AN ABSTRACT OF THE THESIS OF

Jessica M. Nolen-Morse for the degree of Master of Science in Human Development and Family Studies presented on March 14, 2013.
Title: Temperamental Reactivity and Children's Social Competence.

Abstract approved:

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Megan M. McClelland

The current study examined relations between temperamental reactivity at 6 months and social competence in first grade, including if emotion regulation at 54 months played a role as mediator and/or moderator between temperamental reactivity and social competence in first grade. Previous studies have shown that children who are high on temperamental reactivity early on will have poorer social competence in the future (Houck, 1999). This study explored how emotion regulation might mediate this relationship as well as how emotion regulation may serve as a protective factor (e.g., moderator) for those with higher temperamental reactivity. Important background characteristics of child gender and ethnicity, mother's education, and income-to-needs ratio were controlled for. Results indicated that temperamental reactivity at 6 months did not play a significant role in social competence in first grade, nor on emotion regulation at 54 months. Emotion regulation at 54 months was also found to be neither a mediator nor a moderator between this relationship between temperamental reactivity and social competence. The only significant relationship that was found was that between emotion

regulation at 54 months and social competence in first grade, which aligns with previous research.

Temperamental Reactivity and Children's Social Competence

by
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A THESIS

submitted to

Oregon State University

in partial fulfillment of
the requirements for the
degree of

Master of Science

Presented March 14, 2013
Commencement June 2013

Master of Science thesis of Jessica M. Nolen-Morse presented on March 14, 2013.

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I understand that my thesis will become part of the permanent collection of Oregon State University libraries. My signature below authorizes release of my thesis to any reader upon request.

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Jessica M. Nolen-Morse, Author

ACKNOWLEDGEMENTS

First and foremost, I would like to thank my advisor, Dr. Megan McClelland for all of her help with the design and writing process of this study and thesis. But even moreso I would like to thank her for all of her mentorship and advice that was received during this process. She caused me to think critically as a graduate student and helped support me and helped me persevere when seasons of life got me down during this time.

I would also like to thank Dr. Alan Acock for his help with the statistical processes of this thesis, directly and indirectly. I learned so much from him throughout the statistical courses that I had taken before the thesis writing, and he was there to make sure I was on the right track during the analysis.

Thank you also to Dr. Shannon Lipscomb, my committee member, as well as Dr. Megan MacDonald, my graduate school representative, for their input into my thesis. Without that additional support I would not be completing this thesis when I am. In addition, I would like to thank Michaella Sektnan who helped me tremendously in understanding the data set and getting me going in my analysis.

Finally, I would like to thank all of my friends and family for helping me through this process, I would not have made it without your love and support. I especially want to thank my parents, my sister, and my fiancé for encouraging me in every way possible.

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Chapter 1. Introduction

Children bring to school a wide range of behaviors and temperaments as they begin to interact with one another and form social relationships. The formation of social relationships in early childhood can set the foundation for relationships across the lifespan. Children's social competence is an important developmental factor that influences these future social interactions (Fabes, Gaertner, & Popp, 2006; Rubin, Bukowski, & Parker, 2006) and mental health and well-being (Rose-Krasnor & Denham, 2009). If a child is unable to initiate and sustain friendships, he/she may feel rejected, which could take a toll on his/her mental health. In addition, children enter into these relationships with different temperament styles that they have had since birth. Some children may be more successful in social situations more naturally than others. For example, those who are higher in temperamental reactivity may not be as well received as those with lower levels of reactivity because they tend to have more trouble adapting to new situations (Thomas & Chess, 1977).

Social competence is closely tied to emotional competence as well (Semrud-Clikeman, 2007). As children discover peers and play behaviors, they also must begin to navigate the emotional world. Children who are better able to control their emotions tend to be more successful in these new relationships (Eisenberg, Vaughan, & Hofer, 2009). Thus, emotion regulation and temperament may work together to influence social competence. For example, children may have high temperamental reactivity, but if they are able to emotionally regulate in early childhood, their social competence may benefit

as a result. The present study examined relations between temperamental reactivity at 6 months and social competence in first grade, including if emotion regulation at 54 months plays a role as mediator and/or moderator of the relationship between temperamental reactivity and social competence in first grade. Results of this study could provide key information on the importance of children successfully regulating their emotions and how this may strengthen their future social competence.

Chapter 2. Literature Review

Importance of Social Competence

As children begin school, they have to learn how to navigate a variety of new social situations, which will dictate their level of social competence. There is not a consistent definition of social competence among researchers, but many agree that it includes the ability to effectively interact with others and form positive relationships by using key skills, such as communicating well with others, initiating conversations, joining in already established groups, and getting along with others (Fabes et al., 2006; Rose-Krasnor, 2007; Rose-Krasnor & Denham, 2009). Specific aspects of social competence include assertion, self-control, and cooperation (Gresham & Elliott, 1990). Assertion involves initiating conversations and volunteering to help others in the classroom (Gresham & Elliott, 1990). Children exhibit self-control in conflict situations, when they show whether they are able to respond in a socially appropriate way to any teasing or peer pressure they may encounter (Gresham & Elliott, 1990). Cooperation is whether or not children are able to follow a teacher's direction and pay attention in class (Gresham & Elliott, 1990).

Social competence in young children has been shown to have a significant impact on development in future social interactions (Fabes et al., 2006; Rubin et al., 2006), and on mental health and well-being (Rose-Krasnor & Denham, 2009). Through social competence, children are able to gain insight into their own behavior as well as develop expectations for how their future social interactions will go (Semrud-Clikeman, 2007). They also discover how to communicate with others and this sets the foundation for

future interactions and cognitive development (Guralnick, 1999). Children learn the appropriate context for certain behaviors and this helps them relate to others and adapt to new situations (Semrud-Clikeman, 2007). All of these skills that children develop early on may influence how they interact with others in adulthood as well. Thus, it is beneficial to study social competence and the factors that predict this important construct, including temperamental reactivity and emotion regulation (Blair, Denham, Kochanoff, & Whipple, 2004) to optimize a child's development in numerous domains.

