

## ABSTRACT

Title of Proposed Dissertation:      RELATIONSHIPS BETWEEN  
   TEMPERAMENT, EMOTION  
   UNDERSTANDING, AND SOCIAL  
   COMPETENCE IN EARLY CHILDHOOD

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Young children's social competence is regarded as one of the strongest indicators of positive adjustment throughout the lifespan. As part of an effort to unpack its development, a large body of existing research has established relationships between temperamental factors and social competence, as well as between emotion understanding and social competence. However, studies that have examined these constructs have been laden with definitional disagreements and methodological issues, leaving the true magnitude and scope of the relationships difficult to discern. In addition, there has been very little research that has examined relationships between temperament and emotion understanding, although theory and research with clinical samples suggests there are likely links between the two. The current study thus aimed to add to the existing literature by examining temperamental factors, emotion understanding abilities, and social competence in concert. It was

hypothesized that emotion understanding would mediate relationships between temperament and social competence. As expected, certain aspects of temperamental reactivity and self-regulation, as rated by both parents and teachers, correlated with preschoolers' and kindergarteners' performance on emotion understanding tasks, which required them to identify emotions likely to be elicited by common social situations (*emotion situation knowledge*) and to offer explanations for why certain situations may be elicited by those social situations (*emotion situation reasoning*). Interestingly, performance on emotion situation reasoning tasks, but not emotion situation knowledge tasks, emerged as a significant mediator between temperament and social competence, regardless of temperament informant. Although further research is needed in this area, emerging patterns suggest a need to distinguish between children's possession of rote knowledge of emotions and abilities to reason about them. Limitations of the study and implications for future research are also discussed.

RELATIONSHIPS BETWEEN TEMPERAMENT, EMOTION  
UNDERSTANDING, AND SOCIAL COMPETENCE IN EARLY CHILDHOOD

by

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## Chapter 1: Overview

Social competence has long been studied in developmental psychology with findings solidifying its role as perhaps one of the greatest indicators of positive adjustment. Children who are socially competent tend to demonstrate more appropriate social behaviors and to be better able to achieve social success. In turn, they exhibit less aggressive and violent behaviors (Denham, Blair, Schmidt, & DeMulder, 2002) and are more skilled in their abilities to develop and maintain positive relationships with peers (Denham & Holt, 1993). Beyond just positive social outcomes, research has additionally suggested that social competence even exerts an important impact on academic achievement, as some studies have found that children's attainment of social skills is a better predictor of later academic functioning than even initial academic skills (Elias & Haynes, 2008). Further, studies have shown that implementing social and emotional programming in school settings leads to increases in academic achievement across a variety of grade levels and geographic areas (Durlak, Weissberg, Dymnicki, Taylor, & Schellinger, 2011).

Overall, research has indicated that a good repertoire of social skills serves as a protective factor against many psychological disorders and problems. In fact, social competence appears especially important, as it supports the development of other significant protective factors, such as positive self-esteem, friendships, and participation in extracurricular activities (Campos, Del Prette, & Del Prette, 2000). In contrast, deficits in social skills have been implicated as a risk factor for a wide range of negative outcomes and psychological disorders, including depression and externalizing behaviors (Bornstein, Hahn, & Haynes, 2010).

Given the recognized importance of social competence, much research has attempted to investigate in more detail how it is developed in early childhood. Some of this research has focused on the role of environmental factors. For instance, McCloyd (1998) summarizes literature that has shown that children from low socioeconomic status (SES) backgrounds exhibit a higher prevalence of social, emotional, and behavioral problems than their middle class counterparts. Similarly, children whose parents have mental health problems, who experience harsh parenting, and who are exposed to chronic stressors have also been shown to be at greater risk for social-emotional delays (e.g., Keegan-Earmon, 2001; McLeod & Nonnemaker, 2000).

