr>
<td>Maternal Education</td>
<td>.03</td>
<td>.02</td>
<td>.09</td>
<td></td>
<td></td>
</tr>
<tr>
<td>Inhibited</td>
<td>-.01</td>
<td>.03</td>
<td>-.04</td>
<td></td>
<td></td>
</tr>
<tr>
<td>Average Approach</td>
<td>.004</td>
<td>.03</td>
<td>.02</td>
<td></td>
<td></td>
</tr>
<tr>
<td>Child Positive Affect</td>
<td>.13</td>
<td>.13</td>
<td>.18†</td>
<td></td>
<td></td>
</tr>
<tr>
<td>Child Responsiveness</td>
<td>-.23</td>
<td>.11</td>
<td>-.22**†</td>
<td></td>
<td></td>
</tr>
<tr>
<td>Child Control</td>
<td>.72</td>
<td>.25</td>
<td>.41**†</td>
<td></td>
<td></td>
</tr>
<tr>
<td>Affect X Inhibited</td>
<td>-.11</td>
<td>.16</td>
<td>-.10†</td>
<td></td>
<td></td>
</tr>
<tr>
<td>Affect X Average</td>
<td>.13</td>
<td>.17</td>
<td>.10</td>
<td></td>
<td></td>
</tr>
<tr>
<td>Responsiveness X Inhibited</td>
<td>.55</td>
<td>.25</td>
<td>.20**†</td>
<td></td>
<td></td>
</tr>
<tr>
<td>Responsiveness X Average</td>
<td>.29</td>
<td>.17</td>
<td>.15</td>
<td></td>
<td></td>
</tr>
<tr>
<td>Control X Inhibited</td>
<td>-.06</td>
<td>.37</td>
<td>-.02</td>
<td></td>
<td></td>
</tr>
<tr>
<td>Control X Average</td>
<td>-.12</td>
<td>.35</td>
<td>-.04</td>
<td></td>
<td></td>
</tr>
<tr>
<td>III. <strong>Control</strong></td>
<td>8.45**</td>
<td>.49</td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>Child Receptive Vocabulary</td>
<td>.002</td>
<td>.003</td>
<td>.05</td>
<td></td>
<td></td>
</tr>
<tr>
<td>Maternal Education</td>
<td>-.01</td>
<td>.02</td>
<td>-.05</td>
<td></td>
<td></td>
</tr>
<tr>
<td>Inhibited</td>
<td>.03</td>
<td>.02</td>
<td>.10</td>
<td></td>
<td></td>
</tr>
<tr>
<td>Average Approach</td>
<td>.02</td>
<td>.02</td>
<td>.08</td>
<td></td>
<td></td>
</tr>
<tr>
<td>Child Positive Affect</td>
<td>-.16</td>
<td>.10</td>
<td>-.25</td>
<td></td>
<td></td>
</tr>
<tr>
<td>Child Responsiveness</td>
<td>.71</td>
<td>.08</td>
<td>.77**†</td>
<td></td>
<td></td>
</tr>
<tr>
<td>Child Control</td>
<td>-.09</td>
<td>.19</td>
<td>-.06</td>
<td></td>
<td></td>
</tr>
<tr>
<td>Affect X Inhibited</td>
<td>.11</td>
<td>.12</td>
<td>.12</td>
<td></td>
<td></td>
</tr>
<tr>
<td>Affect X Average</td>
<td>.27</td>
<td>.12</td>
<td>.23*</td>
<td></td>
<td></td>
</tr>
<tr>
<td>Responsiveness X Inhibited</td>
<td>-.33</td>
<td>.19</td>
<td>-.14†</td>
<td></td>
<td></td>
</tr>
<tr>
<td>Responsiveness X Average</td>
<td>-.63</td>
<td>.13</td>
<td>-.38**†</td>
<td></td>
<td></td>
</tr>
<tr>
<td>Control X Inhibited</td>
<td>.02</td>
<td>.28</td>
<td>.01</td>
<td></td>
<td></td>
</tr>
<tr>
<td>Control X Average</td>
<td>.05</td>
<td>.26</td>
<td>.02</td>
<td></td>
<td></td>
</tr>
</tbody>
</table>

*p < .10; *p < .05; **p < .01
†p < .05-.10 in a model run with other temperament group as reference group
### Table 2.8

*Multiple Regression Models Predicting Mother Behavior during Clean-up Based on Child Temperament Group and Child Behavior*

<table>
<thead>
<tr>
<th>Variables</th>
<th>B</th>
<th>SE(B)</th>
<th>β</th>
<th>F</th>
<th>R²</th>
</tr>
</thead>
<tbody>
<tr>
<td><strong>I. Positive Affect</strong></td>
<td></td>
<td></td>
<td></td>
<td>2.36*</td>
<td>.21</td>
</tr>
<tr>
<td>Child Receptive Vocabulary</td>
<td>-.003</td>
<td>.004</td>
<td>-.08</td>
<td></td>
<td></td>
</tr>
<tr>
<td>Maternal Education</td>
<td>.01</td>
<td>.02</td>
<td>.05</td>
<td></td>
<td></td>
</tr>
<tr>
<td>Inhibited</td>
<td>-.005</td>
<td>.03</td>
<td>-.02</td>
<td></td>
<td></td>
</tr>
<tr>
<td>Average Approach</td>
<td>.06</td>
<td>.03</td>
<td>.22**</td>
<td>†</td>
<td></td>
</tr>
<tr>
<td>Child Positive Affect</td>
<td>.24</td>
<td>.14</td>
<td>.28†</td>
<td></td>
<td></td>
</tr>
<tr>
<td>Child Compliance</td>
<td>.19</td>
<td>.08</td>
<td>.39**</td>
<td>†</td>
<td></td>
</tr>
<tr>
<td>Child Control Behavior</td>
<td>.20</td>
<td>.30</td>
<td>.16</td>
<td></td>
<td></td>
</tr>
<tr>
<td>Affect X Inhibited</td>
<td>-.23</td>
<td>.18</td>
<td>-.18</td>
<td></td>
<td></td>
</tr>
<tr>
<td>Affect X Average</td>
<td>.04</td>
<td>.19</td>
<td>.02</td>
<td></td>
<td></td>
</tr>
<tr>
<td>Compliance X Inhibited</td>
<td>-.17</td>
<td>.11</td>
<td>-.20†</td>
<td>†</td>
<td></td>
</tr>
<tr>
<td>Compliance X Average</td>
<td>.01</td>
<td>.11</td>
<td>.01†</td>
<td></td>
<td></td>
</tr>
<tr>
<td>Control X Inhibited</td>
<td>-.18</td>
<td>.33</td>
<td>-.11</td>
<td></td>
<td></td>
</tr>
<tr>
<td>Control X Average</td>
<td>-.21</td>
<td>.37</td>
<td>-.09</td>
<td></td>
<td></td>
</tr>
<tr>
<td><strong>II. Responsiveness</strong></td>
<td></td>
<td></td>
<td></td>
<td>7.22**</td>
<td>.45</td>
</tr>
<tr>
<td>Child Receptive Vocabulary</td>
<td>.002</td>
<td>.005</td>
<td>.04</td>
<td></td>
<td></td>
</tr>
<tr>
<td>Maternal Education</td>
<td>-.02</td>
<td>.03</td>
<td>-.04</td>
<td></td>
<td></td>
</tr>
<tr>
<td>Inhibited</td>
<td>.02</td>
<td>.04</td>
<td>.04</td>
<td></td>
<td></td>
</tr>
<tr>
<td>Average Approach</td>
<td>-.02</td>
<td>.04</td>
<td>-.04</td>
<td></td>
<td></td>
</tr>
<tr>
<td>Child Positive Affect</td>
<td>.24</td>
<td>.18</td>
<td>.20</td>
<td></td>
<td></td>
</tr>
<tr>
<td>Child Compliance</td>
<td>.42</td>
<td>.10</td>
<td>.57**</td>
<td>†</td>
<td></td>
</tr>
<tr>
<td>Child Control Behavior</td>
<td>.79</td>
<td>.37</td>
<td>.45†</td>
<td></td>
<td></td>
</tr>
<tr>
<td>Affect X Inhibited</td>
<td>-.11</td>
<td>.22</td>
<td>-.06</td>
<td></td>
<td></td>
</tr>
<tr>
<td>Affect X Average</td>
<td>-.01</td>
<td>.24</td>
<td>-.01</td>
<td></td>
<td></td>
</tr>
<tr>
<td>Control X Inhibited</td>
<td>-.52</td>
<td>.41</td>
<td>-.23</td>
<td></td>
<td></td>
</tr>
<tr>
<td>Control X Average</td>
<td>-.41</td>
<td>.46</td>
<td>-.12</td>
<td></td>
<td></td>
</tr>
<tr>
<td>Compliance X Inhibited</td>
<td>-.02</td>
<td>.14</td>
<td>-.02</td>
<td></td>
<td></td>
</tr>
<tr>
<td>Compliance X Average</td>
<td>.14</td>
<td>.13</td>
<td>.11</td>
<td></td>
<td></td>
</tr>
<tr>
<td><strong>III. Control</strong></td>
<td></td>
<td></td>
<td></td>
<td>2.12*</td>
<td>.19</td>
</tr>
<tr>
<td>Child Receptive Vocabulary</td>
<td>&lt;.001</td>
<td>.003</td>
<td>.002</td>
<td></td>
<td></td>
</tr>
<tr>
<td>Maternal Education</td>
<td>-.003</td>
<td>.02</td>
<td>-.01</td>
<td></td>
<td></td>
</tr>
<tr>
<td>Inhibited</td>
<td>.03</td>
<td>.03</td>
<td>.11</td>
<td></td>
<td></td>
</tr>
<tr>
<td>Average Approach</td>
<td>.06</td>
<td>.03</td>
<td>.25*</td>
<td></td>
<td></td>
</tr>
<tr>
<td>Child Positive Affect</td>
<td>-.19</td>
<td>.13</td>
<td>-.27</td>
<td></td>
<td></td>
</tr>
<tr>
<td>Child Compliance</td>
<td>-.23</td>
<td>.07</td>
<td>-.54**</td>
<td></td>
<td></td>
</tr>
<tr>
<td>Child Control Behavior</td>
<td>-.23</td>
<td>.27</td>
<td>-.23</td>
<td></td>
<td></td>
</tr>
<tr>
<td>Affect X Inhibited</td>
<td>.13</td>
<td>.16</td>
<td>.12</td>
<td></td>
<td></td>
</tr>
<tr>
<td>Affect X Average</td>
<td>.09</td>
<td>.17</td>
<td>.07</td>
<td></td>
<td></td>
</tr>
<tr>
<td>Compliance X Inhibited</td>
<td>.16</td>
<td>.10</td>
<td>.22</td>
<td></td>
<td></td>
</tr>
<tr>
<td>Compliance X Average</td>
<td>.20</td>
<td>.10</td>
<td>.27*</td>
<td></td>
<td></td>
</tr>
<tr>
<td>Control X Inhibited</td>
<td>.29</td>
<td>.29</td>
<td>.22</td>
<td></td>
<td></td>
</tr>
<tr>
<td>Control X Average</td>
<td>.23</td>
<td>.33</td>
<td>.11</td>
<td></td>
<td></td>
</tr>
</tbody>
</table>

†p < .10; *p < .05; **p < .01

†p < .05-.10 in a model run with other temperament group as reference group
Table 2.9

Summary of Significant Simple Slopes of Mother Behavior Predicting Child Behavior by Temperament Group and Context

<table>
<thead>
<tr>
<th>Child Outcome</th>
<th>Mother Predictors</th>
<th>Exuberant</th>
<th>Inhibited</th>
<th>Average Approach</th>
</tr>
</thead>
<tbody>
<tr>
<td>Positive Affect</td>
<td>Positive Affect</td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td></td>
<td>Responsiveness</td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td></td>
<td>Control</td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>Responsiveness</td>
<td>Positive Affect</td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td></td>
<td>Responsiveness</td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td></td>
<td>Control</td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>Control</td>
<td>Positive Affect</td>
<td>**</td>
<td>*</td>
<td>*</td>
</tr>
<tr>
<td></td>
<td>Responsiveness</td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td></td>
<td>Control</td>
<td></td>
<td></td>
<td></td>
</tr>
</tbody>
</table>

**Free Play**

<table>
<thead>
<tr>
<th>Child Outcome</th>
<th>Mother Predictors</th>
<th>Exuberant</th>
<th>Inhibited</th>
<th>Average Approach</th>
</tr>
</thead>
<tbody>
<tr>
<td>Positive Affect</td>
<td>Positive Affect</td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td></td>
<td>Responsiveness</td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td></td>
<td>Control</td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>Compliance</td>
<td>Positive Affect</td>
<td></td>
<td>**</td>
<td>**</td>
</tr>
<tr>
<td></td>
<td>Responsiveness</td>
<td>+</td>
<td></td>
<td></td>
</tr>
<tr>
<td></td>
<td>Control</td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>Control</td>
<td>Positive Affect</td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td></td>
<td>Responsiveness</td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td></td>
<td>Control</td>
<td></td>
<td></td>
<td></td>
</tr>
</tbody>
</table>

*p < .10; *p < .05; **p < .01; value in parentheses indicates significance and comparison group of interaction
Table 2.10
Summary of Significant Simple Slopes of Child Behavior Predicting Mother Behavior by Temperament Group and Context