Defining Temperament

Temperament is defined as individual differences in reactivity and self-regulation that are influenced by genes and environment, with reactivity defined by responses to changes in the environment, internally and externally, and regulation is characterized by effortful control and similar processes (Rothbart & Bates, 1998, 2006; Rothbart & Derryberry, 1981). Rothbart believes that infant temperament is composed of how infants react and regulate their reactivity in unique ways (Fox, 1998; Rothbart, 1989). By looking at reactivity and regulation, especially in infancy, we can see how the biological and behavioral components of temperament are working together (Rothbart & Derryberry, 1981). Early temperamental characteristics provide a framework for how an infant reacts to, and is influenced by, the physical and social worlds around him/her (Rothbart & Derryberry, 1981). This gives insight into the ways a child may respond to his/her environment at a later developmental stage. This study explored infant temperamental reactivity measured using maternal report at 6 months and how it relates to later social competence.

Temperament is comprised of many characteristics, including individual differences in approach, mood, and adaptability (Chess & Thomas, 1996). Approach has been defined as a child's initial response to a new stimulus, such as new people or new foods (Chess & Thomas, 1996). Children who are characterized by a more joyful and friendly disposition are classified as having a more positive mood (Chess & Thomas, 1996). A child's adaptability is his/her response to a new or changed routine (Chess & Thomas, 1996). As children enter school and learn how to interact with others, adaptability is important because of the new situations and people that they will encounter.

Researchers have found that children can be categorized into three temperament groups based on these individual differences: easy, difficult, and slow-to-warm-up (Chess & Thomas, 1996; Thomas & Chess, 1977; Thomas, Chess, & Birch, 1968). Children who are classified as having an easy temperament tend to be highly adaptable, very regular in their biological patterns of eating, sleeping, etc., low in intensity of their reactions, and have a positive mood (Thomas et al., 1968). Infants who have easy temperaments are labeled this way due to their quick adaptability to new situations. However, children classified as "easy" are not exempt from developing behavior problems in the future, although it is less likely (Thomas et al., 1968). Similarly, it is not the case that behavior problems are only associated with children who have a more difficult temperament.

Children characterized by having a difficult temperament are those who tend to be slower to adapt, more irregular in their routines, have a higher level of intensity in their reactions, and who express a more negative mood (Thomas et al., 1968). These children

are not maladaptive, they are just slower to adapt to new situations. Moreover, children who have more difficult temperaments are more likely to be rated higher on antisocial play behavior by teachers (Eisenberg et al., 2009). Once they adapt, however, they may appear the same as those who were able to adapt more quickly in these play behaviors (Thomas et al., 1968). Although it may be perceived that a difficult child is atypical and struggles with several problem behaviors, these children also have positive components of their behavior and temperament (Chess & Thomas, 1996).

The final temperament category is comprised of children with slow-to-warm-up temperaments. This group is characterized by a combination of traits from the easy and difficult temperament groups. For instance, these children are more apt to be slower to adapt like those who have difficult temperaments, yet more regular in their biological patterns like those with easy temperaments (Chess & Thomas, 1996). They also tend to have a mild intensity level in their reactions to new situations. Children with this temperament style tend to be shyer in early childhood than other temperament styles but that may lessen as children get older (Grady, Karraker, & Metzger, 2012).

This study examined children with more difficult temperamental styles to explore whether being rated as a more reactive child by their mothers affects later social competence. The study also examined how emotion regulation strategies may influence this relation. Two main components of difficult temperament are negative reactivity and negative emotionality (Bates, 1989; Clarke-Stewart, Fitzpatrick, Allhusen, & Goldberg, 2000). By measuring infant reactivity, we can begin to see how infants respond to the environment in different ways (Rothbart, 1989). Children who are characterized as being

higher in temperamental reactivity tend to have higher scores in negative mood, and low scores in approach and adaptability (Chess & Thomas, 1996; Rothbart, 2011; Thomas, Chess, & Korn, 1982). This means that a child who is high in temperamental reactivity may have more difficulty in social situations, withdraw from new stimuli, and have difficulty adapting to new environments (Thomas & Chess, 1977). However, these highly reactive children may be able to be more successful in social interactions if they learn useful tools in how to channel their reactivity in more socially appropriate ways.

Temperamental Reactivity and Social Competence

Temperament has been shown to be important for the development of social competence and other social behaviors in children, with greater temperamental reactivity being related to poorer social competence (Houck, 1999; Rothbart, 2007; Rothbart, 2011). Individual differences in temperament "may be significantly responsible for individual differences in the processes that support or hinder socially competent behaviors" (Fabes et al., 2006, p. 299). Children with high levels of temperamental reactivity and high emotion regulation have been characterized as expressive, social, and uninhibited, whereas those with high emotion regulation and low levels of reactivity have been characterized as nonexpressive, inhibited, and highly controlled (Fox, 1989; Rothbart & Derryberry, 1981). Thus, those who are highly reactive but have the mechanisms to effectively regulate that response may be more successful in their peer interactions. One study found that uninhibited children were less likely to be rejected by their peers because they were more sociable (Rimm-Kafman & Kagan, 2005). This would suggest that more inhibited children may be able to achieve similar results if they have

strong emotion regulation. Children respond better to peers who exhibit more positive emotions, which tend to be children who are less reactive, which may also explain the peer rejection that those with more difficult temperaments experience (Halberstadt, Denham, & Dunsmore, 2001). Furthermore, those with low emotion regulation and high levels of reactivity are more likely to struggle with self-control and be hyperactive, while those with low emotion regulation and low levels of reactivity are more likely to be depressed and socially withdrawn (Fox, 1989; Rothbart & Derryberry, 1981). These results indicate that temperamental reactivity and emotion regulation interact in important ways to influence a child's social competence.

Temperamental Reactivity and Emotion Regulation

Temperament has been found to have a considerable influence on early emotional development especially emotion regulation (Blair et al., 2004). Emotions provide us with social functions that help us distinguish whether something is good or bad, influence our social behavior, and aid us in interpreting the actions of others (Gross, 1998). In order to benefit most from our emotions, we must learn how to regulate them. We have to discover how to control our own emotions in order to understand others' emotions and their expression, which will help us interact with peers in social situations and develop strong social competence.

There are several definitions of emotion regulation put forth by researchers. For the purposes of this study, emotion regulation is defined as increasing, reducing, or maintaining emotions, depending on the situation and the goals for the situation (Gross & Thompson, 2007). There are three main aspects of emotion regulation identified by Gross

and Thompson (2007). First, people must be able to regulate positive and negative emotions. Many think that regulating emotions pertains to constraining our negative emotions, when in reality, exhibiting extreme positive emotions may not be appropriate in certain situations. Second, emotion regulation can be conscious to begin with, but then can be internalized so it is done unconsciously. As children develop, they will learn different ways to manage their emotions. Finally, depending on the situation, emotion regulation can be used to improve situations or make them worse.