Although the importance of environmental factors in child development is recognized, other research has begun to move beyond this by exploring the roles of various individual child characteristics. For instance, a study conducted by Włodarczyk et al. (2017) found that children's temperament (easy vs. difficult) was a better predictor of social/emotional development than SES and parental mental health problems. Indeed, there is a great deal of literature showing that individual child characteristics, such as temperament and emotion understanding abilities, play a critical role in the development of social competence. Unfortunately, however, studies examining these constructs have been laden with definitional disagreements and methodological issues, which has resulted in a plethora of inconsistent findings. As a result, the true magnitude and scope of the relationships between these constructs are frequently difficult to discern. Thus, the current investigation attempts

to clarify the nature of these relationships in the context of methodological differences.

Although a great deal of research has established links between temperament factors and social competence, as well as between emotion understanding and social competence, there has been a paucity of research that has examined these constructs in concert. In particular, very little research has investigated relationships between temperament and emotion understanding, though theory and research with clinical samples suggests there are likely links between the two. In addition, the research that has been done often has relied on single measurement methods (e.g., parent ratings) and have thus not offered robust representations of the intended constructs.

Consequently, it is the aim of the current study to add to the research base by examining relationships between temperament, emotion understanding, and social competence simultaneously and by utilizing more multi-rater measurements. In contrast to previous research, the current investigation also posits the notion that children's emotion understanding abilities are likely to mediate relationships between temperamental factors and social competence.

## Chapter 2: Review of the Literature

### **Social Competence**

Although the literature has established the importance of social competence as a construct, given its broad and overarching nature, defining and assessing it have proven to be challenging tasks. Indeed, a universal definition of social competence has yet to be accepted, and the definitions offered throughout the literature can vary widely. Historically, researchers have tended to approach defining and assessing social competence in one of two ways, which involve focusing on either particular social skills or on general social outcomes (for reviews, see Dirks, Treat, & Weersing, 2007 or Hubbard & Coie, 1994).

In the first approach, social competence is conceptualized as a set of desirable and discrete skills, such as the ability to initiate interactions with others or to regulate one's emotions. These skillsets are thought to be important determinants of socially competent functioning and tend to be measured using behavior checklists. Although this skills-based approach to social competence is relatively easy to assess and translate into intervention programming, Rose-Krasnor (1997) identified several shortcomings with the approach. For example, researchers have utilized different methods of selecting which skills or behaviors constitute social competence, which has led to disagreements on the criteria. In addition, the skills-based approach conceptualizes social competence as residing within an individual as a trait or ability, rather than as emerging from interactions between individuals and their environments. This is problematic because, as Dirks, Treat, and Weersing (2007)

note, the value and effectiveness of particular social behaviors are likely to vary from situation to situation, as there is no one behavior that will always be the most effective course of action. For instance, even some behaviors regarded as highly prosocial (e.g., smiling) could be less appropriate in certain contexts (e.g., when managing an interpersonal conflict). Lastly, utilizing a solely skills-based approach also is likely to lead to a failure to “see the forest for the trees.” In other words, by focusing on merely the presence or absence of particular discrete skills, it is easy to overlook how individuals actually utilize and integrate the skills within their lives.

Consistent with this notion, compared to the skills-based approach, the second approach places more emphasis on examining social outcomes rather than on investigating the specific acts that constitute social competence. For instance, Hubbard and Coie (1994) defined social competence as “the ability to be effective in the realization of social goals” (p. 2). Some of the social outcomes that have been previously investigated in the literature include having friends, being popular or liked by others, or being able to influence peers. However, as Rose-Krasnor (1997) points out, this approach also has some limitations. For instance, there have been disagreements about what constitutes a competent social outcome, as well as about who is the best judge of social outcomes (e.g., peers, parents, teachers). This is an important point, as research suggests that different groups of judges use different criteria when evaluating children’s behavior (Dirk, Treat, & Weersing, 2007). Additionally, the outcomes-based approach is often investigated using sociometric assessments whose results provide information about whether a child is accepted or rejected by their peers but fail to provide insight into why a child might be rejected.