<table>
<thead>
<tr>
<th>Mother Outcome</th>
<th>Child Predictors</th>
<th>Exuberant</th>
<th>Inhibited</th>
<th>Average Approach</th>
</tr>
</thead>
<tbody>
<tr>
<td>Positive Affect</td>
<td>Positive Affect</td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td></td>
<td>Responsiveness</td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td></td>
<td>Control</td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>Responsiveness</td>
<td>Positive Affect</td>
<td>$^*$ (+inhibited)</td>
<td></td>
<td></td>
</tr>
<tr>
<td></td>
<td>Responsiveness</td>
<td>$^{*1}$ (+inhibited)</td>
<td></td>
<td>$^{+1}$ (+inhibited)</td>
</tr>
<tr>
<td></td>
<td>Control</td>
<td>$^{**}$</td>
<td>$^*$</td>
<td>$^*$</td>
</tr>
<tr>
<td>Control</td>
<td>Positive Affect</td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td></td>
<td>Responsiveness</td>
<td>$^{**}$</td>
<td>$^{**}$</td>
<td>$^{**}$</td>
</tr>
<tr>
<td></td>
<td>Control</td>
<td></td>
<td></td>
<td></td>
</tr>
</tbody>
</table>

<table>
<thead>
<tr>
<th>Mother Outcome</th>
<th>Child Predictors</th>
<th>Exuberant</th>
<th>Inhibited</th>
<th>Average Approach</th>
</tr>
</thead>
<tbody>
<tr>
<td>Positive Affect</td>
<td>Positive Affect</td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td></td>
<td>Compliance</td>
<td>$^*$ (ns)</td>
<td></td>
<td>$^*$ (+inhibited)</td>
</tr>
<tr>
<td></td>
<td>Control</td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>Responsiveness</td>
<td>Positive Affect</td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td></td>
<td>Compliance</td>
<td>$^{**}$</td>
<td>$^{**}$</td>
<td>$^{**}$</td>
</tr>
<tr>
<td></td>
<td>Control</td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>Control</td>
<td>Positive Affect</td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td></td>
<td>Compliance</td>
<td>$^{*1}$ (*average)</td>
<td></td>
<td></td>
</tr>
<tr>
<td></td>
<td>Control</td>
<td></td>
<td></td>
<td></td>
</tr>
</tbody>
</table>

$^p < .10; ^* p < .05; ^{**} p < .01$
Values in parentheses indicate significance and comparison group of interaction
$^{1}$Simple slope was negative in magnitude
Figure 2.1. Temperament group LPA 4-class solution estimated class means and class membership totals, displayed as raw scores (top) and as proportion of total possible score (bottom).
STUDY 3:

Children’s behavioral self-regulation and conscience: Differential outcomes based on temperament, parenting, and parenting context

Children achieve a host of cognitive and motor milestones in the early years of life that set the stage for voluntary modulation of thoughts, emotions, and behavior, and in turn allow children to produce goal-directed responses and to align with external expectations (Kopp, 1982; Vohs & Baumeister, 2011). In other words, children develop the basic capacity for self-regulation. These early developmental milestones also allow for the development of conscience, a system of self-regulatory processes that motivate moral thought, emotion, and behavior (Kochanska & Aksan, 2006). Because self-regulation and conscience are thought to draw from the same systems of functioning, the development and expression of these outcomes are found to be highly related over time (Kochanska & Aksan, 2006; Kochanska et al., 1996; 1997). Further, although the capacity for many self-regulatory processes appears to come on line within the first three years of life, same-age children still display many individual differences in their performance on self-regulation and conscience tasks (Kochanska, Coy, & Murray, 2001; Kochanska, Murray, & Coy, 1997; Kochanska, Murray, Jacques, Koenig, & Vandegeest, 1996; Kopp, 1982). Individual differences in performance are likely determined in part by children’s characteristics and their early experiences, and researchers should continue to unpack how different developmental influences work together to promote self-regulatory skills. To that end, the present study will focus on specific contributions of child temperament, parenting, and parenting contexts in predicting behavioral indicators of self-regulation and conscience.

Temperament, as conceived by Rothbart (e.g., Rothbart & Bates, 2006; Rothbart & Derryberry, 1981) comprises constitutional differences in reactivity and self-regulation. The self-
regulatory component, termed effortful control, reflects individual differences in the ability to inhibit a dominant response in order to perform a subdominant response, detect errors, and engage in planning (Rothbart & Bates, 2006; Rothbart, Ellis, & Posner, 2011; Rueda, 2012). By definition this component supports the ability to intentionally align with rules or expectations. However, reactive components of temperament, specifically emotional and behavioral reactivity to novelty, threat/punishment, and reward, can also influence the ability to display regulated behavior. A helpful way to interpret these temperament-based differences is by framing them within temperament types. The “inhibited” label is typically used to describe children who display relatively higher reactive inhibition to novelty, fearful emotional reactivity, and sensitivity to threat or punishment (e.g., Fox, Henderson, Marshall, Nichols, & Ghera, 2005; Kagan, Reznick, Clarke, Snidman, & Garcia-Coll, 1984; Putnam & Stifter, 2005; Rothbart & Bates, 2006). In contrast, the “exuberant” label is used to describe children who display relatively higher reactive approach to novelty, impulsivity, positive emotional reactivity, and sensitivity to reward (e.g., Degnan et al., 2011; Kagan et al., 1984; Polak-Toste & Gunnar, 2006; Putnam & Stifter, 2005; Rothbart & Bates, 2006). When identified, children who are more moderate on these traits have been labeled “low” or “average” in reactivity (Dollar, Stifter, & Buss, under review; Putnam & Stifter, 2005).

Temperamental differences in self-regulation and conscience have been most frequently tied to inhibited or exuberant traits. Specifically, inhibited children’s tendency to reactively inhibit behavior in the presence of novelty or threat has been found to relate to voluntary control of behavior in other contexts (Aksan & Kochanska, 2006; Kochanska & Knaack, 2003). Moreover, fearfulness and punishment-sensitivity are thought to motivate a concern to display correct behavior in order to avoid punishment and/or discomfort about transgressing against rules
or against other people (e.g., Kochanska, 1993). Exuberant children’s tendency to display reactive approach (e.g., impulsivity) to novelty and cues of reward may create difficulties in self-regulation when external expectations require inhibiting these responses (Dollar & Stifter, 2016; Polak-Toste & Gunnar, 2006). Lower levels of fearfulness and lack of concern for punishment may also lead to greater disregard for the consequences of one’s behavior or the impact one’s behavior has on other people (Kochanska, 1993; Frick & Morris, 2004). Thus, collectively, inhibited children evidence a greater preparedness to develop regulatory skills and conscience, whereas exuberant children may require greater support throughout development in order to develop these abilities (Dollar & Stifter, 2016; Kochanska, 1993; Polak-Toste & Gunnar, 2006).

Differences in parental socialization also play an important role in children’s development of self-regulation and conscience (Dunn, 2014; Eisenberg, Smith, & Spinrad, 2014; Kopp, 1982; Laible & Thompson, 2007). A high level of mutual positive affect, responsiveness, and cooperation among parent and child, sometimes called a “mutually responsive orientation” (MRO), is thought to forge a parent-child relationship in which the child embraces parent socialization messages and has a greater motivation to align behavior with parental demands (Kochanska, 1997b; Kochanska, 2002). Similarly, mutually positive and reciprocal interactions with the parent serve as early bases for the child’s perceptions of mutual responsibility and cooperation with other people and desire to respect moral rules and values at large (Kochanska, 1997b; Russell, Pettit, & Mize, 1998; Thompson, Meyer, & McGinley, 2006).

In tandem with positivity and mutuality, parental socialization can also be conveyed through control or structuring behaviors (Baumrind, 1966; 1971; Hoffman, 1975; Maccoby & Martin, 1983). Through consistent supervision, demands, and feedback, parents guide children toward appropriate responses that align with their expectations, but also give children the
autonomy to plan and produce future responses (Baumrind, 2012; Grolnick & Pomerantz, 2009). Considered separately from coercive or harsh parenting, gentle control/structuring behaviors impose reasonable constraints on children’s behavior while directing them toward independent understanding and enactment of acceptable responses.

Research on self-regulation and conscience has increasingly incorporated influences of both temperament and parenting. Kochanska (1991; 1993) was among the first researchers to investigate differential parental socialization of conscience based on temperament. She proposed that conscience development involves two components: affective discomfort, reflecting a sensitivity or anxious arousal regarding transgressions and violations of standards, and behavioral control, reflecting an ability to control behavior to refrain from transgressions and align with standards. Presuming differences in temperamental motivations, Kochanska suggested that children who are relatively more fearful or anxious (similar to inhibited children) may experience more affective discomfort, thus parental gentle discipline may be sufficient to arouse anxiety about producing acceptable behavior without eliciting fear or distress (Kochanska, 1993; 1995; 1997). Affective discomfort may be a weaker motivator for children who are less fearful or more impulsive (similar to exuberant children), so behavioral control skills may instead be beneficial for these children. She suggested that a mutually positive, reciprocal, or cooperative relationship between parent and child would produce a positive motivation to accept parental values and thus promote better behavioral control (Kochanska, 1995; 1997a). These and subsequent studies (Kochanska, 1995; 1997a; Kochanska, Forman, & Coy, 2007) demonstrated across multiple samples of children that maternal gentle discipline deemphasizing power and maternal power assertion (negatively), predicted measures of compliance, adherence to rules without supervision, and prosocial or moral responses to hypothetical prompts in relatively
fearful children. Alternatively, single or aggregate measures of positive parent-child relationships including attachment security, (mutual) responsiveness, shared positive affect, and MRO, predicted the aforementioned outcomes as well as a willing stance toward the parent in relatively fearless children. Despite their consistent findings, Kochanska examined temperament based on median-splits or tests of high and low values on a continuous, aggregate measure of child fearfulness or inhibition to novelty. To our knowledge, no study has investigated temperament-based effects of similar parenting variables using a typological approach to assessing temperament. The current study seeks to do so, examining children characterized as inhibited, exuberant, and average-approach.

Temperament-based effects may also emerge more strongly when parental socialization behaviors are observed in specific contexts. Given the importance of compliance, rule-adherence, and internalization of parental messages to the development of self-regulation and conscience, variations in contextual regulatory structure may pull for differing expressions of parental socialization qualities. This idea aligns with past arguments made by parenting researchers that the manifestation and impact of parental socialization behaviors may differ depending on the parent’s goals for the child, the child’s perception of parental goals or messages, and the domains of child functioning to which parental socialization behavior applies (Dix, 1992; Grusec & Davidov, 2010; Grusec & Goodnow, 1994; Grusec, Goodnow, & Kuczynski, 2000). Situations in which parental goals center on child regulation, and on encouraging the child to produce responses that differ from his/her preferred response, likely evoke a greater frequency of parenting behavior directed at controlling or structuring child responses. Conversely, situations in which parental and child goals are both more diffuse or non-directive, as during a free play session, may allow for more parenting behavior and parent-child interactions reflecting positivity
and reciprocity.

These differences in structure may in turn play a role in how parents successfully socialize children of different temperament types. For parents of inhibited children, the general tendency to display more gentle control and regulation of child behavior in structured tasks is relatively well-attuned to their children’s sense of anxiety or motivation to comply. Exuberant children, however, may be more likely to respond with anger or noncompliance to parental regulatory goals that conflict with their own goals. Thus, structured tasks may be a more appropriate context from which to observe parental socialization of regulatory and conscience outcomes in inhibited children compared to other temperament types. Conversely, unstructured tasks may allow for greater exchanges of mutual positivity and responsiveness in the parent and child which, again, would be expected to be especially predictive of self-regulation and conscience outcomes in exuberant children. Thus, unstructured tasks may be a more appropriate context from which to observe parental socialization of these outcomes in exuberant children compared to other temperament types.

Only a few studies have incorporated contextual differences in studies of parenting, temperament, and regulatory outcomes. Kochanska’s (Kochanska & Askan 1995; Kochanska, Aksan & Nichols, 2003; Kochanska, Coy, & Murray, 2001) research on early regulatory development included comparisons of parent and child behavior in regulatory “don’t” contexts, in which the child is expected to inhibit a desired response, and “do” contexts, in which the child is expected to sustain an undesired or tedious response. Children tended to display more compliance and internalization of contextual demands in “don’t” contexts, and child temperamentual fearfulness and shyness was found to relate to internalization of regulatory goals only in these contexts. These findings suggested that “do” contexts are more of a regulatory
challenge for children, and pull for individual regulatory differences even in more inhibited children. Drawing from these evident differences in regulatory challenge, Augustine and Stifter (2015) found that maternal socialization behaviors related to later conscience outcomes in exuberant toddlers only when measured on a “don’t” context, and for inhibited toddlers only when measured in a “do” context. Finally, Dennis (2006) examined interactions between child temperamental approach and a number of parenting behaviors observed in an unstructured and structured task related to child regulation at preschool age. The results suggested that maternal responses that focused on positive child or situational qualities in a wait task related to better emotional self-regulation in high-approach children, whereas shared positive affect in a free play related to mother-reported compliance in low-approach children. Although these findings are contrary to the current conceptualization of the consequences of context for different temperament types, it is important to consider that these relations were measured concurrently and at preschool age when children may have already developed a number of regulatory skills. Dennis (2006) acknowledged that these results could reflect both child and mother effects, in that mothers appeared to adjust their behaviors to the child’s needs in each task. Better-developed regulatory skills may allow for more positive mother-child interactions, effects that may be more apparent in contexts in which one’s temperament group would otherwise not be expected to be the most positive or responsive to the mother—structured regulatory tasks for exuberant children, unstructured tasks for inhibited. In general, more research on contextual differences in parenting and temperament of this nature is warranted, but specifically, predicting children’s regulatory performance from parenting observed at an earlier point in children’s self-regulatory development would lend greater confidence to temporal interpretations of these patterns.
Current Study

Child temperamental inhibition and exuberance appear to underlie differences in self-regulatory and conscience development, as well as differences in the outcomes of maternal socialization qualities such as mutual positivity/responsiveness and maternal control/structuring behavior. However, longitudinal research on the relevance of contextual goals for the emergence of these temperament-based effects of maternal socialization behavior is sparse. Thus, the current study seeks to contribute greater understanding of the means through which parental socialization promotes self-regulation and conscience based on child temperament.