A child's temperament can influence what emotion regulation strategies he/she decides to use. Temperament can influence the coping strategies that a child utilizes, which then will result in the type of emotion regulation chosen to use in that coping (Rothbart, 2011; Rothbart & Bates, 2006). For example, shyer children might be more apt to seek out a caregiver to help them regulate certain emotions, whereas a more extroverted, or more reactive child, may choose to self-soothe or distract to regulate (Zimmermann & Stansbury, 2003). Similarly, a child's temperamental reactivity level can affect his/her sensitivity to emotions and the situations in which those emotions are elicited (Rothbart, 2011). Two different children can experience the same event but it may be threatening to only one of the children due to the differences in temperamental reactivity (Rothbart, 2011). The child who is higher in reactivity may not be as threatened because he/she is used to approaching new stimuli more willingly. Thus, each child may choose a different way to emotionally regulate because each of them are experiencing different emotions in that particular situation.

Emotion Regulation and Social Competence

Emotion regulation becomes critical around preschool age because children are encountering a more complex social world and are developing more multifaceted emotions (Denham et al., 2003), and the ability to self-regulate. As children enter preschool, they begin to enter into a larger variety, and number, of social relationships, which results in needing to understand emotions. They are also becoming more aware of the necessity to regulate strong emotions to fit into this socially and culturally appropriate setting (Thompson & Lagattuta, 2006). If children are able to flexibly regulate, that is, control their positive and negative emotions, the social situations they encounter will be affected depending on how they choose to regulate. Thus, these children will be more likely to develop strong social competence.

In addition to temperament, emotion regulation in preschool has been found to influence future social interactions (Denham et al. 2003). Previous research has shown that emotion regulation influences many aspects of socioemotional development for young children (Bridges et al., 2004; Eisenberg, Champion, & Ma, 2004; Eisenberg, Fabes, Guthrie, & Reiser, 2002), including social competence (Carlson & Wang, 2007; Denham et al., 2003; Ramani, Brownell, & Campbell, 2010; Thompson & Lagattuta, 2006). Children who have better emotion regulation have been shown to have better social competence in terms of better play interactions and more connected play behaviors (Eisenberg et al., 2009). By regulating their emotions, children are able to react well to their peers' feelings, maintain friendships, and work well with a group, which leads to peer acceptance, thus boosting their social competence in those play interactions (Thompson & Lagattuta, 2006). Children who are unable to effectively regulate their

emotions may struggle to maintain positive social interactions. For example, children who are unable to contain their positive emotions and become over-aroused may focus more on themselves and may not be successful in social situations where negative emotion is prominent (Eisenberg, Fabes, Carlo, & Karbon, 1992). Similarly, children who display great distress may not attend to the negative emotions of others or join in a social situation appropriately (Eisenberg et al., 1992), which could result in peer rejection. Eisenberg and Morris (2002) argue that children who are able to successfully regulate their emotions are not over- or under-controlled, but they will be able to respond in a more socially appropriate manner to new experiences. This will most likely increase their peer acceptance and therefore their social competence.

In the current study, emotion regulation was measured by a delay of gratification task. Delay of gratification is the ability to "postpone immediate gratification and persist in goal-directed behavior for the sake of later outcomes" (Mischel, Shoda, & Rodriguez, 1989, p. 933). Delay situations are the most common settings in which young children need to regulate their emotions because waiting situations can evoke negative emotions (Silk, Shaw, Forbes, Lane, & Kovacs, 2006). Children who are able to utilize adaptive strategies may be able to reduce the negative affect, while those who employ maladaptive ones may increase the negative emotions (Silk et al., 2006). This suggests that children who are able to better regulate their emotions may be more successful in delay situations. Previous research has shown that good delay of gratification in preschoolers leads to better development and better social competence in the future (Lee, Lan, Wang, & Chiu, 2008; Mischel et al., 1989; Ramani et al., 2010). During the preschool years, children are

increasingly able to delay gratification because this is also when emotion regulation develops, which then affects their ability to initiate and maintain peer relationships.

Temperamental Reactivity, Emotion Regulation, and Social Competence

Emotion Regulation as a Mediator. As we have seen above, temperamental reactivity affects the emotion regulation strategies that children employ and how they react to different situations (Rothbart, 2011; Rothbart & Bates, 2006; Zimmermann & Stansbury, 2003). Furthermore, we have seen how emotion regulation influences social competence in that it greatly affects how peers see one another. Children who are able to successfully regulate their emotions may be able to better maintain friendships and experience more peer acceptance than those who are not able to regulate as well (Thompson & Lagattuta, 2006). Based on this research establishing paths between these constructs, it is possible that emotion regulation will serve as a mediator of the relationship between temperamental reactivity at 6 months and social competence in first grade.

This would suggest that emotion regulation may be playing a larger role than temperament alone in the development of a child's social competence or at least contributes to the explanation of this relationship. Thus, it is possible that infant temperament lays the foundation for a child's ability to emotionally regulate, which then influences his/her social competence. For example, children who display difficult behavior, or who have higher temperamental reactivity, may be less capable of regulating their emotions in socially appropriate ways, resulting in poorer social competence than their more temperamentally easy peers (Szewczyk-Sokolowski et al., 2005). Previous

research has found that a child's level of reactivity as well as the ability to regulate his or her emotions contributes to whether or not a child is able to function successfully in social situations (Eisenberg et al., 1992).

Emotion Regulation as a Moderator. Temperament and emotion regulation have been found to be joint predictors of social functioning and the effect of their interaction has been found to better predict the quality of children's social interactions than temperament or emotion regulation on their own (Blair et al., 2004; Eisenberg et al., 2002). For example, one study found that emotion regulation better predicted problem behavior than temperament when children had high levels of negative emotionality, but that temperament was a better predictor when children were low in negative emotionality (Eisenberg et al., 2002). However, as emotion regulation decreased, negative temperament better predicted problem behavior, indicating that the interaction between the two was the better predictor rather than each construct on its own (Eisenberg et al., 2002). Based on these results, it is possible that emotion regulation may moderate the relationship between a child's temperamental reactivity and his/her social competence in first grade. For example, children who are highly reactive may have better social competence if they are higher in emotion regulation and poorer social competence if they are low in emotion regulation because emotion regulation may serve as a buffer for these children (Fox, 1989; Rothbart & Derryberry, 1981). This suggests that the relationship between temperamental reactivity at 6 months and social competence in first grade may be based on the child's level of emotion regulation.