As a result, the information obtained is difficult to translate into intervention programming.

In order to balance the limitations and strengths of the skills- and outcomes-based approaches, Rose-Krasnor (1997) incorporated them both into her prism model of social competence. According to this model, at its topmost level, social competence is defined as “effectiveness in interaction” (p. 119) and is the result of organized behaviors that meet both short- and long-term developmental needs. The middle level of the model, the Index level, consists of summary indices that reflect social outcomes, such as group status and friendships. This level is also split into Self and Other components, recognizing that there are likely to be differences in the child’s abilities to meet his/her own personal goals versus interpersonal connectedness. Depending on the personal goals that a child holds, his/her view of the effectiveness of an interaction may be quite different from those of peers or adults. For example, children may feel quite effective and view it as an effective outcome when they steal a toy that they want out of another’s hand, yet their peer group may respond negatively, and their teachers are likely to view them as lacking social competence.

Lastly, the bottom and most concrete level of the model includes specific social skills, as well as motivations. Consistent with skills-based approaches, here is where specific behaviors and skillsets resides, such as emotion understanding abilities. Rose-Krasnor (1997) thus recognizes that specific skills or behaviors are necessary to be socially competent but that possessing such skills is not sufficient in and of itself to ensure social competence. For example, in everyday interactions



children have been noted to fail to perform a behavior that is within their repertoires due to a lack of motivation or to high emotional arousal. Thus, other considerations such as motivation and the ability to recognize which skills are appropriate to employ in various conditions are equally important. Overall, Rose-Krasnor conceptualizes social competence not as an ability that resides within individuals but rather as a joint interaction between individuals and their social environments, which is a view that has become increasingly accepted. As Dirks, Treat, and Weersing (2007) point out, “many of the theories of social competence advanced in the last two decades posit that competence depends, at least in part, on the situation in which a behavior is enacted” (p. 329).

### **Development of Social Competence**

A great deal of the research on social competence has focused on early childhood populations. This is because, at this developmental stage, children are beginning to acquire and refine the basic social skills that will be important for producing socially competent behavior throughout the lifespan. Research suggests that, as early as age two, children are attracted to peers as social partners and possess sophisticated social repertoires, including abilities to independently initiate social interactions with both adults and peers (Goldman & Ross, 1978) and to engage in short periods of cooperative play with peers (Howes & Matheson, 1992). As children enter preschool, they are highly attracted to the social world and are exposed to a wider range of social opportunities. Together, this creates a “launching pad” for social experience, and children begin to participate in more prolonged and rich social exchanges that provide critical experience for their social development.

Early childhood research also suggests that children demonstrate individual differences in the emergence and quality of their peer interactions at this age (Rubin et al., 2003). These individual differences demonstrate relative stability throughout childhood and even adolescence (Obradovic et al., 2006) and predict important developmental outcomes. For instance, children who demonstrate behavioral problems such as impulsivity and defiance in preschool tend to be more disruptive in their play with peers as they transition to kindergarten (Fantuzzo, Bulotsky-Shearer, Fusco, & McWayne, 2005) and to be perceived as less popular when they reach school age (Spinrad et al., 2006). Additionally, lower rates of social competence in preschoolers are predictive of long-term internalizing and externalizing issues (Bornstein, Hahn, & Haynes, 2010). Thus, it appears that if social competence is not obtained in early years, development becomes disrupted and places children on a negative developmental trajectory. In contrast, acquisition of social competence early in life buffers against later behavioral, social, and academic difficulties.

## **Temperament**

Given the recognized importance of social competence, much research has attempted to investigate in more detail how it is developed in early childhood. Results of this research have indicated that child temperament plays an important role. Temperament has been defined as comprising “individual differences in children’s styles of engagement with their surroundings” (Teglasi et al., 2015), which form the basis of later personality development. Although various theoretical approaches to conceptualizing temperament have been proposed, the field has

generally agreed that the individual differences related to temperament are present early in life, are biologically rooted, and are relatively stable across situations.