Mother-child mutual positivity/responsiveness and maternal control behaviors were observed in a context involving no inherent regulatory structure, a free play task, and a context involving clear regulatory structure, a clean-up task, when the child was 18 months old. Child temperament was assessed at the same time point based on responses to novel stimuli, and latent profile analysis was used to classify infants to temperament profiles. Based on previous research (Dollar, Stifter & Buss, under review; Putnam & Stifter, 2005), it was predicted that three qualitative temperament groups would emerge: an inhibited, exuberant, and average approach group. Several measures of child behavioral self-regulation and conscience were assessed when the child was 4.5 years old.

Consistent with the existing literature (e.g., Aksan & Kochanska, 2004; Kochanska, 1995; 1997a; Kochanska, Forman, & Coy, 2007) it is hypothesized that that mother-child mutual positivity/responsiveness is a stronger predictor of behavioral self-regulation and conscience measures for exuberant children compared to children of other temperament types, whereas maternal control/structuring behavior is hypothesized to be a stronger predictor of these outcomes in inhibited children compared to children of other temperament types. Further, based
on expected context-based differences in parental goals and responses, it is predicted that the
effects of mother-child mutual positivity/responsiveness for exuberant children will be stronger
when this quality is observed in an unstructured free play context, and the effects of maternal
control/structuring behavior for inhibited children will be stronger when this quality is observed
in a structured clean-up context.

Method

Participants

Participants for this study were 147 infants and their mothers recruited for a longitudinal
study of emotional development with laboratory visits. Infants in the original sample were
equally distributed by gender (53% male) and primarily Caucasian (93%). Mothers averaged
29.66 years of age at the time of the child’s birth (SD = 4.77 years) and 55% had at least a
college education. The majority of mothers (81.9%) were married to the infant’s father. Median
annual family income in this sample fell in a category of $40,000-$60,000.

The original study followed infants and their mothers in lab visits from 6 to 18 months of
age. A total of 13 families from the original sample did not participate in the 18-month visit.
Mothers of infants who did not participate at 18 months tended to have fewer years of education
($t(145)=2.16, p = .04$) than those who participated, but did not differ on other demographic
characteristics. A subset of 96 families were contacted 3 years later for a follow-up study and 82
families agreed to participate. Families who participated in the follow-up study did not differ
significantly from the remainder of the original sample on any demographic characteristics. The
current study utilizes data from the 18-month lab visit and from two lab visits conducted when
the child was 4.5 years of age. All study procedures were approved by the institutional review
board and informed consent was obtained from all participants (mothers provided consent on
behalf of their infants/children).

Difficulties with task administration led to unusable 18-month temperament assessment data for one child. Two mothers spoke a language other than English during the 18-month mother-child interaction tasks, so among the mother variables, only positive affect was coded for these mothers. Thus, the final sample for the 18-month predictors ranged from 131-134.

**Procedure**

**18 months.** Mothers and infants participated in a laboratory visit within two weeks of when the infant turned 18 months of age. Relevant to this study, infants’ participated in a risk room task at the beginning of the lab visit to assess infant temperament. Later in the visit, mothers and infants participated in a free play session to assess mother and child behavior in an unstructured socialization context, followed by a clean-up task to assess mother and child behavior in a structured socialization context.

**Risk Room.** In this task, adapted from the Laboratory Temperament Assessment Battery (Lab-TAB; Goldsmith, Reilly, Lemery, Longley, & Prescott, 1994), the infant and mother were invited to enter a laboratory room filled with a number of novel objects, including a small pop-up tunnel, a set of steps, a black box with “teeth,” and a gorilla mask on a table. The mother was asked to sit in a chair in the corner of the room and allow the infant to roam the room and interact with the novel objects. After 3 minutes of free exploration, an unfamiliar experimenter entered the room; s/he asked the mother to sit back but did not intentionally approach the infant. Speaking in a positive tone of voice, the experimenter then asked the child to engage with each object (climb through the tunnel, jump from the steps to a small mattress below, put a hand in the black box, pet the gorilla mask). The experimenter-present portion of the task was observed for infant temperamental reactions to novelty.
**Free Play and Clean-up.** The mother and child were provided with a basket of age-appropriate toys and were asked to sit together on the laboratory floor to play. Mothers were provided with no specific instructions for their behavior during the free play except to play however they normally would at home, and to try to remove as many toys as possible from the basket throughout the interaction to prepare for the clean-up task. The experimenter also explained that she would return in several minutes to cue the mother to begin the clean-up task. During the clean-up the mother was asked to do her best to get the child to return all the toys to the basket independently and to avoid cleaning up for the child. After this set of instructions, the experimenter exited the laboratory and the mother and child were left alone to play for 5 minutes. The experimenter then opened the laboratory door briefly to cue the mother to initiate the clean-up and remind her of the instructions. The mother and child were then again left alone for up to 3 minutes or until all toys were returned to the basket.

**4.5 years.** Children participated in a lab visit when they were approximately 4.5 years of age ($M = 4.54$ years) and a second lab visit approximately one month later. Among visit tasks, this study focuses on three measures of behavioral self-regulation (tongue task, continuous performance task, clean-up task) and two behavioral measures of conscience (memory game, puzzle task).

**Behavioral self-regulation.**

Three tasks were used to measure behavioral self-regulation. Across these tasks the child was instructed to inhibit and/or produce behavior in line with external instructions, but distinct from the conscience tasks, the child was aware that the parent and/or experimenter could supervise his/her adherence to the instructions by observing the child’s behavior in real time or checking the child’s completion of the task after the fact. However, consistent with the
conscience tasks, the experimenter or parent provided minimal guidance after the initial instructions and thus child behavior was still largely self-regulated.

_Tongue task_ (adapted from Kochanska et al., 1996). The experimenter introduced a game in which she and the child balanced a candy on their tongues for as long as possible with mouth open and without chewing, sucking, or swallowing the candy. They practiced the task with a 10-second training trial, then completed a test trial that lasted up to 2 minutes, at which point the experimenter would “lose” the task by eating her candy. If the child closed his/her mouth or touched the candy the experimenter provided one reminder to keep his/her mouth open and clear. The test trial was ended early if the child ate the candy or dropped the candy from his/her tongue after 1 minute had passed (the trial was re-started if the candy fell before 1 minute).

_Clean-up alone task_ (Kochanska et al., 1996). At the conclusion of a dress-up play session with an experimenter, the parent who accompanied the child to the visit, typically the mother, was asked to open the laboratory door and briefly instruct the child to start picking up the dress-up items and put them in a provided basket. The parent then closed the door and the child was left alone to pick up the dress-up items for up to 2 minutes or when all the items were returned to the basket.

_Continuous performance task (CPT)._ During this computerized task, which was designed for this study, the child was instructed to press a key as quickly as possible when a picture of a rabbit appeared on the screen, and to not press the key if a picture of another animal (polar bear, kangaroo, elephant, deer, frog) appeared. The task was completed in three sets of 12 randomized presentations, including 6 pictures of rabbits and 6 of other animals. Picture presentations lasted 3 seconds during the first set, 2 seconds during the second set, and 1 second during the third set; all presentations were separated by 500 millisecond breaks. The task was programmed using
PsychoPy software (Peirce, 2007) and key presses were recorded. If the child appeared to stop paying attention to the task or to watch the screen without enacting any behavior, the experimenter provided one reminder to press the button when s/he sees a rabbit. A response was considered correct if the child pressed the key during a rabbit presentation or did not press the key during a non-rabbit presentation.

**Behavioral measures of conscience.**

Two tasks were used to measure the moral behavior component of conscience. In both tasks the child was given clear instructions to inhibit and/or produce behavior during a “game,” and then left unsupervised. This lack of supervision provided an opportunity for the child to cheat at the tasks to gain a greater reward, and in the puzzle task an opportunity to stop persisting at a difficult activity, without the experimenter’s knowing. Displaying non-cheating or rule-abiding behavior without supervision reflected the child’s adherence to standards and/or sensitivity to violating standards.

**Memory game** (adapted from Kochanska et al., 1996). The experimenter introduced a memory game in which cards were placed face-down on the table and flipped over in pairs to find a match. The experimenter told the child that each time s/he found a match s/he would receive a sticker. The pair took turns playing, and after the child had found two matches, the experimenter was signaled to leave the room by a knock from the other room. The experimenter told the child she needed to go help outside and instructed the child not to look under the cards while she was gone because that would be cheating. The child was left alone with the cards for two minutes.

**Puzzle task** (following Eisenberg et al., 2000). The child was seated in front of a box that had a cloth panel with arm holes facing the child, transparent plexiglass in the back, and a simple
shape puzzle attached inside. The experimenter placed the puzzle pieces inside the box and told
the child she wanted to see how fast children can complete puzzles when they can’t see what
they are doing. If the puzzle was finished before two minutes, the child would receive two
stickers. The experimenter helped the child put his/her arms inside the box, set a timer, and
reminded the child not to look at the puzzle because that would be cheating. The child was left
alone for two minutes, or less if the child completed the puzzle.

**Child language assessment.** Due to possible differences in understanding of the task
instructions, children’s receptive vocabulary was assessed using the Peabody Picture Vocabulary
Task, Fourth Edition (PPVT; Dunn & Dunn, 2007). Scaled receptive vocabulary scores were
created for each child \( M = 112.77, SD = 14.55 \).

One child refused to complete this measure. This child had received approximately the
mean score on a measure of receptive vocabulary assessed at 18 months (Bayley, 2006) and this
measure was significantly related to PPVT scores in this sample \( r = .44, p < .001 \); thus a mean
receptive language score of 113 was assigned for this participant.

**Behavioral Coding**

**18 months.**

**Temperament assessment.** Following previous research (Putnam & Stifter, 2005)
temperament was assessed through affective and approach-withdrawal responses to the risk
room; all measures were coded by trained teams of undergraduate coders.

Child *positive affect* and *negative affect* were coded from facial affect and vocalizations
in 5-second intervals through by teams of trained coders. Positive affect was coded on a 4-point
scale from 0 = “No positive; no indication of positive facial affect and no positive intonation in
voice” to 3 = “High positive; highly positive affect such as a smile with mouth open widely,
intense laughing, or squealing with delight.” Negative affect was also coded on a 4-point scale from 0 = “No negative: no indication of negative facial affect and no positive intonation in voice” to 3 = “High negative; highly negative affect such as a large grimace with mouth open, extreme crying, or screaming.” Drift reliability was assessed on 20% of recordings, with an ICC = .98. Positive and negative affect scores were calculated as the mean affect level across intervals.

Approach-withdrawal responses were assessed through proximity to the mother, latency to play, total time playing, engagement with the novel objects, activity level, and spontaneous vocalizations. Proximity to the mother was coded second-by-second on a 5-point scale from 1 = “Both hands or a significant part of the body is touching mother” to 5 = “More than two arm lengths from mother.” As such, a high score on this measure represented a greater distance from the mother. Drift reliability was assessed on 21% of recordings with an ICC = .99. Proximity scores were calculated as the mean level of proximity to the mother across total seconds. Latency to play was coded as the length of time in seconds until the child first engaged with one of the risk room objects. Drift reliability was assessed on 21% of recordings with an ICC = .92. Total time playing was coded as the length of time in seconds that the child interacted with any risk room object during the episode. Drift reliability was assessed on 21% of recordings with an ICC = .97. Due to slight task length differences, latency to play and total time playing scores were calculated as the proportion of total task length. Engagement with the risk room was coded in 5-second intervals on a 6-point scale from 0 = “No engagement with any risk room object” to 5 = “High active engagement; engages with a toy in an appropriate way (e.g., crawls through tunnel, jumps off steps) with high energy level. Drift reliability was assessed on 21% of recordings with an ICC = .99. Engagement scores were calculated as the mean engagement level across intervals.
Activity level was coded in 5-second intervals on a 4-point scale from 0 = “No activity; child is completely, or nearly completely, still” to 3 = “High activity; vigorous, exuberant activity.” Drift reliability was assessed on 20% of recordings with an ICC = .97. Activity level scores were calculated as the mean activity level across intervals. Spontaneous vocalizations were coded in 5-second intervals, defined as the presence of a child-initiated, non-distressed attempt at vocal communication at any time during the interval. Drift reliability was assessed on 20% of recordings with an average kappa = .70. Spontaneous vocalization scores were calculated as the proportion of intervals in which a spontaneous vocalization was observed.