Goals of the Present Study

There were three main goals for this study (see Figure 1). As seen in the model, temperamental reactivity in infancy and emotion regulation in preschool were proposed predictors of social competence in first grade. Specifically, this study explored whether emotion regulation at 54 months mediates and/or moderates the relationship between temperamental reactivity at 6 months and social competence in first grade

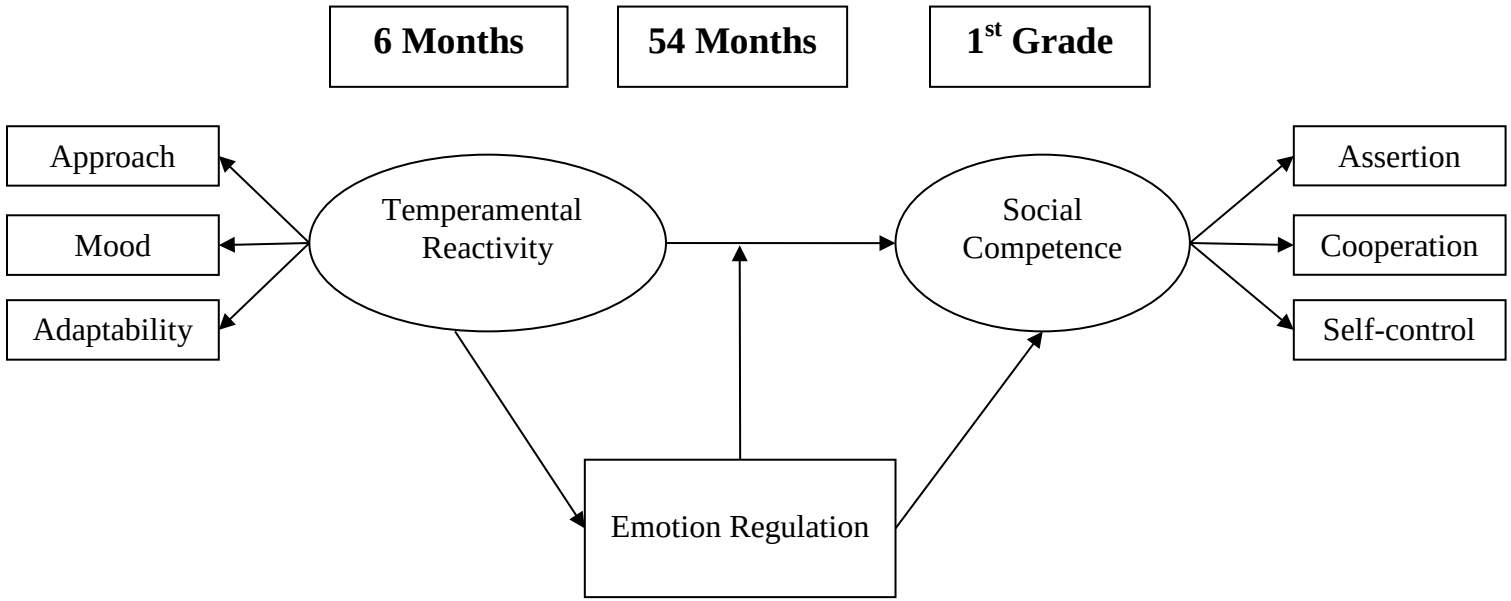
Research Question #1: Is temperamental reactivity at 6 months directly related to social competence in first grade? Previous research indicates that temperament has been consistently significant in the emergence of competence and social skills in children with greater temperamental reactivity resulting in poorer social competence (Houck, 1999; Rothbart, 2007; Rothbart, 2011). Based on these studies, it was predicted that children with higher temperamental reactivity at 6 months of age will have lower social competence in first grade.

Research Question #2: Does emotion regulation at 54 months mediate the relationship between temperamental reactivity at 6 months and social competence in first grade? Previous research has found that temperamental reactivity influences emotion regulation (Rothbart, 2011; Rothbart & Bates, 2006; Zimmermann & Stansbury, 2003). It has also been found that emotion regulation affects social competence (Denham, 2003; Eisenberg et al., 1992; Thompson & Lagattuta, 2006). Thus, it was hypothesized that there would be an indirect effect of temperamental reactivity on social competence through emotion regulation. According to this hypothesis, children who have higher levels of temperamental reactivity would be more likely to have poorer emotion regulation, which would result in poorer social competence. Children have different

temperaments that lead to different behaviors in social situations, but emotion regulation is a key component in which of these behaviors they choose to display. Hence, it was predicted that emotion regulation would partially or fully mediate the relationship between temperamental reactivity and social competence.

Research Question #3: Does emotion regulation moderate the relationship between temperamental reactivity at 6 months and social competence in first grade? It was hypothesized that emotion regulation would act as a moderator of the relationship between temperamental reactivity and social competence because the relationship between temperamental reactivity at 6 months and social competence in first grade was predicted to change with differing levels of emotion regulation at 54 months. Specifically, as children are rated higher on temperamental reactivity, strong emotion regulation would serve as a buffer to help foster better social competence, but poor emotion regulation would not result in improved social competence. This was based on the research finding that temperament and emotion regulation are joint predictors of social competence and better predict social competence together than each construct on its own (Blair et al., 2004; Eisenberg et al., 2002). It was hypothesized that preschoolers who develop successful ways to regulate their emotions would then internalize these methods so that when they entered first grade, these regulation strategies would help them develop stronger social competence as rated by teachers, regardless of their temperamental reactivity level.

Figure 1
Model of Temperamental Reactivity on Social Competence



*Error terms not shown in figure

Chapter 3. Method

Study Design

This study used data from phase I and phase II of the National Institute of Child and Human Development (NICHD) Study of Early Child Care and Youth Development (see http://secc.rti.org). In this dataset, children and their families were recruited at birth and followed through the conclusion of phase II in second grade.

Participants

Children and families were recruited from hospitals in or near Little Rock, Arkansas; Irvine, California; Lawrence, Kansas; Boston, Massachusetts; Philadelphia, Pennsylvania; Pittsburg, Pennsylvania; Charlottesville, Virginia; Morganton, North Carolina; Seattle, Washington; and Madison, Wisconsin. In order to be eligible to participate in the study, the mother had to be over the age of 18, the mother had to be fluent in English, the mother and baby needed to be healthy, the baby could not be put up for adoption, the family had to live within an hour of the research site, and the family could not anticipate leaving the area within a year.