Early research on temperament focused on examining the stability of temperamental variables across time and establishing taxonomies of temperament dimensions, which has its roots in the work of Thomas and Chess (1977). Thomas and Chess sought to understand how children's personalities emerged and interacted with their environments. To examine this, they conducted a longitudinal study of children's behavioral styles by interviewing parents about their children's reactions to a variety of stimuli and situations. From their data, they were able to describe different behavioral dimensions that clustered into three types, which they labeled as *easy*, *difficult*, and *slow-to-warm-up* temperaments. They found that children displaying these different profiles exhibited certain patterns of responding across a variety of situations. They thus introduced the idea that children bring their own style and characteristics to their interactions with others, which impacts their development and adaptation.

The work of Thomas and Chess thus stimulated other researchers to explore the notion that inborn characteristics of children contribute significantly to later behavior. Subsequent theories of temperament have varied in the numbers of temperament dimensions proposed, the emphasis on emotion versus behavior, and the extent to which the environment influences these initial tendencies (for a review, see Calkins & Mackler, 2011). However, Rothbart and her colleagues (Rothbart, 1989; Rothbart & Derryberry, 1981; Rothbart & Bates, 2006) have articulated one of the most influential and accepted theories of early temperament over the past several

decades, which proposes that the construct of temperament can be broken down into both reactive and self-regulatory components.

In terms of the reactive dimension of temperament, Rothbart has noted that the initial reactivity of an infant is characterized by his/her physiological and behavioral reactions to sensory stimuli of different qualities and intensities. These patterns of reactivity are believed to be present and observable at birth and reflect a relatively stable characteristic (Rothbart, Derryberry, & Hershey, 2000). Early in infancy, children respond to stimuli that elicit negative affect with vocal and facial indices of negativity, which are thought to reflect generalized distress (Calkins & Mackler, 2011). This initial reactivity is rudimentary and lacks the complexity and range of later emotional responses. However, as children develop cognitively, their affective responses differentiate into specific emotions, such as fear, sadness, or anger (Bronson, 2000).

The self-regulatory dimension of temperament proposed by Rothbart has been described largely in terms of attentional and motoric control mechanisms that emerge across early development. For example, even in the first year of life, children develop the ability to shift their attention in order to control their emotional reactivity, which is a skill that continues to develop throughout the preschool and school-age years (Rothbart, 1989). Research also suggests that there are clear individual differences in the ability to utilize attention to successfully control emotions (Rothbart, 1981, 1986). Overall, Rothbart and other temperament theorists view young infants as highly reactive organisms who, ideally, become increasingly controlled by self-regulatory processes over the course of development. In other

words, theory and research suggests that individual differences either in the reactive or self-regulatory dimensions of temperament are likely to have implications for later social adjustment.

### **Measuring Temperament**

Temperament research has developed various assessment methodologies in an attempt to measure children's early behavioral traits. As Thomas and Chess (1977) initially theorized, a child's behavioral style is reflected in the similarity of his/her responses to situations commonly confronted during the course of early development and thus would be readily observable to parents. As such, a great deal of temperament research has relied heavily on parent questionnaires or interviews in which parents are asked to rate the frequency of which a child demonstrates particular behaviors. One of the most widely used and researched parent questionnaires of temperament is the Child Behavior Questionnaire (CBQ; Ahadi, Rothbart, & Ye, 1993; Rothbart, Ahadi, Hershey, & Fisher, 2001) and its corresponding short form (CBQ-SF; Putnam & Rothbart, 2006). These are regarded as comprehensive measures in the literature, as they investigate both reactive and self-regulatory dimensions of temperament.