**Maternal interactive behaviors in free play and clean-up.** To observe comparable parenting measures in the free play and clean-up task, maternal responses were coded in a relatively task-neutral manner using similar definitions for each construct. All measures were coded by trained teams of undergraduate coders.

Maternal affect was coded in 10-second intervals in each task using a scheme adapted from Kochanska and Aksan (1995). A “high positive” code was assigned if the mother displayed clear positive affect at least once during the interval, defined as a clear smile, positive vocalization (laugh or chuckle), or positive (playful or joyful) intonation while speaking. “Neutral/positive” was coded if the mother did not display high positive affect as defined above, but the mood was pleasant or neutral throughout the interval. Although positive affect was of primary interest, a “neutral/negative” code was assigned if at any point in the interval the mother displayed mildly negative affect indicating irritation, impatience, boredom, or otherwise infusing the interaction with mild negativity (no mothers displayed negative affect more extreme than this level). Intervals coded as high positive were assigned a score of 2, neutral/positive a score of 1, and if an interval contained a neutral/negative code it was assigned a score of 0. Drift reliability
was assessed on 21% of recording, with an ICC = .80 for risk room and ICC = .80 for clean-up.

Responsive/reciprocal behavior and control/structuring behavior codes were adapted from past research (Cipriano & Stifter, 2010; Kochanska, Coy, & Murray, 2001; Lindsey, Cremeens, and Caldera, 2010), and developed to reflect behaviors that could be observed in either socialization context. As such, these behaviors were defined by their general function or intent in reference to the child, not specific to the regulatory structure of the task. Descriptions and examples of the codes observed for each construct are presented in Table 3.1.

Responsive/reciprocal behaviors were those behaviors indicating willingness on the mothers’ part to endorse the child’s choices, follow the child’s agenda, comply with the child’s requests, and/or provide reasoning about behavior to the child. Each task was coded in 10-second intervals for the presence of any of these behaviors; otherwise a “none” code was applied. Drift reliability was assessed on 21% of recordings, with an average kappa for encouragement, compliance, reasoning, and observation, respectively, of 0.76, 0.79, 0.94, 0.88 for free play, and 0.84, 0.88, 0.82, 0.75 for clean-up. Responsive/reciprocal behavior scores were calculated as the proportion of total behaviors (i.e., all responsive codes and “none” codes) that were coded as a responsive/reciprocal behavior.

Control/structuring behaviors were those behaviors used by the mother in an attempt to change, redirect, or elicit child behavior or attention, request verbal responses, or otherwise attempt to enact alteration in the child’s behavior. Importantly, all of these behaviors must have been displayed with neutral/positive affect, suggesting gentle control on the part of the mother. Additionally, the behavior labeled “decision request” was coded only in free play, as this behavior was rarely observed in clean-up. Each task was coded in 10-second intervals for the presence of any of these behaviors; otherwise a “none” code was applied. Drift reliability was
assessed on 21% of recordings, with an average kappa for command, prohibition, redirection, scaffolding, behavior request, and knowledge request, respectively, of 0.84, 0.89, 0.83, 0.88, 0.95, 0.92 for clean-up and .95, 1.00, .88, .95, .97, and .95 for free play, and .97 in addition for decision request in free play. Control/structuring behavior scores were calculated as the proportion of total behaviors (i.e., all control codes and “none” codes) that were coded as a control/structuring behavior.

**Child interactive behaviors in free play and clean-up.** Coding schemes were developed to capture positive affect and responsive/compliance behaviors in the child that were roughly analogous to those coded in mothers. All measures were coded by trained teams of undergraduate coders.

*Affect responses* were coded from facial affect and vocalizations in 10-second intervals through both tasks. As children tended to display negative affect with greater frequency than mothers, both positive and negative responses were coded. Positive affect was coded on a 3-point scale from 0 = “No positive; no smiles or vocalizations that indicate positive affect” to 2 = “High positive; child displays a clear smile, clear positive vocalization, or exuberant body movement.” Drift reliability was assessed on 21% of recordings, with an ICC = .97 for free play and ICC = .83 for clean-up. Negative affect was also coded on a 3-point scale from 0 = “No negative: no frowns or vocalizations that indicate negative affect,” to 2 = “High negative; child displays a clear frown or upset facial expression, a high negative vocalization (e.g., crying, screaming), or a highly negative body movement (e.g., stomping, hitting).” Drift reliability was assessed on 21% of recording, with an ICC = .94 for free play and ICC = .96 for clean-up. Positive and negative affect scores were calculated for each task as the mean affect level across intervals. Examination of score distributions indicated that a majority of children did not have a negative affect score
above 0 in free play ($N=98$) or clean-up ($N=78$), leading to little variability in distinct negative affect scores. To account for this issue, an overall affect score for each task was calculated as the mean of positive and negative affect scores across the task. Thus, a score above 0 indicated that the child displayed relatively higher positive relative to negative affect, whereas a score below 0 indicated that the child displayed relatively higher negative relative to positive affect.

*Child responsive/compliance* behavior was also coded in 10-second intervals, using more global codes than those for mother behavior due to limitations in child verbal fluency. Additionally, responsive behavior was defined slightly differently in each task. Mother behavior in the clean-up task was almost exclusively tied to the child’s progress at cleaning up the toys and mothers provided consistent guidance to pick up and put away the toys, thus the child’s responsiveness to the parent was generally represented by compliance to the mother’s requests to put away the toys or engage in behavior related to the clean-up task. Conversely, in the free play task, child responsiveness tended to be displayed either as compliance to specific maternal requests or by spontaneous shifts in behavior or attention to align with the mother’s activity. Accordingly, *free play responsive behavior* was defined as the presence of an intentional shift in behavior or attention in response to the mother or accepting changes to his/her behavior enacted by the mother. Additionally, due to the mentioned apparent differences in mothers’ attempts to structure child behavior, coders could indicate if the mother did not provide a cue that could enact a child response during the interval. Drift reliability was assessed on 21% of recordings with an ICC = .78 for responsive behavior and ICC = .82 for no cue to respond. *Clean-up compliance* was defined as the presence of behavior directed toward the goal of cleaning up or otherwise in line with the mother’s request to clean up. Drift reliability was assessed on 21% of recordings, with an ICC = .93. Responsive behavior scores were calculated for each task as the
proportion of total intervals in which responsive behavior was coded (and as in the case of free play, this score was based on the total number of intervals in which a cue to respond was present).

4.5 years. Child behavior in all regulation and conscience tasks (except the CPT task, which recorded performance by computer) was observed for responses reflecting adherence, or lack thereof, to the respective task rules (i.e., producing requested behavior or inhibiting prohibited behavior). Except for frequency of peeks, all behaviors were coded second-by-second. All measures were coded by trained teams of undergraduate coders. To account for slight differences in task time, scores were calculated as proportion of total task time unless otherwise noted.

Tongue task. Total task time was defined as the total time before the child ate or dropped the candy, reflecting rule adherence. Time spent engaging in two interfering behaviors was subtracted from the total task time: mouth closed, defined as the total time the child closed his/her mouth for at least a 1 second period, and touching candy, defined as the total time the child spent touching the candy in his/her mouth, such as to hold it in place. Drift reliability was assessed on 30% of recordings, with an ICC of .99 for latency to end task, .84 for mouth closed, and .96 for touch candy.

Clean-up task. Time spent cleaning was defined as the total time spent picking up items and putting them in the basket (if the child picked up an item but did not eventually place it in the basket, this was not considered cleaning). Drift reliability was assessed on 21% percent of recordings, with an ICC of .84.

Memory game. Latency to peek was defined as the total time before the child flipped or peeked beneath a card. Time spent peeking was defined as the total time the child spent flipping
over cards or lifting cards to look at the underside. Coders also recorded the total number of times the child flipped or peeked under a card. Drift reliability was assessed on 22% of recordings, with an ICC of 1.00 for latency to peek, .89 for time spent peeping, and 1.00 for total number of peeks. The majority of children (71%) did not peek during this task, thus the latency to peek measure was alternatively scored dichotomously as “did not peek” and “peeked.”

**Puzzle task.** Latency to peek was defined as the total time before the child lifted the cloth to see the puzzle or pulled out a puzzle piece to see its shape. Time spent peeking was defined as the total time the child spent looking under the cloth or removing puzzle pieces. Coders also recorded the total number of times the child peeked under the cloth or pulled out a piece. Most children quickly realized the task was too difficult to complete on their own, thus the tendency to display sustained persistence at the puzzle without peeking did appear to reflect a willingness to sustain a difficult rule-compliant activity without supervision, rather than a high level of approach to reward. Thus, persistence at the task was also coded, defined at the total time spent attempting to complete the puzzle without peeking. Drift reliability was assessed on 21% of recordings, with an ICC of 1.00 for latency to peek, .97 for time spent peeking, .90 for total number of peeks, and .96 for persistence.

**Data reduction.**

**Mother-child mutual positivity/responsiveness.** Correlations among mother and child responsive/(compliance) behavior and positive affect in free play and in clean-up were examined. During free play, mother responsive/reciprocal behavior was significantly correlated with mother affect, child responsive behavior, and child affect ($r_s = .27-.40, ps = <.001-.008$) and child responsive behavior was marginally correlated with child affect ($r = .18, p = .09$). In clean-up, all mother and child behaviors were significantly correlated ($r_s = .23-.64, ps = <.001-$
.03) except mother affect and responsive/reciprocal behavior ($r = .12, p = .24$). Given this moderate consistency in responses, mutual positivity/responsiveness composites were calculated for each context as the mean of standardized mother responsive/reciprocal behavior, child responsive/compliance behavior, mother positive affect, and child positive affect scores.

**Behavioral self-regulation.** Correlations among tongue task behavior, clean-up behavior, and overall CPT performance were relatively modest ($rs = .10-.15, ps = .19-.36$). It was found that CPT accuracy during the second set of images (2-second presentations) had relatively better consistency with the other measures ($rs = .12-.19, ps = .09-.28$). Additionally, in a principal components analysis these measures loaded onto a single factor (eigenvalue = 1.31) with similar magnitude loadings (.60-.72), suggesting that they represented distinct indicators of a larger construct. Thus, a composite score for behavioral self-regulation was calculated as the mean of standardized CPT set 2 performance, clean-up time, and tongue task time scores.

**Conscience.** Correlations among all coded responses in the memory game and puzzle task were examined. Number of peeks in the puzzle task appeared to have modest relations to behavior in the memory game (absolute value $rs = .15-.18, ps = .12-20$), but all other behaviors were marginally to strongly correlated (absolute value $rs = .20-.92, ps = <.001-07$). Accordingly, a composite score for behavioral indicators of conscience was calculated as the mean of standardized memory game peeked (no/yes), time peeking, memory game number of peeks, puzzle task latency to peek time, puzzle task peeking time, puzzle task number of peeks, and puzzle task persistence time.

**Temperament Group Formation**

Temperament groups were formed based on child responses in the risk room using latent profile analysis (LPA; Lazardsfeld & Henry, 1968). LPA is a form of structural equation mixture
modeling in which mutually-exclusive and exhaustive classes of a latent variable, in this case temperament, are estimated from multiple observed indicators measured on a continuous scale using maximum likelihood estimation. The LPA approach was used because continuous relative scores were thought to provide a more accurate representation of conceptual differences in temperament compared to discrete response categories. Risk room positive affect, negative affect, proximity to mother, latency to play, total time playing, engagement, activity level, and spontaneous vocalization scores were entered into the analysis as observed indicators. The LPA was conducted in Mplus version 7.4.

One- to five-class solutions were compared using the Bayesian information criteria (BIC) and sample-size adjusted BIC (a-BIC), on which a lower value suggests better fit, and the Lo-Mendell-Rubin likelihood ratio test (LMR LRT; Lo, Mendell, & Rubin, 2001), which tests the difference in model -2 log-likelihood when each new class is added. Fit statistics are reported in Table 3.2 along with model entropy, which indicates the certainty of membership classification. As can be seen in the table, BIC and aBIC improved as number of classes increased. However, the LMR LRT test suggested that there was a significant improvement in fit when adding a fourth class to the model, but not when adding a third or fifth class. Thus, the four-class solution was selected for the latent temperament variable.

Estimated means of each observed variable for each class and class membership totals are plotted in Figure 3.1, first by raw scores and then, to account for scale differences, by proportion of total possible score. Interpretation of these levels suggested that the profiles conformed to high-inhibited (very high negative affect, low positive affect, very high withdrawal), inhibited (higher negative affect, low positive affect, higher withdrawal), balanced (moderate levels of reactivity), and exuberant (low negative affect, higher positive affect, higher approach) patterns.
Entropy for the 4-class solution was .94, and posterior probabilities of membership in classes were generally very high, with 90% of children classified with a probability above .90. Thus, posterior probabilities were used to assign each child to an observed temperament group for use in subsequent analyses. The high-inhibited class had very small group size (n = 4) and was distinguished from the inhibited group primarily based on differences in negative affect. This 4-class solution with small extremely inhibited group has been found in previous studies (Dollar, Stifter, & Buss, under review; Putnam & Stifter, 2005), and consistent with these studies, the extremely inhibited group was collapsed with the inhibited group for the purposes of statistical analyses.