When the children were 1 month old, 1,364 families with healthy newborns were interviewed and enrolled in the study with approximately equal numbers of families at each site. The enrolled families varied in ethnic background, socioeconomic status, and family composition. For example, the sample is considered ethnically diverse with approximately 25% of the families belonged to ethnic minorities. Approximately 75% identified as White/Non-Hispanic, 13% Black/Non-Hispanic, 7% Hispanic, and approximately 5% identified themselves as Asian, Native American or other ethnicities.

In addition, mother's education varied with 10% completing less than 12th grade, 21% graduated high school, 33% had some college, 21% had a bachelor's degree and 15% completed a graduate or professional degree. The mean household income of the sample was $37,781.28 with almost 19% of the families on public assistance and 14% of the mothers were single.

Measures

The data used for this paper were collected at 6 months, 54 months, and in first grade through face-to-face interviews in the home and in the laboratory setting. Levels of temperamental reactivity at 6 months were collected via parent questionnaire in the home. Emotion regulation at 54 months was assessed via a delay of gratification test in the laboratory setting. Finally, social competence in first grade was assessed via teacher questionnaire that was sent to the teachers at the schools.

Temperamental reactivity. A latent variable for temperamental reactivity was created based on three subscales of the Revised Infant Temperament Questionnaire (RITQ; Carey & McDevitt, 1978). Mothers completed this questionnaire at 6 months by indicating how often their child demonstrated the behavior on a six-point scale (ranging from 1= almost never to 6= almost always). The latent variable includes the mean of the items that make up each of the subscales. These subscales include: *approach* (initial response to a new stimulus, i.e. accepting or rejecting new people or foods), *mood* (disposition of the child, whether it be joyful and friendly or fussy and unfriendly), and *adaptability* (response to a new or changed routine, not concerned with initial response but rather how easy the transition is) (Chess & Thomas, 1996). There are 11 items that

represent approach, 10 items that represent mood, and 11 items that represent adaptability. Higher scores represent more perceived temperamental reactivity (Cronbach's alpha: approach = .75, mood = .60, adaptability = .66).

Emotion regulation. Emotion regulation was measured by a delay of gratification task (Mischel, 1974, 1981) at the laboratory at 54 months. First, the child selects which of three types of food is his or her favorite (M&Ms, animal crackers, pretzels). Then, the child is given two choices: 1) wait for seven minutes until the experimenter comes back to the room and the child will receive a larger portion of the preferred food, or 2) ring a bell so that the experimenter will return to the room early, which would result in the child receiving a smaller portion of the preferred food. Both size portions of the food are left in front of the child in the room when the experimenter leaves and the session is videotaped so as to observe each child's response. The experimenter then reported whether the child understood the directions, any comments the child made before the experimenter left the room, what terminated the waiting session, whether they passed (waited the full seven minutes) or failed, and how long the child waited (in minutes) if he or she did. For the current study, the amount of time the child waited will be used to measure emotion regulation through this task. The longer the child waited indicates better emotion regulation.

Social competence. A latent variable for social competence was composed of all three subscales of the Social Skills Rating System (SSRS; Gresham & Elliott, 1990). Teachers completed this questionnaire in first grade by indicating how often the child demonstrated the social behavior on a three-point scale (0 = never, 1 = sometimes, 2 =

very often). The aggregate variable includes the mean of the 10-items of each behavioral subscale: *assertion* (initiating behaviors, such as introducing oneself, starting conversations with peers, and helping peers with classroom tasks), *cooperation* (paying attention to the teacher's instructions, putting materials away properly, and using free time in an appropriate way), and *self-control* (behaviors that emerge in conflict situations, such as responding to peer pressure and teasing appropriately, and controlling his or her temper). Higher scores indicate higher levels of perceived social competence (Cronbach's alpha: assertion = .84, cooperation = .90, self-control = .87).

Control variables. Demographic data were collected during in-home interviews at one month, where the mother reported the baby's gender and ethnicity, as well as her own education. The mother also reported family income at all of the in-home interviews at 1, 6, 15, 24, 36, and 54 months as well as in kindergarten and first grade. An income-to-needs ratio was created for each of the time points by dividing the family's total income by the poverty threshold for the household, which was determined by the year the income is earned, how many family members live there, as well as the number of children under the age of 18 living there full-time. The higher the ratio, the greater amount of financial resources the family has. Specifically, ratios less than 1.0 are considered poor, ratios between 1.0 and 1.7 are near poor, and ratios greater than or equal to 1.8 are not poor (NICHD, 2003). In order to best characterize the family's average income level from age 6 months to first grade, the income-to-needs ratios was averaged across all eight time points. This average ratio was log transformed to normalize the distribution (Kline, 2005).

Data Analysis Plan

Structural Equation Modeling (SEM) was used to explore the relationships among temperamental reactivity, emotion regulation, and social competence. SEM is a statistical method that takes a confirmatory approach to analyze multivariate observations created by causal processes (Byrne, 2012). Structural equation models contain structural and measurement models, which were simultaneously analyzed using Mplus 6 software (Muthén & Muthén, 2010). Missing values were estimated using the full informational maximum likelihood estimation. This estimation utilizes all of the available information that is available for each of the 1,364 cases (Kline, 2005). Correlations, means, and standard deviations for all variables will be reported.

There are two main elements of structural equation models, the measurement model and the structural model. The measurement model evaluates the fit of latent variables. A latent variable is defined as an unobserved variable that is created through combining similar observed variables (NICHD, 2004). In this study, two latent variables, for temperamental reactivity and social competence, were used. As mentioned above, the latent variable for temperamental reactivity at 6 months includes approach (loading = .75), mood (loading = .60), and adaptability (loading = .66). The latent variable representing social competence in first grade includes assertion (loading = .84), cooperation (loading = .90), and self-control (loading = .87). All of the loadings of the measured variables on the latent variable were significant ($p < .001$).

The structural model evaluates how well the proposed model fits the data in addition to estimating the parameters between variables. In order to assess the structural

model, numerous goodness-of-fit statistics will be reported and interpreted. These will be the overall chi-square, the comparative fit index (CFI), the Tucker Lewis index (TLI), the root mean square error of approximation (RMSEA), and the standardized root mean square residual (SRMR). When reporting and interpreting the proposed paths between the variables, unstandardized coefficients, standard errors, z-scores, and standardized coefficients (β) will be used.