Research conducted with the CBQ has found that, when its structure is factor analyzed, three broad factors of temperament emerge. These factors include: (1) Negative Affectivity, described as susceptibility to negative emotion; (2) Surgency/Extraversion, involving activity levels, positive emotionality, and impulsive behaviors; and (3) Effortful Control, which incorporates self-control and attentional characteristics. Research has also found that these three broad factors of

temperament can be further divided into subcomponents (see Appendix A for definitions). Although some subcomponents have been found to cross load on various factors, some general agreement has been established. For example, the Negative Affectivity factor examines one's experience of discomfort, sadness, fear, and anger/frustration, as well as soothability. The Surgency/Extraversion factor more specifically examines impulsivity, enjoyment of high intensity stimuli, activity levels, positive anticipation, smiling and laughter, and shyness. Lastly, the Effortful Control dimension is comprised of subcomponents including enjoyment of low intensity stimuli, inhibitory control, perceptual sensitivity, and attentional control (Putnam & Rothbart, 2006).

Although the creation of parent questionnaires such as the CBQ has helped to advance the study of temperament, it has also raised some questions. In recent years, findings across various psychology-related fields have consistently indicated that there is often low agreement in ratings obtained between informants that observe children in different settings (e.g., between parents and teachers; see De Los Reyes & Kazdin, 2005 for a review). Often, researchers have viewed these differences as a problem and have attempted to reconcile them by simply discarding ratings from some informants or by averaging ratings across informants, which are practices that may have obscured findings. However, rather than viewing differences in ratings as a problem to be reconciled, more recent research (e.g., Teglasi et al., 2015) has suggested that differences between independent raters provide unique insight into an individual's functioning and relate differentially to outcomes. Thus, the value of multi-informant measurement has become increasingly recognized. As a result,

researchers have also begun to utilize teacher questionnaires to investigate temperament in young children.

Though questionnaires continue to be widely used in the literature, it is important to note that they have been criticized for potential biases in responses and for low agreement across raters (e.g., Stifter, Willoughby, & Towe-Goodman, 2008). As such, some researchers have also attempted to investigate temperament using observational or laboratory methods. Some have utilized naturalistic observations either at home, in school, or in laboratory settings during which the frequency and intensity of particular behaviors characteristic of various temperament dimensions are coded. In contrast, others have utilized similar coding procedures in the context of semi-structured laboratory tasks designed to elicit various reactions. However, these methods have received criticism, as well, as observational methods can be vulnerable to distortion and are based off a constricted range of behaviors (Calkins & Mackler, 2011). Indeed, research has also found low levels of convergence between laboratory tasks and parent reports of temperament, leading many to question their ecological validity (e.g., Dhimi et al., 2004; Majandzic & Van Den Boom, 2007). However, as Lo, Vroman, and Durban (2015) point out, it is likely not fair to expect high congruence among multiple temperament assessment methods, as each has its distinct advantages and limitations. Rather, it is recommended that multi-method assessments be used, since “different methods may contribute incremental information or novel insights regarding the nature of temperamental traits and their associations with external criteria” (p. 280).

## **Temperament and Social Competence**

A large body of research has examined the relationship between temperament and social competence with studies generally dividing into those that focus on one of the three aspects of temperament proposed by Rothbart and colleagues (e.g., Putnam & Rothbart, 2006): Negative Affectivity, Surgency/Extraversion, and Effortful Control. However, the literature is difficult to interpret as studies have varied widely in their methodologies. In a vast majority of investigations, temperament and social competence have typically been measured using rating scales that were completed by parents and/or teachers. Some of these studies have relied on examining between-rater relationships (e.g., parent-rated temperament and parent-rated social competence), whereas others have investigated relationships across different raters (e.g., parent-rated temperament and teacher-rated social competence), and yet others have averaged ratings collected from different informants into single composites. To obfuscate matters more, some research has also incorporated the use of observational or laboratory measures. As discussed earlier, although each method has strengths, they also possess limitations. Ultimately, given the wide variety of measures and analyses used, an attempt is made to summarize general patterns of findings across the research body in the context of these methodological differences.