In order to confirm the distinctness of the classified temperament groups used in study analyses, each classified group was compared to the others with regard to the risk room temperamental response indicators using t-tests. The inhibited group differed significantly from the exuberant group on all indicators in the expected direction (ts = [2.73-24.07], ps = <.001-.009). The inhibited group differed significantly from the average approach group on nearly all indicators in the expected direction (ts = [2.25-13.03], ps = <.001-.009) but not on positive affect (t(93) = -1.01, p = .32). The exuberant group differed significantly from the average approach group on positive affect, proximity to mother, latency to play, total time playing, and engagement, all in the expected direction (ts = [3.06-12.80], ps = <.001-.003) and was marginally higher on spontaneous vocalizations (t(88) = 1.75, p = .08); these groups did not differ significantly on negative affect (t(88) = .62, p = .54) or activity level (t(57.5) = 1.22, p = .22).

To confirm the robustness of the latent classes and the decision to collapse the observed inhibited and high inhibited group, the LPA was re-run in 2 ways. First, the LPA was re-run on the full sample with all observed indicators except negative affect, and a three-class (inhibited, average approach, exuberant) with similar group sizes and variable means had the best fit. Second, the LPA was re-run excluding data from the participants who would be classified to the extremely inhibited class (all had a posterior probability of 1) and a similar three-class solution again had the best fit.
Analytic Plan

**Preliminary analyses.** Prior to conducting primary study analyses, differences in the central variables of the study based on demographic information (e.g., child gender, maternal age, maternal education, family income) or child receptive language score were examined. There were marginally significant differences in behavioral self-regulation based on child gender \((t = 1.94, p = .06)\), with females scoring higher on this measure. Further, child PPVT receptive vocabulary was significantly correlated with both the behavioral self-regulation score \((r = .27, p = .02)\) and the behavioral measure of conscience score \((r = .31, p = .005)\). Thus, all models controlled for both child gender and receptive vocabulary.

**Primary analyses.** Temperament- and context-based prediction of behavioral self-regulation and conscience were tested with a series of multiple regression models. Previous research with small-to-moderately-sized samples (e.g., Dennis, 2006; Kochanska, Forman & Coy, 2007) has detected temperament-by-parenting effects by testing parenting behaviors in the same model, and a similar approach was taken with this study. However, research on context-based temperament-by-parenting or temperament-by-temperament interactions (e.g., Dennis, 2006; Dollar & Buss, 2014; Augustine & Stifter, 2015) has tended to run models separately by context rather than introducing 3-way interaction terms; thus models were tested separately by context. Finally, 2- and 3-way (with temperament) interactions between the maternal socialization behaviors were not of explicit interest in this study, so these interactions were not included in the models.

The final analyses thus included two models predicting each 4.5-year outcome from mother-child behavior in the two 18-month contexts, for a total of four models. These models included dummy codes allowing one group to serve as the reference group for simple effects and
interactions. In the models predicting each outcome, the predictors included control variables, two temperament group dummy codes, mother-child mutual positivity/responsiveness, mother control (standardized for comparability), and interactions between the two temperament group dummy codes and each of the mother-child predictors.

Because one temperament group serves as a reference group in these models, the slope of the temperament group dummy codes represents the overall difference in the outcome variable between that temperament group and the reference group. The slope of each of the three predictor responses (e.g., mother responses, child responses) represents the simple slope of that response on the outcome variable for the temperament reference group. Interactions between a temperament group dummy code and a predictor response indicates if the simple slope of that response differs between that temperament group and the reference group. These models were run with each temperament group as the reference group to capture all temperament group effects.

Results

Descriptive statistics for all raw and composite variables are reported in Table 3.3. Context differences in the 18-month variables were confirmed using paired sample t-tests. Among indicators of mutual responsiveness/positivity, mother responsive/reciprocal behavior levels did not differ significantly from free play and clean-up; however, child responsive behavior, mother affect, and child affect were higher in free play compared to clean-up. Additionally, mother control behavior was lower in free play compared to clean-up. Temperament group differences among all raw and composite 18-month predictors were also considered. Without controlling for other variables, it was found that mothers of children in the average-approach group displayed higher positive affect in clean-up than mothers of children in
the inhibited group ($t = 2.96, p = .004$), and more control/structuring behavior in clean-up than mothers of children in the inhibited group ($t = 2.67, p = .01$). No other temperament group differences were found.

Correlations between primary study variables are reported in Table 3.4. Mother-child mutual positivity/responsiveness scores were significantly correlated from free play to clean-up, as were mother control/structuring behavior levels, suggesting consistency in both qualities in dyads. Mother-child mutual positivity/responsiveness and mother control/structuring behavior were not significantly correlated within free play; however, they had a significant negative correlation in clean-up. Mother-child mutual positivity/responsiveness in clean-up had a marginally significant correlation with the behavioral self-regulation composite and the conscience composite, whereas the other predictors did not. Lastly, as would be expected, there was a significant positive correlation between behavioral self-regulation and conscience composite scores.

**Behavioral Self-Regulation**

Results from the two regression models predicting the behavioral self-regulation composite from 18-month free play and clean-up variables are presented in Table 3.5. These models include parameters for the exuberant group as the reference temperament group, and predictors that were marginally significant or significant in a model with a different temperament reference group are noted. Both models had a significant omnibus test.

In the model testing temperament and mother/child interactive behavior during free play, there was a significant interaction between temperament and maternal behavior suggesting that the slope of mother control/structuring differed for the exuberant and average approach group. Specifically, mother control/structuring behavior in free play had a significant positive simple
slope for the exuberant group, whereas it had a significant negative slope for the average approach group \((B = -.26, SE = .12, p = .04)\). The simple slope for the inhibited group was not significant \((B = .02, SE = .14, p = .90)\). As can be seen in Figure 3.2, higher levels of mother control/structuring behavior during the free play task related to higher behavioral self-regulation scores for the exuberant group, but related to lower behavioral self-regulation scores for the average approach group. There were no significant interactions or simple slopes for mother-child mutual positivity/responsiveness.

In the model testing temperament and mother/child interactive behavior during clean-up, there was a significant interaction suggesting that the slope of mother control/structuring differed between the exuberant and inhibited group, and a marginally significant interaction suggesting a difference in slope between the exuberant and average approach group. Specifically, mother control/structuring behavior in free play had a significant positive simple slope for the exuberant group, a marginally significant negative slope for the inhibited group \((B = -.22, SE = .12, p = .08)\), and a nonsignificant slope for the average approach group \((B = -.20, SE = .20, p = .33)\). As displayed in Figure 3.3, higher levels of control/structuring behavior during the clean-up task again related to better behavioral self-regulation for the exuberant group, whereas it related to poorer behavioral self-regulation scores for the inhibited group. There were no significant interactions or simple slopes for mother-child mutual positivity/responsiveness.

**Conscience**

Results from the two regression models predicting the conscience composite from 18-month free play and clean-up variables are presented in Table 3.6. These models include parameters for the exuberant group as the reference temperament group, and predictors that were marginally significant or significant in a model with a different temperament reference group are
noted. The model testing temperament and mother/child interactive behavior during free play did not have a significant omnibus test, and no significant unique predictors of conscience beyond the effect of receptive vocabulary.

The model testing temperament and mother/child interactive behavior during clean-up had a marginally significant omnibus test \((p = .067)\), and there were few significant parameters beyond the effect of receptive vocabulary and child gender. However, the model run with the inhibited group as the reference group revealed that mother-child mutual positivity/responsiveness had a significant positive slope only for the inhibited group \((B = .40, SE = .20, p = .05)\), but not for the exuberant group (see Table 3.6), or the average approach group \((B = .24, SE = .24, p = .30)\). As can be seen in Figure 3.4, higher mother-child mutual positivity/responsiveness related to higher scores on the conscience composite in the inhibited group. There were no significant interactions or simple slopes for mother control/structuring behavior.

**Discussion**

The current study investigated the contributions of child temperament type, two forms of socialization influence: mother-child mutual positivity/responsiveness and mother control/structuring behavior, to measures reflecting two important developmental regulatory outcomes in childhood: behavioral self-regulation and conscience. Further, this study explored the relevance of parenting context in these relations, with the expectation that the effects of socialization quality on these regulatory outcomes for children of different temperament types will vary with the context in which parent-child interactions are observed. We hypothesized that mother-child mutual positivity/responsiveness would be a stronger predictor for exuberant children compared to other temperament types, especially when observed in an unstructured free
play context, and that mother control/structuring behavior would be a stronger predictor for inhibited children compared to other temperament types, especially when observed in a structured clean-up context.

In general, the results of this study pointed to a somewhat different pattern of effects. Most prominent were the findings for maternal control/structuring behavior. First, greater control in both the free play and clean-up context was related to significantly better behavioral self-regulation later in childhood for children in the exuberant temperament group. Thus, contrary to our expectations, exuberant children’s behavioral self-regulation appeared to be more strongly predicted by the mother’s attempts to structure interactions and the child’s attention and behavior than it is by indicators of a positive and responsive mother-child relationship. As mentioned, however, a number of researchers have emphasized the importance of promoting behavioral control skills for children who are relatively uninhibited or exuberant, as these children may not otherwise be primed to adhere to external rules and expectations (Dollar & Stifter, 2016; Kochanska, 1993; Polak-Toste & Gunnar, 2006). The present results may reflect this process in action. If mothers of exuberant children consistently infuse gentle control and structure into their parent-child interactions, they may help their children to be more attentive and receptive to external expectations, and may provide more opportunities for their children to practice compliance and self-control of behavior to meet these expectations. In these data, maternal control/structuring may thus have had implications more specific to the skills tapped by the later behavioral self-regulation measures than did measures of mutual positivity/responsiveness. Previous studies have found that mothers’ use of specific behaviors like commands and redirection related to positive regulatory outcomes in exuberant children (e.g., Augustine & Stifter, 2015; Cipriano & Stifter, 2010), thus this study provides further evidence that gentle
control may in fact be a meaningful contributor to behavioral self-regulation in exuberant children. Moreover, although significant effects emerged from both free play and clean-up for exuberant children, it is not necessarily the case that contextual structure did not weigh into mother-child interactions for exuberant children. Mothers and children appeared to display context differences in most behaviors coded in these interactions (see Table 3.3), and analyses accounted for both mother control/structuring and mother-child mutual positivity/responsiveness. Thus, mothers of exuberant children may have navigated the differing interplay of parent and child behavior across contexts such that their control/structuring behavior continually supported their children’s emerging behavioral self-regulation.

Conversely, mother control/structuring behavior was found to relate to lower behavioral self-regulation performance later in childhood for children in the average approach and inhibited temperament groups. These effects varied with parenting context, however, emerging from free play behavior for the average approach group, and from clean-up behavior for the inhibited group. Similar to reasoning regarding the exuberant group, the fact that control/structuring behavior related to poorer self-regulation for these groups might reflect the appropriateness of this behavior for each temperament type in each context. A child identified as relatively average in temperamental approach and affective responses might thus be expected to be relatively average on reactive inhibition or affective discomfort responses, as well as in fearless or impulsive responses. Children of this temperament type thus may not necessarily benefit from added parental support or structure at all times, particularly in contexts with limited regulatory goals when the child might instead independently enact behavior or joint interactions with the mother. Thus, the mothers’ tendency to place higher structure on the child’s behavior in this sort of context may actually serve to disrupt opportunities to engage in self-initiated or self-controlled
behavioral responses. Maternal control/structuring behavior in clean-up, which was instead generally directed at a specific behavioral and regulatory goal, was found to have a weaker, albeit negative, association with behavioral self-regulation for these children.

The finding that greater mother control/structuring behavior during clean-up related to poorer behavioral self-regulation for the inhibited temperament group was counter to our original hypotheses regarding inhibited children’s readiness to receive regulatory information from parents. Instead, these results suggest that greater maternal control in structured, goal-oriented situations could serve an unsettling function for this temperament type. Kochanska (1993; 1995; 1997) argued that affective discomfort may be a potent motivator of regulated behavior for relatively inhibited children, but it is important that this response be elicited at a moderate level so as not to cause distress. Mothers displayed a somewhat high number of control/structuring behaviors in the clean-up task on average, so for the inhibited group, a relatively higher level of maternal control behavior may in fact have been sufficient to evoke a high level of anxiety or distress thought to preclude effective socialization of their regulatory behavior. In the free play context, however, mothers displayed comparatively lower mean levels of control/structuring behavior, and mothers and children tended to display higher levels of each indicator of mutual positivity/responsiveness. Thus, taking those differences into account, control/structuring behavior in free play does not appear to have an effect on behavioral self-regulation for inhibited children, in the present study.