Chapter 4. Results

The present study examined if there was a relationship between temperamental reactivity at 6 months and social competence in first grade. In addition, emotion regulation was a proposed mediator and moderator of this relationship. Descriptive statistics for the variables used in this analysis are listed in Table 4.1 and 4.2. Table 4.1 shows means and standard deviations for the observed variables as well as the correlations between all predictor, mediator/moderator, and outcome variables. Table 4.1 indicates that there is a significant correlation between all three measures of temperamental reactivity; approach, mood, and adaptability. It also shows that emotion regulation is significantly correlated with the approach and adaptability subscales of temperamental reactivity. Furthermore, the assertion subscale of social competence is significantly correlated with adaptability and emotion regulation. The cooperation subscale is significantly correlated with adaptability, emotion regulation, and assertion. Finally, the self-control subscale is marginally correlated with adaptability and significantly correlated with emotion regulation, assertion, and cooperation. Table 4.2 shows the unstandardized coefficients, standard errors, and standardized coefficients of direct and indirect paths. This table shows that the only significant relationship is the direct effect of emotion regulation at 54 months on social competence in first grade. It is important to note that none of the subscales of temperamental reactivity nor those of social competence were highly correlated with emotion regulation, indicating that they are indeed separate measured constructs in this study.

Structural Equation Model

To identify the direct and indirect pathways between temperamental reactivity at 6 months and social competence in first grade and examine the mediating and moderating role of emotion regulation at 54 months, one structural equation model was tested (see Figure 1). Both the measurement model and the structural model for all outcomes were evaluated simultaneously using Mplus 6 software (Muthen & Muthen, 2010). It was found that approach, mood, adaptability at 6 months, and emotion regulation at 54 months explained 16% of the variance in social competence in first grade. In addition, approach, mood, and adaptability at 6 months explained 10% of the variance in emotion regulation at 54 months.

In this analysis, multiple goodness-of-fit statistics were reported because the overall chi-square statistic is affected by the large sample size. The chi-square (32) = 167.31, $p<.001$. Thus the model fails to reproduce the covariances of all of the observed variables in the model. This result is not surprising given the size of the sample. With a sample this size, we rely on the measures of goodness of fit to assess how closely the model reproduces the covariances of all the observed variables. Other indices of fit, including the comparative fit index (CFI = .93) and the standardized root mean square residual (SRMR = .05), indicate a good model fit (Kline, 2005). The root mean error of approximation (RMSEA) indicated a close approximate fit at .06, and a 90% confidence interval of .05-.07 (Kline, 2005).

Direct Effect of Temperamental Reactivity on Social Competence

The first goal of this study was to explore the direct relationship between temperamental reactivity at 6 months and social competence in first grade (see Table 4.2

and Figure 2). It was expected that there would be a direct negative relationship between temperamental reactivity and social competence. Specifically, as temperamental reactivity increases, social competence was predicted to decrease. However, the direct relationship between temperamental reactivity and social competence was not statistically significant (β = .01, p > .10).

Indirect Effect of Temperamental Reactivity on Social Competence via Emotion Regulation

The second goal of this study was to explore whether emotion regulation at 54 months mediated the relationship between temperamental reactivity at 6 months and social competence in first grade. It was expected that there would be a significant indirect effect, indicating that those who were higher in temperamental reactivity would have poorer emotion regulation, which would result in poorer social competence. While there was a statistically significant relationship between emotion regulation and social competence (β = .19, p < .001), indicating that as children increased in emotion regulation, they had better social competence as a result, there was not a significant relationship between temperamental reactivity and emotion regulation (β = .05, p > .10) (see Table 4.2 and Figure 3). This indicates that emotion regulation at 54 months did not significantly mediate the relationship between temperamental reactivity at 6 months and social competence in first grade (β = .01, p > .10).

Emotion Regulation as a Moderator of the Direct Effect of Temperamental Reactivity on Social Competence

The final goal of this study examined if emotion regulation at 54 months was a potential moderator of the relationship between temperamental reactivity at 6 months and social competence in first grade. It was hypothesized that emotion regulation would serve as a moderator of this relationship. Specifically, as scores of temperamental reactivity got higher, strong emotion regulation would serve as a buffer to help foster better social competence. However, the interaction term of temperamental reactivity x social competence was not significant (β = -.01, p > .10) meaning that emotion regulation did not serve as a significant moderator of the relationship between temperamental reactivity and social competence (see Table 4.2 and Figure 3).

Demographic controls

When examining the longitudinal relationship between temperamental reactivity at 6 months and social competence in first grade, there are several demographic factors that may play a role in influencing this relationship. Thus, child's gender, child's race, maternal education, and an income-to-needs ratio were included as controls in this study. Results indicated that child gender (β = .20, p < .001) and maternal education (β = .23, p < .001) significantly influenced social competence in first grade, while a child's race (β = .04, p > .10) and the income-to-needs ratio (β = .02, p > .10) did not. In addition, a child's race (β = .12, p = .001), maternal education (β = .16, p < .001), and the income-to-needs ratio (β = .13, p = .001) significantly influenced emotion regulation at 54 months, while a child's gender (β = .05, p < .10) had a marginally significant influence.

Table 4.1

Correlations, Means, and Standard Deviations (N=1,364)

Variable	1	2	3	4	5	6	7
1. Temperamental Reactivity: Approach	—						
2. Temperamental Reactivity: Mood	.420***	—					
3. Temperamental Reactivity: Adaptability	.515***	.391***	—				
4. Emotion Regulation	.112***	-.014	.095**	—			
5. Social Competence: Assertion	.013	.009	.068*	.117***	—		
6. Social Competence: Cooperation	.047	.028	.118***	.244***	.484***	—	
7. Social Competence: Self-Control	- .013	-.029	.060†	.207***	.506***	.615***	—
M	4.473	4.080	4.623	4.477	1.325	1.549	1.517
SD	.735	.664	.640	3.007	.388	.407	.371

Note. †p≤.10, *p≤.05, **p≤.01, and ***p≤.001.