### **Negative Affectivity**

Negative Affectivity is theorized to be a component of the reactive dimension of temperament and has been defined as a child's tendency to respond to stressors with a high degree of negative emotionality, including irritability, fearfulness, sadness, and discomfort (Rothbart & Bates, 2006). Rothbart (1989) found that



individual differences in Negative Affectivity are present during infancy, but results from studies examining the relationships between Negative Affectivity and social competence have been inconsistent (see Table A for a summary of reviewed studies). For instance, some studies have found moderate negative relationships between Negative Affectivity and social competence (e.g., Eisenberg et al., 1993), whereas others found only small or insignificant relationships between the two (e.g., Mathieson & Banerjee, 2010; Rispoli et al., 2013).

As mentioned, some of these inconsistencies in findings can likely in part be attributed to different methodologies that have been used throughout the literature. Studies that have examined the relationship between Negative Affectivity and social competence by looking at correlations among ratings from the same informant (e.g., parent-rated Negative Affectivity and parent-rated social competence; teacher-rated Negative Affectivity and teacher-rated social competence) have generally found significant and moderate negative correlations between the two. For example, in Zhou, Main, and Wang's (2010) study, parent and teacher ratings were collected for both Negative Affectivity and social competence. Significant correlations between the two constructs were found both within parent ratings ( $r = -0.22$ ) and within teacher ratings ( $r = -0.30$ ). However, when studies have examined the relationships across different raters (e.g., parent-rated Negative Affectivity and teacher-rated social competence), findings have been somewhat equivocal. In some studies, a significant, but smaller, relationship remains (e.g., Sallquist et al., 2009), whereas in other studies, the correlation is reduced to insignificance (e.g., Mathieson & Banerjee, 2010). In Zhou, Main, and Wang's (2010) study, for instance, teacher-rated Negative

Affectivity was significantly correlated with parent-rated social competence ( $r = -0.13$ ), but there was not a significant correlation between parent-rated Negative Affectivity and teacher-rated social competence.

Interestingly, studies that have incorporated other measurement methods, such as observations, laboratory measures, or peer sociometric ratings have also yielded mixed findings. Generally, laboratory or observation-based measures of Negative Affectivity have been significantly correlated with parent and teacher ratings of social competence (e.g., Rispoli et al., 2013; Rothbart, Ahadi, & Hershey, 1994). However, when observational or sociometric measurement methods are used to assess social competence, the findings are mixed. For example, in Auerbach-Major's (1998) study, although only parent ratings were utilized to assess Negative Affectivity, social competence was measured in several ways, including through teacher ratings, naturalistic observations in the classroom, and sociometric ratings from peers. Parent ratings of Negative Affectivity did exhibit small but significant negative correlations with teacher-rated social competence but were not significantly associated with results from sociometric or observational measures. A study by Eisenberg et al. (1993) was similar and also collected sociometric ratings of social competence. In that study, parent-rated Negative Affectivity was significantly associated with sociometric ratings, but only for boys ( $r = -0.43$ ). In Zhou, Main, and Wang's (2010) study, meanwhile, teacher-rated Negative Affectivity was significantly associated with peer sociometric ratings ( $r = -0.15$ ), but parent ratings of Negative Affectivity were not.

The differences in findings regarding the relationship between Negative Affectivity and social competence can also likely be in part explained by research that has indicated that Negative Affectivity itself can be broken down into two separate factors: internalizing and externalizing. Whereas the internalizing aspects of Negative Affectivity include fearfulness and sadness, the externalizing aspects include anger and frustration. Not only does this dichotomy between the two emotion types make intuitive sense, it has also been supported by factor analytic research (Rothbart, Ahadi, & Hershey, 1994).