Another notable pattern of effects is the null findings for the conscience composite. Although this measure was significantly and positively correlated with the behavioral self-regulation measure, only one interesting finding emerged; greater mother-child mutual positivity/responsiveness in the clean-up task was related to more rule-compatible behavior in
the conscience measures but only for the inhibited group. Though the magnitude of this effect did not differ significantly from those for the exuberant or average approach, this result provides some preliminary evidence that indicators of positivity and responsiveness in mother-child interactions may also have positive outcomes for inhibited children. Given that this effect emerged from the clean-up task, this finding may reflect the benefits of reducing distress or anxiety in inhibited children in the context of a task with high regulatory demands. These influences may also be particularly important for inhibited children’s performance in the tasks used to measure later conscience. For example, in the puzzle game, a child’s anxiety about not completing the difficult task requested by the experimenter could potentially overwhelm the competing expectation to avoid cheating. By creating a perception of other people (including parents and authority figures) as responsive and understanding rather than punishing, positivity and reciprocity in parent-child interactions surrounding regulatory tasks may help inhibited children to avoid anxious responses and adhere to moral rules despite other demands.

With regard to the average approach and exuberant groups, it is possible that the conscience tasks did not elicit other challenges to regulatory functioning, particularly approach to reward, at a sufficient level. Although cheating paradigms are commonly used in research on conscience development and internalization of rules in children of this age (e.g., Kochanska et al., 1996; Laible & Thompson, 2000), the majority of children in this sample avoided cheating in the memory game, thus leaving most variability to be attributed to the puzzle task. Future research on similar parenting-by-temperament interactions may find stronger effects by using outcome measures of conscience development that involve greater behavioral demands or more potent reward stimuli. Greater variability may also be achieved with measures of conscience development that specifically pull for other-oriented concerns, such as opportunities for prosocial
behavior or games in which cheating behavior clearly disadvantages another person. Since it has been argued that the effects of mutual positivity and responsiveness aid in conscience development by promoting a sense of caring and reciprocity for others (e.g., Dunn, 2014; Kochanska, 1997b, Thompson et al., 2006), stronger effects of this socialization quality may emerge with outcome measures that more clearly recruit those concerns.

To conclude, the current study examined temperament- and context-based associations between parenting behavior and child behavioral self-regulation and conscience development. Our findings emerged from a wide range of observational data on child temperament, parent-child interactions across two different contexts, and two forms of regulatory functioning assessed by multiple tasks. The longitudinal design also allowed us to examine differences in children’s regulatory outcomes at preschool age based on temperament and parent-child interactions observed earlier in development.

The study design remained correlational in nature, however, and causal conclusions may not be drawn from the data. This study also utilized observations from a community sample of mothers and children without any over-sampling based on early temperament criteria. The temperament groups thus represent children who were relatively more or less extreme on approach-withdrawal and affective responses to novelty in this sample of children. Though this caveat exists in other studies examining relative differences in temperament traits or dimensions in moderately-sized samples, it is unclear if children classified to the exuberant or inhibited groups represent children who would be considered extreme on temperamental exuberance or inhibition within the larger population. Distinct temperament profiles emerged from the temperament assessment and in a manner similar to the few other studies yielding inhibited, exuberant, and average approach or low-reactive groups (Dollar, Stifter, & Buss, under review;
Putnam & Stifter, 2005), suggesting emerging reliability of these groupings. However, studies utilizing larger samples may be able to provide greater confirmation of these profiles in reference to population-level distributions of data. Lastly, given the relatively weak prediction of the conscience development outcome in this study, the consistency of these results should be examined with additional and different measures of child conscience.

Nonetheless, this study provides additional evidence of temperament-specific effects of socialization qualities like maternal control and mutually positive/responsive mother-child interactions in predicting child self-regulatory outcomes. Further, this study contributes to the growing body of research suggesting that observation context is an important factor to consider when predicting the outcomes of temperament and/or parenting. In this case, the apparent relevance of different parenting qualities to children’s self-regulatory development varied not only by child temperament, but by the context in which parenting was observed. Mothers appeared to rely on different regulatory goals in the unstructured and structured contexts, which in turn elicited some differences in mother and child behavior in each context. However, child temperament may help to determine whether mother behavior, particularly control/structuring behavior, serves to reinforce or disrupt the child’s emerging behavioral control when displayed in certain contexts. Taken together, continued investigation of differential outcomes of specific parenting behaviors in specific contexts appears to be a constructive means through which to understand how developmental experiences support or undermine positive self-regulatory development in children of differing temperament types.
References


the Preschool Laboratory Temperament Assessment Battery (Lab-TAB). Unpublished manuscript. Madison: University of Wisconsin.


### Descriptions and Examples of Maternal Behavior Codes

<table>
<thead>
<tr>
<th>Responsive/ Reciprocal</th>
<th>Definition</th>
<th>Example(s)</th>
</tr>
</thead>
<tbody>
<tr>
<td><strong>Encouragement</strong></td>
<td>Mother responds or reacts to child’s behavior by providing verbal encouragement or support or by mirroring the child’s action.</td>
<td>Says “good job” or “thank you;” compliments child on behavior, mirrors child behavior (e.g., dancing) or verbalizations.</td>
</tr>
<tr>
<td><strong>Compliance</strong></td>
<td>Mother responds to a request or control attempt from child by providing assistance or behavior in line with child’s request.</td>
<td>Hands a requested toy to child, takes a toy offered by child, allows child to sit in her lap.</td>
</tr>
<tr>
<td><strong>Reasoning</strong></td>
<td>Mother responds to a request or control attempt from child with verbal reasoning.</td>
<td>Child vocalizes to her while struggling with toy and she explains how to use it; child whines to her and she explains that s/he must clean-up to move on to the next task.</td>
</tr>
<tr>
<td><strong>Observation</strong></td>
<td>Mother actively attends to and accepts child’s ongoing behavior without intervening in any way.</td>
<td>Observes child for the majority of the interval without interrupting or engaging in independent behavior.</td>
</tr>
</tbody>
</table>

<table>
<thead>
<tr>
<th>Control/ Structuring</th>
<th>Definition</th>
<th>Example(s)</th>
</tr>
</thead>
<tbody>
<tr>
<td><strong>Command</strong></td>
<td>The mother tells child to do something or produce some kind of behavior.</td>
<td>“Hug the baby,” “Show me where the cow goes,” “Come back here,” “Put the toys in the basket.”</td>
</tr>
<tr>
<td><strong>Prohibition</strong></td>
<td>The mother tells child to not do something or to stop some kind of behavior.</td>
<td>“No, you can’t get in the basket,” “Don’t put that in your mouth.”</td>
</tr>
<tr>
<td><strong>Redirection</strong></td>
<td>The mother attempts to redirect child’s attention to her, to a toy, or to the task while the child is looking away from her.</td>
<td>Calls child’s name, says “Look at the..!,” intentionally makes a noise with a toy while looking at child.</td>
</tr>
<tr>
<td><strong>Scaffolding</strong></td>
<td>The mother attempts to change child’s behavior by modeling a different behavior or by physically guiding child’s behavior.</td>
<td>Intervenes in child’s play by demonstrating how to use a toy or suggesting a new way to play with it; demonstrates putting a toy in the basket; hands child a toy to put away.</td>
</tr>
<tr>
<td><strong>Behavior request</strong></td>
<td>The mother requests that the child change behavior in some way, phrased as a question.</td>
<td>“Can you feed the baby?” “Can you hit the drum?” “Can you put the toys away?” “Can you clean-up for mommy?”</td>
</tr>
<tr>
<td><strong>Knowledge request</strong></td>
<td>The mother requests some sort of knowledge from child, phrased as a question.</td>
<td>“Where is the pig?” “Who is that?” “Where do the blocks go?”</td>
</tr>
<tr>
<td><strong>Decision request</strong></td>
<td>The mother asks child to make a decision or express a preference about the interaction; typically phrased as a question.</td>
<td>“What do you want to play with?” “Does the baby want to eat now?”</td>
</tr>
</tbody>
</table>
Table 3.2

Model Fit Indices for 18-Month Temperament Group Latent Profile Analyses

<table>
<thead>
<tr>
<th>Solution</th>
<th>BIC</th>
<th>saBIC</th>
<th>LMR LRT Value</th>
<th>LMR LRT p-value</th>
<th>Entropy</th>
</tr>
</thead>
<tbody>
<tr>
<td>1-class</td>
<td>787.62</td>
<td>737.01</td>
<td>-</td>
<td>-</td>
<td>-</td>
</tr>
<tr>
<td>2-class</td>
<td>467.80</td>
<td>388.72</td>
<td>355.82</td>
<td>.01</td>
<td>0.94</td>
</tr>
<tr>
<td>3-class</td>
<td>332.95</td>
<td>225.40</td>
<td>174.97</td>
<td>.25</td>
<td>0.95</td>
</tr>
<tr>
<td>4-class</td>
<td>262.11</td>
<td>126.10</td>
<td>112.62</td>
<td>.03</td>
<td>0.94</td>
</tr>
<tr>
<td>5-class</td>
<td>240.98</td>
<td>76.50</td>
<td>63.91</td>
<td>.42</td>
<td>0.93</td>
</tr>
</tbody>
</table>

BIC = Bayesian information criterion; a-BIC = Sample-Size Adjusted BIC; LMR LRT = Lo-Mendell-Rubin Adjusted Likelihood Ratio Test
Table 3.3

Means and Standard Deviations for Primary Study Variables

<table>
<thead>
<tr>
<th>18 Month Predictors</th>
<th>Free Play</th>
<th>Clean-up</th>
<th>Difference t, p-value</th>
</tr>
</thead>
<tbody>
<tr>
<td></td>
<td>M</td>
<td>SD</td>
<td>Range</td>
</tr>
<tr>
<td>Mother responsive/reciprocal behavior</td>
<td>.44</td>
<td>.14</td>
<td>.13-.82</td>
</tr>
<tr>
<td>Child responsive/compliance behavior</td>
<td>.85</td>
<td>.10</td>
<td>.55-1.00</td>
</tr>
<tr>
<td>Mother affect</td>
<td>1.17</td>
<td>.14</td>
<td>1.00-1.78</td>
</tr>
<tr>
<td>Child affect</td>
<td>.17</td>
<td>.19</td>
<td>-.13-.83</td>
</tr>
<tr>
<td>Mother-child mutual positivity/responsiveness composite</td>
<td>-.002</td>
<td>.63</td>
<td>-1.49-2.50</td>
</tr>
<tr>
<td>Mother control/structuring behavior</td>
<td>.82</td>
<td>.12</td>
<td>.39-1.00</td>
</tr>
</tbody>
</table>

<table>
<thead>
<tr>
<th>4.5 Year Outcomes</th>
<th>M</th>
<th>SD</th>
<th>Range</th>
</tr>
</thead>
<tbody>
<tr>
<td>CPT score (set 2)</td>
<td>10.20</td>
<td>2.02</td>
<td>6-12</td>
</tr>
<tr>
<td>Clean-up cleaning time</td>
<td>.70</td>
<td>.36</td>
<td>0-1.00</td>
</tr>
<tr>
<td>Tongue task time</td>
<td>.73</td>
<td>.30</td>
<td>.03-1.00</td>
</tr>
<tr>
<td>Behavioral self-regulation composite</td>
<td>.01</td>
<td>.66</td>
<td>-1.79-.87</td>
</tr>
<tr>
<td>Memory game peeked (yes/no)</td>
<td>No=70.7%, Yes=29.3%</td>
<td></td>
<td></td>
</tr>
<tr>
<td>Memory game peaking time</td>
<td>.02</td>
<td>.06</td>
<td>0-.39</td>
</tr>
<tr>
<td>Memory game number of peeks</td>
<td>1.22</td>
<td>3.19</td>
<td>0-2.22</td>
</tr>
<tr>
<td>Puzzle task latency to peek</td>
<td>.50</td>
<td>.40</td>
<td>0-1.00</td>
</tr>
<tr>
<td>Puzzle task peaking time</td>
<td>.25</td>
<td>.28</td>
<td>0-.98</td>
</tr>
<tr>
<td>Puzzle task number of peeks</td>
<td>2.51</td>
<td>3.04</td>
<td>0-.16</td>
</tr>
<tr>
<td>Puzzle task persisting time</td>
<td>.47</td>
<td>.34</td>
<td>0-1.00</td>
</tr>
<tr>
<td>Conscience composite</td>
<td>-.001</td>
<td>.71</td>
<td>-2.32-.84</td>
</tr>
</tbody>
</table>

1These behaviors were used to create the mutual positivity/responsiveness composite.
2These behaviors were used to create the behavioral self-regulation composite.
3These behaviors were used to create the conscience composite.
Table 3.4

*Correlations among Primary Study Variables*

<table>
<thead>
<tr>
<th>Variable</th>
<th>1</th>
<th>2</th>
<th>3</th>
<th>4</th>
<th>5</th>
<th>6</th>
</tr>
</thead>
<tbody>
<tr>
<td>1. Mother-child mutual positivity/ responsiveness, Free Play</td>
<td>---</td>
<td>.32**</td>
<td>-.06</td>
<td>-.04</td>
<td>.12</td>
<td>.12</td>
</tr>
<tr>
<td>2. Mother-child mutual positivity/ responsiveness, Clean-up</td>
<td>---</td>
<td>-.03</td>
<td>-.33**</td>
<td>.21+</td>
<td>.26*</td>
<td></td>
</tr>
<tr>
<td>3. Mother control/structuring behavior, Free Play</td>
<td>---</td>
<td>.28**</td>
<td>-.07</td>
<td>.10</td>
<td></td>
<td></td>
</tr>
<tr>
<td>4. Mother control/structuring behavior, Clean-up</td>
<td>---</td>
<td>-.08</td>
<td>-.16</td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>5. Behavioral self-regulation composite</td>
<td>---</td>
<td>.32**</td>
<td></td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>6. Conscience composite</td>
<td>---</td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
</tr>
</tbody>
</table>