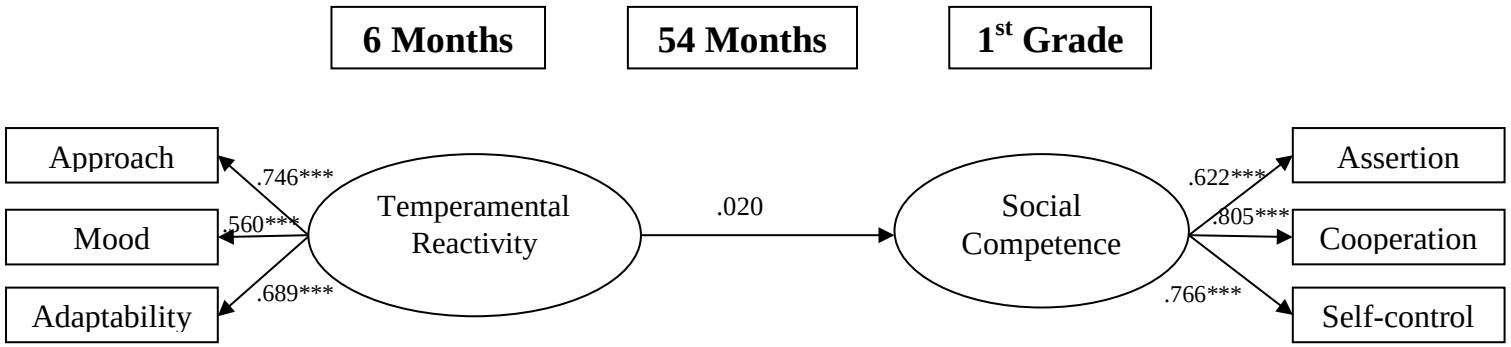
Table 4.2

Unstandardized Coefficients, Standard Errors, and Standardized Coefficients of Direct and Indirect Paths (N= 1,364)

	Endogenous Variables							
	Emotion Regulation				Social Competence			
Exogenous Variables	B	SE(B)	Z	β	B	SE(B)	Z	β
Temperamental Reactivity								
Direct Effect:	.287	.209	1.371	.052	.012	.025	.484	.020
Indirect: Temp→ER→SC	----	----	----	----	.006	.005	1.320	.010
Total Effect:					.018	.025	.722	.030
Emotion Regulation								
Direct Effect:	----	----	----	----	.021	.004	5.048	.192***

Note. Demographic controls included child's gender, child's race, maternal education, and income-to-needs ratio
*p≤.05, **p≤.01, and ***p≤.001.

Figure 2
Results of Structural Equation Modeling of Temperamental Reactivity on Social Competence without Mediator/Moderator



*Error terms not shown in figure
*Demographic controls included child's gender, child's race, maternal education, and income-to-needs ratio

Figure 3
Results of Structural Equation Modeling of Temperamental Reactivity on Social Competence with Mediator/Moderator

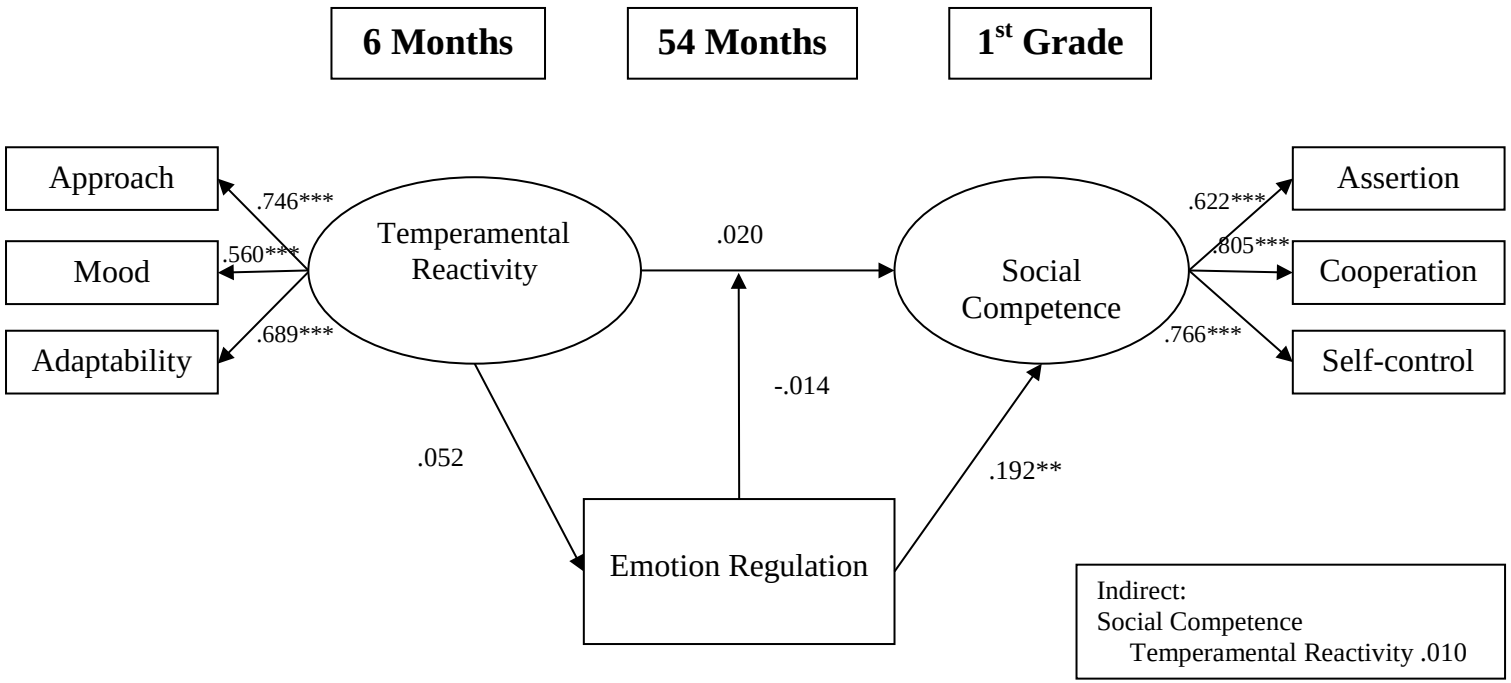


Figure 3. Error terms not shown in figure. Demographic controls included child's gender, child's race, maternal education, and income-to-needs ratio. Chi-square (32) = 167.31, p<.001, CFI = .93, TLI = .89, SRMR = .05, RMSEA = .06