Further providing support for the need to separately consider the externalizing and internalizing aspects of Negative Affectivity, research has found that the two relate differentially to outcomes. A vast majority of studies have confirmed a significant relationship between externalizing Negative Affectivity and social competence (e.g., Auerbach-Major, 1998; Kolak et al., 2013), whereby proneness to anger and frustration is correlated with lower levels of social competence. Although this is clear, the findings on the internalizing aspects of Negative Affectivity are mixed. Many studies suggest that proneness towards sadness and fearfulness are also associated with lower social competence (e.g., Auerbach-Major, 1997; Kolak et al., 2013). However, other studies have indicated that such internalizing emotions are actually positively related to some prosocial behaviors, such as empathy, and negatively associated with antisocial behaviors, such as aggression (e.g., Rothbart, Ahadi, & Hersey, 1994).

## **Surgency/Extraversion**

Like Negative Affectivity, Surgency/Extraversion (sometimes referred to as Exuberance) is also theorized to be one of the reactive dimensions of temperament. Children who are high in Surgency tend to be more active, enjoy higher intensity activities, be more impulsive, and be less shy than their peers. Overall, they are more likely to show heightened positive affect and to exhibit approach behaviors, especially in the presence of novelty, and theory posits that such tendencies are rooted in biological systems (e.g., Gray, 1982; Depue & Collins, 1999). Indeed, research has indicated that individual differences in Surgency emerge early in infancy and continue to show considerable stability throughout the lifespan (Stifter, Putnam, & Jahromi, 2008; Fox et al., 2001).

The existence of Surgency as a temperamental construct is well-accepted, yet findings regarding its relationship with social competence have been mixed (see Table B for a summary of reviewed studies). Specifically, several studies suggest that a positive relationship exists between the two. For instance, some research has shown that displays of positive affect in infants are associated with greater sociability in childhood (e.g., Fox et al., 2001; Hane et al., 2008). Similarly, in Degnan et al.'s (2011) study, laboratory measures of Surgency obtained in infancy and toddlerhood were later positively associated with laboratory measures of social competence at five years of age. The same pattern was also found in Mathieson and Banerjee's (2010) study, which utilized parent and teacher ratings of Surgency and social competence rather than laboratory measures. In particular, Surgency was associated with lower levels of peer problems ( $r = -0.22$ ) and instances of disconnected play at school ( $r = -$

0.21), as well as with higher levels of prosocial behaviors ( $r = 0.21$ ). Some research has suggested that this positive relationship between the two continues into adolescence and even adulthood, as well (e.g., Davey, Eaker, & Walters, 2003; Graziano & Ward, 1992; Caspi et al., 2003).

Although these studies suggest that Surgency is positively associated with social competence, other research has produced contrary findings suggesting that Surgency is related to more maladaptive social-emotional outcomes. For example, some studies that used parent- and teacher-rated measurement methods have found that Surgency is negatively correlated with social competence (Sallquist et al., 2009), as well as positively correlated with aggression (Berdan, Keane, & Calkins, 2008; Rothbart, Ahadi, & Hershey, 1994; Gunnar, Seabanc, Tout, Donzella, & van Dulmen, 2003) and externalizing behavior problems (Chen, Deater-Deckard, & Bell, 2014). Studies incorporating laboratory observations and measures of Surgency have also reached similar findings, whereby Surgency was positively associated with parent-rated anger (Calkins, Fox, & Marshall, 1996), parent-rated externalizing problems (Degnan et al., 2011; Putnam & Stifter, 2005), parent-rated internalizing problems (Stifter, Putnam, & Jahromi, 2008), and the likelihood of meeting criteria for a mood or disruptive behavior disorder later in childhood (Hirshfeld-Becker et al., 2007).