+ p < .10, * p < .05, ** p < .01
Table 3.5

*Multiple Regression Models Predicting Child Behavioral Self-Regulation Composite Based on Child Temperament Group and 18M Free Play and Clean-up Variables*

<table>
<thead>
<tr>
<th>Variables</th>
<th>B</th>
<th>SE(B)</th>
<th>β</th>
<th>F</th>
<th>$R^2$</th>
</tr>
</thead>
<tbody>
<tr>
<td><strong>I. Free Play Variables</strong></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>Child Receptive Vocabulary</td>
<td>.02</td>
<td>.01</td>
<td>.35**†</td>
<td></td>
<td>.23</td>
</tr>
<tr>
<td>Child Gender</td>
<td>.38</td>
<td>.15</td>
<td>.29*†</td>
<td></td>
<td></td>
</tr>
<tr>
<td>Inhibited</td>
<td>-.23</td>
<td>.19</td>
<td>-.17</td>
<td></td>
<td></td>
</tr>
<tr>
<td>Average Approach</td>
<td>-.17</td>
<td>.19</td>
<td>-.12</td>
<td></td>
<td></td>
</tr>
<tr>
<td>Mother-Child Mutual Positivity/Responsiveness</td>
<td>.17</td>
<td>.19</td>
<td>.17</td>
<td></td>
<td></td>
</tr>
<tr>
<td>Mother Control/Structuring Behavior</td>
<td>.26</td>
<td>.13</td>
<td>.40*†</td>
<td></td>
<td></td>
</tr>
<tr>
<td>Mutual X Inhibited</td>
<td>.04</td>
<td>.27</td>
<td>.02</td>
<td></td>
<td></td>
</tr>
<tr>
<td>Mutual X Average</td>
<td>-.07</td>
<td>.28</td>
<td>-.04</td>
<td></td>
<td></td>
</tr>
<tr>
<td>Control X Inhibited</td>
<td>-.24</td>
<td>.18</td>
<td>-.20</td>
<td></td>
<td></td>
</tr>
<tr>
<td>Control X Average</td>
<td>-.52</td>
<td>.18</td>
<td>-.46**</td>
<td></td>
<td></td>
</tr>
<tr>
<td><strong>II. Clean-up Behavior</strong></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>Child Receptive Vocabulary</td>
<td>.01</td>
<td>.01</td>
<td>.28*†</td>
<td></td>
<td>.24</td>
</tr>
<tr>
<td>Child Gender</td>
<td>.35</td>
<td>.15</td>
<td>.27*†</td>
<td></td>
<td></td>
</tr>
<tr>
<td>Inhibited</td>
<td>-.21</td>
<td>.19</td>
<td>-.15</td>
<td></td>
<td></td>
</tr>
<tr>
<td>Average Approach</td>
<td>-.10</td>
<td>.21</td>
<td>-.07</td>
<td></td>
<td></td>
</tr>
<tr>
<td>Mother-Child Mutual Positivity/Responsiveness</td>
<td>.32</td>
<td>.20</td>
<td>.33</td>
<td></td>
<td></td>
</tr>
<tr>
<td>Mother Control/Structuring Behavior</td>
<td>.24</td>
<td>.12</td>
<td>.37*†</td>
<td></td>
<td></td>
</tr>
<tr>
<td>Mutual X Inhibited</td>
<td>-.21</td>
<td>.27</td>
<td>-.13</td>
<td></td>
<td></td>
</tr>
<tr>
<td>Mutual X Average</td>
<td>-.12</td>
<td>.29</td>
<td>-.07</td>
<td></td>
<td></td>
</tr>
<tr>
<td>Control X Inhibited</td>
<td>-.45</td>
<td>.17</td>
<td>-.41*</td>
<td></td>
<td></td>
</tr>
<tr>
<td>Control X Average</td>
<td>-.43</td>
<td>.24</td>
<td>-.27+</td>
<td></td>
<td></td>
</tr>
</tbody>
</table>

*p < .10; †p < .05; **p < .01
†p < .05-.10 in a model run with other temperament group as reference group
Table 3.6
Multiple Regression Models Predicting Child Conscience Composite Based on Child Temperament Group and 18M Free Play and Clean-up Variables

<table>
<thead>
<tr>
<th>Variables</th>
<th>B</th>
<th>SE(B)</th>
<th>β</th>
<th>F</th>
<th>R²</th>
</tr>
</thead>
<tbody>
<tr>
<td><strong>I. Free Play Variables</strong></td>
<td>1.36</td>
<td>.16</td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>Child Receptive Vocabulary</td>
<td>.01</td>
<td>.01</td>
<td>.28*†</td>
<td></td>
<td></td>
</tr>
<tr>
<td>Child Gender</td>
<td>.20</td>
<td>.17</td>
<td>.14</td>
<td></td>
<td></td>
</tr>
<tr>
<td>Inhibited</td>
<td>-.01</td>
<td>.22</td>
<td>-.01</td>
<td></td>
<td></td>
</tr>
<tr>
<td>Average Approach</td>
<td>-.04</td>
<td>.21</td>
<td>-.02</td>
<td></td>
<td></td>
</tr>
<tr>
<td>Mother-Child Mutual Positivity/Responsiveness</td>
<td>-.16</td>
<td>.21</td>
<td>-.15</td>
<td></td>
<td></td>
</tr>
<tr>
<td>Mother Control/Structuring Behavior</td>
<td>-.20</td>
<td>.14</td>
<td>-.29</td>
<td></td>
<td></td>
</tr>
<tr>
<td>Mutual X Inhibited</td>
<td>.41</td>
<td>.30</td>
<td>.21</td>
<td></td>
<td></td>
</tr>
<tr>
<td>Mutual X Average</td>
<td>.19</td>
<td>.32</td>
<td>.09</td>
<td></td>
<td></td>
</tr>
<tr>
<td>Control X Inhibited</td>
<td>.22</td>
<td>.20</td>
<td>.17</td>
<td></td>
<td></td>
</tr>
<tr>
<td>Control X Average</td>
<td>.28</td>
<td>.20</td>
<td>.23</td>
<td></td>
<td></td>
</tr>
<tr>
<td><strong>II. Clean-up Behavior</strong></td>
<td>1.85+</td>
<td>.21</td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>Child Receptive Vocabulary</td>
<td>.01</td>
<td>.01</td>
<td>.29*†</td>
<td></td>
<td></td>
</tr>
<tr>
<td>Child Gender</td>
<td>.28</td>
<td>.16</td>
<td>.20*†</td>
<td></td>
<td></td>
</tr>
<tr>
<td>Inhibited</td>
<td>-.01</td>
<td>.21</td>
<td>-.01</td>
<td></td>
<td></td>
</tr>
<tr>
<td>Average Approach</td>
<td>-.01</td>
<td>.23</td>
<td>-.01</td>
<td></td>
<td></td>
</tr>
<tr>
<td>Mother-Child Mutual Positivity/Responsiveness</td>
<td>-.04</td>
<td>.22</td>
<td>-.03†</td>
<td></td>
<td></td>
</tr>
<tr>
<td>Mother Control/Structuring Behavior</td>
<td>-.12</td>
<td>.14</td>
<td>-.17</td>
<td></td>
<td></td>
</tr>
<tr>
<td>Mutual X Inhibited</td>
<td>.44</td>
<td>.30</td>
<td>.25</td>
<td></td>
<td></td>
</tr>
<tr>
<td>Mutual X Average</td>
<td>.28</td>
<td>.32</td>
<td>.14</td>
<td></td>
<td></td>
</tr>
<tr>
<td>Control X Inhibited</td>
<td>.12</td>
<td>.19</td>
<td>.10</td>
<td></td>
<td></td>
</tr>
<tr>
<td>Control X Average</td>
<td>-.08</td>
<td>.26</td>
<td>-.05</td>
<td></td>
<td></td>
</tr>
</tbody>
</table>

*p < .10; *p < .05; **p < .01
†p < .05-.10 in a model run with other temperament group as reference group
Figure 3.1. Temperament group LPA 4-class solution estimated class means and class membership totals, displayed as raw scores (top) and as proportion of total possible score (bottom).
Figure 3.2. Effect of maternal control in free play context on child behavioral self-regulation by temperament group.
Figure 3.3. Effect of maternal control in clean-up context on child behavioral self-regulation by temperament group.
Figure 3.4. Effect of mother-child mutual positivity/responsiveness in clean-up context on child conscience by temperament group.
GENERAL CONCLUSIONS

Children’s temperamental characteristics and self-regulatory abilities have important implications for their socioemotional competence in childhood and beyond (e.g., Eisenberg, Smith & Spinrad, 2011; Pérez-Edgar & Fox, 2005; Polak-Toste & Gunnar, 2006; Stifter & Dollar, 2016). Parenting experiences are a major potential contributor to children’s approach-withdrawal tendencies and self-regulatory skills over time (e.g., Degnan & Fox, 2007; Dunn, 2014; Eisenberg, et al., 2011; Fox, Henderson, Marshall, Nichols, & Ghera, 2005; Kochanska, 1997), but longitudinal research that compares parenting across different interactive contexts is lacking. The study of varying contexts of observation offers more precise information about how parenting-by-temperament interactions or transactions play out in early development, and what forms of parenting and in which situations are most predictive of child regulatory outcomes.

Thus, the overarching goal of the current dissertation project was to contribute to the developmental literature on how parenting interacts with child temperamental characteristics to predict outcomes relevant to child self-regulatory capabilities, specifically, by exploring various means through which contexts of measurement affect patterns of influence within and across three time points during the first several years of life. The first study explored how behaviors mothers displayed when introducing their infants to two different-intensity novel objects interacted with infants’ early approach to novelty to predict approach-withdrawal tendencies in toddlerhood, observed in two different-intensity contexts. The second study explored variations in parent and child behaviors relevant to the socialization of self-regulatory development in toddlerhood, based on child temperament type and the regulatory structure of the context in which parent-child interactions were observed. The third study examined longitudinal relations between two parent-child interaction qualities observed in unstructured and structured contexts
in toddlerhood and child behavioral self-regulation and conscience development in preschool, for children of each temperament type.

Consistent with the wide body of literature on parenting-by-temperament interactions (see Kiff, Lengua, & Zalewski, 2011; Putnam, Sanson, & Rothbart, 2002; Rothbart & Bates, 2006; Sanson, Hemphill, & Smart, 2004), Study 1 and Study 3 together provide compelling evidence for variations in the outcomes of parenting behavior based on child temperamental characteristics. However, a distinct piece of information generated from each of these studies is that significant findings largely emerged due to the additional consideration of contexts of measurement. Study 1 was among the first to examine mothers’ behavior when introducing their infants to novel stimuli as a predictor of later approach-withdrawal responses, but the findings for the low- and high-approach infants varied with the intensity of novel stimuli presented to them both in infancy and toddlerhood. Maternal stimulation behavior with a low-intensity novel toy was a predictor of less approach (or greater withdrawal) in low-approach infants measured in a high-intensity novel stimulus interaction. Positive affect with the high-intensity novel object was a predictor of greater approach in high-approach infants when measured in a lower-intensity novel task. Study 3 utilized temperament profiles yielded from a latent profile analysis of the data on toddler approach-withdrawal and affective responses to novelty to predict emerging behavioral self-regulation and conscience later in childhood. In this case, task regulatory structure was highlighted as a contextual distinction relevant to both temperamental differences and parenting behavior with regard to the socialization of self-regulatory skills. Higher maternal control/structuring behavior observed in both an unstructured (free play) and structured (clean-up) context related to better behavioral self-regulation exclusively for children classified into the exuberant temperament type. However, this same parenting behavior related to poorer behavioral
self-regulation in children in the average approach temperament group when parenting was observed in the unstructured task, and in the inhibited temperament group when parenting was observed in the structured task.