Chapter 5. Discussion

The aim of this study was to further research on the relationships among temperamental reactivity, emotion regulation, and social competence. Although research exists on these relationships, research is lacking about the longitudinal effects of temperamental reactivity in infancy and social competence in first grade. Most of the current research involves looking at concurrent results of the relationship between these constructs (Eisenberg et al., 2009; Szewczyk-Sokolowski et al., 2005), which is why this study examined the possible longitudinal results. However, findings did not support a statistically significant relationship between temperamental reactivity at 6 months and social competence in first grade. Although the longitudinal idea for this study would have added to current research regarding these constructs, temperament at 6 months may not have been the best age to start with in measuring temperamental reactivity. These is some evidence for the stability of temperament from an early age (Casalin, Luyten, Vliegen, & Meurs, 2012), but there are many who have found that temperament becomes more stable around two years of age (Houck, 1999), which may explain the lack of results concerning temperamental reactivity at 6 months influencing social competence in first grade as well as emotion regulation at 54 months. However, this lack of significant findings concerning the age of the child when the temperamental measurement was taken could be good news for parents. This may indicate that parents have a bigger role in influencing a child's temperament and thus his/her future social competence, which is better news than biological factors potentially being a larger component in this relationship. Parents may

feel as if their children are not predestined to be a certain way based on their infant temperamental reactivity.

The internal alphas for the RITQ were also low, which indicates that this measure may not have worked very well. It may be that it was given at too early of an age. It is also possible that children in the first grade are able to develop good or poor social competence regardless of their level of temperamental reactivity in infancy due to other biological and environmental factors such as family structure, genes, education quality, socioeconomic status, and race.

In addition, emotion regulation had been identified as a possible key factor in the development of social competence as well as a construct that works with temperament to influence this development (Blair et al., 2004; Eisenberg et al., 1992; Eisenberg et al., 2002), which is why it was included in this study as a potential mediator and moderator of the relationship between temperamental reactivity and social competence. Results indicated that emotion regulation at 54 months does not mediate or moderate this relationship. However, there was a significant relationship between emotion regulation at 54 months and social competence in first grade, which coincides with previous research on this topic (Carlson & Wang, 2007; Denham et al., 2003; Ramani, Brownell, & Campbell, 2010; Thompson & Lagattuta, 2006), which found that emotion regulation influences future social competence. This research in combination with the results found in this study suggests that interventions geared towards improving a child's emotion regulation around preschool age would be beneficial to the child's future social skill development. It may mean that emotion regulation plays a greater role in future social

competence than temperamental reactivity at 6 months of age. If emotion regulation strategies are taught to children in early childhood, they may be able to learn improved social skills as a result. Children who have better emotion regulation have been shown to have better social competence because they are able to successfully navigate peer interactions and play, thus improving peer acceptance (Eisenberg et al., 2009; Thompson & Lagattuta, 2006). Due to these findings, it is possible that emotion regulation plays a more proximal role than temperament at a young age in influencing social competence.

Although there were not statistically significant results for many of the relationships between the main constructs, there were some significant findings regarding several of the included demographic control variables. Children's gender and mother's education level were both found to play a significant role in social competence of first graders. Girls were found to have a significantly higher level of social competence as compared to boys. Previous research has also supported this finding. In one study researchers found that girls' playgroups tended to be more intimate, nurturing, and relational, while boys were more aggressive in their play and did not hold as many conversations (Rose-Krasnor, 1997). Further research focusing on this would be interesting to find out what other factors contribute to this result. As for maternal education, the higher the mother's education level, the better social competence the child had in first grade. This also supports previous research. In one study, when a mother had a higher education level, she was in a better socioeconomic situation, allowing her to pick out a high quality early child care center for the child, which then resulted in better social competence later (Augustine, Cavanagh, & Crosnoe, 2009). A child's race and the

income-to-needs ratio of the family were not found to be a significant influence on social competence. This suggests that whether a child was white or not did not play a role in his or her social competence at the end of first grade. It is interesting to note that the income-to-needs ratio of the family was not significant although the mother's education level was a significant predictor. It would stand to reason that the higher the mother's education, the higher income level she would have thus correlating with the income-to-needs ratio in its effect on a child's social competence in first grade.

In addition, a child's race, mother's education, and the income-to-needs ratio were found to have a significant influence on a child's emotion regulation at 54 months, although gender only had a marginally significant influence. This suggests that white children in this study had better emotion regulation than non-white children. Results indicated that as maternal education and the income-to-needs ratio increased, the ability for the child to better regulate emotions increased. Previous research has indicated that children who grow up in a family with higher socioeconomic status and a more educated mother develop better emotion regulation because the mother spends more time talking to the child, thus teaching him or her how to emotionally regulate (Bradley & Corwyn, 2002)

Limitations and Future Directions

Although this study did not produce the desired results to expand current research on the relationship between temperamental reactivity, emotion regulation, and social competence, it can be altered in a few ways in the future. It may be beneficial to use different measures as the RITQ is a maternal report and the SSRS is a teacher reported

measure, which can result in bias and subjectivity. The Revised Infant Behavior Questionnaire (RIBQ; Gartstein & Rothbart, 2003) is another infant temperament measure and has stronger reliability and validity than the RITQ used in the present study, although we were able to gain rich information from the RITQ. Future research may want to consider using the RITQ to see if more significant results were found with this measure.

Another limitation of the present study was the early age in which temperament was measured. Measuring temperament at an older age, which may be more stable or one in which multiple measurements could be taken rather than the sole observation of the mother may produce more significant results. Results of this study suggest that temperament at 6 months may not accurately represent a child's later temperament including possible relations to emotion regulation and social competence. Future studies should assess temperament when more stability is found, around 2 years old.

A final limitation is that other environmental effects not accounted for in the present study may have influenced relations among the variables of interest. For example, variables such as the quality of the home environment and parenting should be considered for future research because a child's development is affected by many different factors as well as the context in which they are in. Future research is needed to see if controlling for more factors would identify more mediating and moderating factors of the relationship between temperamental reactivity and social competence.

Chapter 6. Conclusion

The present study explored if emotion regulation at 54 months was a mediator and/or moderator of the relationship between temperamental reactivity at 6 months and social competence in first grade. The only significant relationship that was found was between emotion regulation at 54 months and social competence in first grade, which supports previous research. There were also significant results found with some of the controls that were used involving these relationships.

Although this current longitudinal study did not produce the significant results we were hoping for, there is a need for longitudinal research using stronger measures to explore these relationships. There are many concurrent studies exploring these relationships but a lack of strong longitudinal studies. Future research can look at these relationships with different ages and different measures to further explore this important concept of emotion regulation at 54 months affecting children's future social development.

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