Across these two studies, specific parenting qualities had significant relations to the outcome of interest for children with certain temperamental characteristics, but null or inverse relations for children with differing temperamental characteristics. These results provide additional evidence for the idea that differences in temperamental predispositions or motivations may alter the ways in which environmental input, in this case parenting, encourages particular child outcomes. Different parenting behaviors appear relatively more impactful for children of certain temperamental qualities than others, and central to this dissertation, contexts of measurement added an additional source of variation in links between parenting behavior and child outcomes. Child temperamental characteristics may motivate differing perceptions of situational novelty, structure, goal-conflict, or any other characteristic relevant to a particular child outcome of interest. Accordingly, parent-child interactions in specific kinds of contexts may be relatively more informative for capturing temperament-specific parenting effects. Importantly, a specific level or profile of temperamental characteristics did not seem to confer generally greater susceptibility to the environment as might be suggested by some models (e.g., Belsky & Pluess, 2009; Boyce & Ellis, 2005), and all variation in child outcomes was not accounted for by parenting behavior in one type of context alone. Instead, temperament-based parenting effects differed more with the type of parenting behavior that was shown and/or the context in which parenting behavior was observed. Thus, temperament-and-context-based models provide distinct knowledge about how positive self-regulatory development can be encouraged in temperamentally-different children.
Another distinct piece of information generated from each of these studies is additional support for the contention that not only do parents and children behave differently when in different situational contexts or with different goals in mind (e.g., Buss, 2011; Dix, 1992; Grusec & Davidov, 2010; Kochanska, Coy, & Murray, 2001; Kwon, Bingham, Lewsader, Jeon, & Elicker, 2013), but that these contextual differences are quite relevant to children’s temperamental and self-regulatory development. Study 1 confirmed that parenting behaviors and child behaviors differed significantly across low- and high-intensity novel contexts. For example, mothers displayed higher mean levels of positive affect and lower levels of stimulation with a high-intensity novel stimulus compared to low-intensity stimulus, which may help to explain why these behaviors were differentially predictive of children’s approach-withdrawal. The results of Study 2 did not indicate strong temperament group differences in children’s change in behavior from an unstructured to structured context, but did confirm that all children displayed changes in behavior across these contexts on average, displaying more positive, responsive, less-controlling behavior in an unstructured context compared to structured context. Context also played a role in mother behavior. Mothers displayed more control behavior in the structured compared to unstructured context, consistent with expectations. Further, the rank-order distribution of their responsiveness scores was not maintained across contexts (i.e., responsiveness was not significantly correlated across contexts), suggesting that mothers who were highly responsive in the unstructured context were not necessarily so in the structured context. Systematic differences in mother and child behavior in different contexts has meaning for the ways in which parents socialize their children toward particular regulatory outcomes. Specifically, context-based differences in mothers’ stimulation and positive affect responses when introducing infants to novel stimuli might reflect a tendency to more actively encourage
engagement with low-intensity novelty compared to supporting self-initiated child engagement with higher-intensity novelty. Similarly, parents did appear to display more attempts to control or structure child behavior in light of a specific contextual goal, but this coincided with less positive affect, less responsiveness, and more attempts to control mother behavior in the child. Thus, parenting in structured contexts might be more closely tied to parents’ socialization goals for child regulatory skills than it is in unstructured contexts, but may also coincide with less receptiveness to socialization behavior in many children.

Compared to Study 1 and 3, Study 2 also provided relatively more information about the elicitation of parenting behavior based on child temperament type and interactive context. It was hypothesized that temperament type would lead to differences in child behavior and in relations between parent and child behavior. Again, temperament type differences were not found in mean levels of child behavior or predictions of child behavior from mother behavior. However, in models predicting mother behavior, there were several cases in which certain child behaviors related to certain mother behaviors only in the exuberant and/or average approach group. This type of pattern is important to keep in mind when drawing inferences about parenting influences for children of different temperament types. So-called “reactive” person-environment models assume that child characteristics determine the relative influence of environment input on developmental outcomes (see Belsky & Pluess, 2009; Caspi & Roberts, 2001; Wachs & Gandour, 1983). “Evocative” person-environment models focus more on how child characteristics actually evoke specific kinds of input from the environment which then make certain developmental outcomes more likely to occur (see Caspi & Roberts, 2001; Scarr, 1983). The results of Study 2 may represent an intermediate step in these patterns, in that mother behaviors did not systematically differ with child temperament at the mean level, but when
children displayed certain behaviors, correlated mother behaviors differed by temperament type. Again, these do not represent causal patterns between child and mother behavior, but they do offer some indication that parents of children of different temperament types tend to display different behaviors based on their child’s behavior. Thus, more precise temperament-by-parenting interaction models may need to account for potential temperament-parenting correlations, or at the very least, take care to account for variations in child behavior in contexts in which parenting behavior is observed.

Collectively, these studies contribute to the parenting and temperament literature by providing a number of findings about temperament- and context-specific parent and child behavior, relations between child and parent behavior, and interactions of parenting behavior with child temperament. This dissertation project and its comprising studies had many methodological strengths. First, these studies all relied on detailed behavioral observations of child temperament as well as parent and child behavior, including micro-coding of all tasks of interest. This body of observed variables reflects ratings made by trained assistants who had viewed dozens of task recordings prior to coding the data. Accordingly, these measures might be based on less-subjective criteria and a more comprehensive knowledge of individual differences in mother and child behavior than measures provided by the mother alone. The latent profile analysis of child temperament allowed for examination of temperament types involving characteristics relatively consistent with previous conceptions of inhibited and exuberant traits (e.g., Degnan et al., 2011; Fox et al., 2005; Kagan, Reznick, Clarke, Snidman, & Garcia-Coll, 1984; Rothbart & Bates, 2006), as well as existing studies that categorized children into similar temperament types (Dollar, Stifter, & Buss, under review; Putnam & Stifter, 2005). Lastly, the data used in these studies represent observations of a single sample of mothers and children who
took part in multiple lab visits over the child’s first several years of life. Thus, longitudinal data were available to address questions of developmental change from infancy to toddlerhood and from toddlerhood to preschool age.

However, despite the detailed and longitudinal nature of the data, these studies did include a number of limitations. First, these findings are based on a moderately-sized community sample of primarily-Caucasian families. Though significant temperament-by-parenting interactions have emerged from smaller samples (e.g., Dennis, 2006; Kochanska, Forman & Coy, 2007) it is possible that some analyses, particularly those with 4.5-year outcome data, were limited in statistical power compared to studies using larger samples. Additionally, as discussed in Paper 3, the temperament groups were based on relative differences within this specific sample. Again, these groups were qualitatively consistent with temperament groups drawn from different samples with a similar demographic make-up, but this person-oriented approach could certainly be advanced with replication in larger, more socioeconomically- or culturally-diverse samples. Another limitation to the relatively detailed observations is that they were nonetheless captured within relatively brief, laboratory-based tasks. This approach is not at all uncommon within the child development literature, but certain researchers (e.g., Kochanska, 1997; Kochanska & Murray, 2000) have managed to create parenting quality composites based on several extended observations in the laboratory and home setting. Greater assurance of the ecological soundness of these data might be achieved with a larger body of observations.

Another issue worth acknowledging in this dissertation project is the relative density of many analyses and the preciseness of the findings that emerged from them. That is, these analyses dealt with specific behaviors, in specific contexts, and/or with children who displayed specific temperamental characteristics, and many of the significant findings were uncovered at
this level of specificity. An argument for the implications of these specific findings must be made. A common assertion in the parenting literature is that parent-child relationships are perhaps best thought of as an accumulation of many interactions throughout development, such that, for example, any specific behavior is really conveyed within an overarching parenting style or the overall quality of the parent-child relationship (e.g., Baumrind, 1996; 1971; Darling & Steinberg, 1993; Maccoby & Martin, 1983). Nonetheless, this idea must necessarily be juxtaposed with the salient role that constructs like parental sensitivity, responsiveness, or empathy play in researcher’s expectations about what parenting behaviors predict positive socioemotional outcomes in children (Ainsworth, 1969; Ainsworth, Blehar, Waters, & Wall, 1978; Dix, 1992; Kochanska, 1997), and the question of what actually constitutes sensitive and responsive behavior with a given child in any given situation. Research such as that conducted in the current dissertation project provides specific information about what parenting behaviors and qualities appear to be sensitive and well-attuned to children’s individual needs, goals, and motivations in specific interactive contexts based on child temperament. The implications of this knowledge are clear from a basic science standpoint, but it also has important meaning for intervention and clinical practice. Intervention or therapy approaches that target specific parenting behaviors or parent-child interactions with the goal of invoking lasting patterns of behavioral change in the child would certainly benefit from knowledge about what kinds of behaviors and contexts are in fact most relevant to target. In other words, specific knowledge may help interventionists and clinicians to most successfully utilize limited time and resources to promote the most wide-scale improvements in the parent-child relationship.

In light of the findings of this dissertation project, a number of topics regarding parenting-by-temperament interactions in self-regulatory development are worthy of attention in
future research. First, the current studies examined the role of context by inviting parents and children to participate in standardized tasks intended to capture representative behavior in different contexts. However, it is unclear the extent to which each parent-child dyad experiences a similarly wide variety of contextual experiences in their own lives. For example, mothers who find their child’s negative responses to novel stimuli to be upsetting, or who themselves feel anxiety about encountering new situations or people, may in turn limit the child’s opportunities to encounter or engage with novel situations and people (Hastings et al., 2010). In terms of self-regulatory development, it is assumed that no parent-child dyad will consistently agree on their goals for the child’s behavior; however, parents may differ in the tendency to assert this goal conflict in order to motivate change in the child’s behavior, or to avoid situations in which goal conflict will arise. Thus, although these studies observed all dyads across specific task context, children may not experience these kinds of contexts with equal frequency across development. Accounting for this variation of contextual exposure might help to refine longitudinal findings for parenting behavior and child outcomes. Additionally, these studies focused on contextual comparisons that were not yet well-studied in the literature, but it should be acknowledged that parent-child interactions in many other contexts must certainly contribute to children’s temperamental and self-regulatory development. For example, past studies found that parent-child interactions in problem-solving or competing-demands tasks also related to temperament-based regulatory outcomes (e.g., Augustine & Stifter, 2015; Cipriano & Stifter, 2010; Conway & Stifter, 2012). Thus, future research examining a wider number of contexts with varying qualities of contextual novelty and/or regulatory structure could provide a more comprehensive perspective on developmental change in children’s self-regulatory outcomes.

Secondly, it is important to continue to explore antecedents of parenting behavior, and to
form a better understanding not only of what parenting behaviors lead to particular self-regulatory outcomes in children, but potential reasons why parents come to differ from one another in their displays of these parenting behaviors. Study 2’s findings support the idea that child temperament and child behavior may together contribute to variations in parenting behavior. However, research suggests that parental characteristics and motivations may also come into play. Maternal personality, mental health, ecological support/stress, marital relationships, parenting knowledge, and parenting self-efficacy are some of the many qualities highlighted as potential contributors to parenting behavior and parenting with regard to temperament (Belsky, 1984; Clark, Kochanska, & Ready, 2000; Crockenberg & Leerkes, 2003; Hastings, Nuselovici, Rubin, Cheah, 2010; Teti & Gelfand, 1991).

Third, there are many opportunities for differing conceptual and measurement approaches. As mentioned in Study 3, it may help to examine a wider range of conscience development tasks in order to elicit a wider range of motivational factors relevant to parenting and temperament. The models run in Study 3 could also be extended to outcomes regarding emotional and cognitive measures of self-regulation and conscience, as parenting and temperament may certainly interact to predict outcomes in other domains. Similarly, although these studies drew from past research when selecting parenting behaviors of interest, their approaches could of course be applied to other worthy parenting constructs. For example, a number of studies suggest that constructs like maternal protective behavior, or conversely, encouraging approach to novelty, may both relate to children’s approach-withdrawal tendencies over time (Hastings et al., 2010; Kiel & Buss, 2011; 2012; Kiel, Buss, & Primo, 2016). Similarly, these models could be used to explore putatively negative constructs such as power assertion, harsh discipline, or mutually non-compliant relationships (e.g., Grusec & Goodnow,
1994; Kochanska & Askan, 2006; Patterson & Fisher, 2002) as precursors to poorer self-regulation and conscience development. Lastly, these studies necessarily assessed parenting, child temperament, and child regulatory outcomes at specific times in children’s development. Assessing parent-child interactions in toddlerhood may have been useful for predicting longitudinal outcomes given the findings of Study 3, but as alluded to in Study 2, other points in development may be more informative for capturing temperament differences in mother or child behavior in these interactions.

In conclusion, the current dissertation project represents an important first step for research examining a range of temperamental and self-regulatory outcomes. Despite the limitations of the current studies and the many available paths for future research, the findings of the current studies underline the importance of contextual novelty and regulatory structure in research on parent-child interactions and temperament. Specific qualities, behaviors, and interactions in the parent-child relationship may make differing contributions to the course of children’s temperamental and self-regulatory development. Research that acknowledges this variation may help to unearth a range of valuable information about positive child development and the early developmental experiences that serve to promote it.
References


play: the influence of social context on parenting quality, toddlers’ engagement with parents and play behaviors, and parent–toddler language use. *Child and Youth Care Forum, 42*, 207–224.


VITA

Mairin E. Augustine

Education
2011 M.S. Psychology (Social and Cognitive Development Specialization), Lehigh University
2009 B.S. Psychology (Developmental Concentration, High Honors), Lehigh University

Professional Positions Held
2011-2016 Graduate Research Assistant, Infant and Child Temperament Lab, Department of Human Development and Family Studies, Pennsylvania State University (Mentor: Dr. Cynthia Stifter, Ph.D.)
2012-2015 Graduate Teaching Assistant and Instructor, Department of Human Development and Family Studies, Pennsylvania State University
2008-2011 Undergraduate and Graduate Research Assistant, Emotional Development Lab, Department of Psychology, Lehigh University (Mentor: Dr. Deborah Laible, Ph.D.)
2008-2009 Research Assistant, Center for Promoting Research to Practice, College of Education, Lehigh University (Supervisors: Dr. Karen Gischlar, Ph.D.; Dr. Gini Hampton, Ph.D.)

Selected Publications


Laible, D., McGinley, M., Carlo, G., Augustine, M., & Murphy, T. (2014). Does engaging in prosocial behavior make you see the world through rose colored glasses? The links between social information processing and prosocial behavior. Developmental Psychology, 50, 872-880.

Selected Presentations