As was the case with Negative Affectivity, some of these inconsistencies in findings may be related to some extent to the large variations in methodologies and measurement tools utilized across studies. Again a general pattern emerges whereby within-rater correlations are stronger than between-rater correlations. For example, in Sallquist et al.'s (2009) study, teacher-rated Surgency was significantly and

negatively correlated with teacher-rated social competence ( $r = -0.24$ ). However, there was no significant correlation between parent-rated Surgency and teacher-rated social competence. Additionally, some of these mixed findings may be related to the previously raised question of who serves as the best judge of socially competent outcomes. For instance, in Degnan et al.'s study (2011), laboratory measures of Surgency served as a positive predictor of observed social competence during laboratory tasks, yet were also associated with parent-ratings of externalizing behavior problems. Similarly, in Gunnar et al.'s investigation (2003), teacher-rated Surgency demonstrated a negative association with teacher-ratings of social competence but not with peer sociometric ratings. In other words, the findings in these studies varied depending on who was judging social competence or on the situations in which children's social competence was observed.

Another issue that may contribute to these mixed findings relates to how Surgency tends to be measured. As mentioned, a large majority of studies in the literature measure temperament through questionnaire methods, particularly the CBQ. Within the CBQ, the Surgency composite itself is comprised of several subscales, including those that reflect activity levels, impulsivity, shyness, and displays of positive emotions (Smiling/Laughter). It is thus possible that children may receive high Surgency scores for different reasons. For instance, children who display more positive emotions and who are less shy can receive high Surgency scores. In this case, positive correlations with social competence are expected, as such children may be characterized as outgoing, interested in their environments, and sociable, thereby exposing them to more opportunities to develop and practice socially competent

behaviors. In contrast, children who are more impulsive and who display high activity levels can also be rated as high in Surgency. These children are likely to be perceived as highly energetic and as constantly exploring their environments with disregard to behavioral rules. As a result, they may be more likely to get themselves into negative encounters with peers and adults, limiting their positive social experiences. For such children, a negative correlation between Surgency and social competence would be expected. In other words, different profiles of scores within the Surgency broad factor may exhibit varying relations with social competence. Consistent with this notion, Teglasi et al. (2015) examined relationships between all CBQ subscales and social competence. Within the Surgency factor, positive correlations emerged for Smiling/Laughter, whereas negative correlations were found for Shyness and Activity Level.

### **Effortful Control**

Whereas Negative Affectivity and Surgency/Extraversion are the reactive components of temperament, Effortful Control is theorized to serve a regulatory function. It has been defined as “the ability to inhibit a dominant response and/or to activate a subdominant response” (Rothbart & Bates, 2006, p. 129). It involves the abilities to willfully deploy one’s attention and to inhibit or activate a behavior, particularly when one does not want to do so but should in order to achieve a goal or to adapt to the context.

Like the reactive temperament dimensions, Effortful Control is also theorized to have biologically-based roots. However, it is generally believed that children are dependent on external sources (e.g. caregivers) to regulate their arousal early in

infancy. With development, they then become increasingly able to utilize their own regulatory strategies, such as eliciting social assistance from others or deploying self-soothing behaviors (e.g., sucking a thumb). By approximately six months of age, children are even able to reduce their own distress by voluntarily orienting their attention away from arousing stimuli (Crockenberg & Leerkes, 2004). Research further suggests that between 22 and 44 months of age, children not only continue to refine their abilities to manipulate their attention but also develop the ability to inhibit dominant behavioral responses (Posner & Rothbart, 2000; Kochanska, Murray, & Harlan, 2000). Overall, individual differences in one's capacity for Effortful Control have been found to be relatively stable throughout the life span, with abilities in this area continuing to improve during school years and even into adulthood (Eisenberg, Hofer, & Vaughan, 2007; Kochanska & Knaack, 2003).

Research investigating the links between Effortful Control and social competence has largely found a positive relationship between the two (see Table C for a summary of reviewed studies). However, methodological differences have again obscured findings regarding the magnitude of this relationship. Specifically, studies that have examined within-rater ratings of Effortful Control and social competence have typically found moderate to large correlations between the two. For instance, Zhou, Main, & Wang (2010) collected parent and teacher ratings for both Effortful Control and social competence. They found that parent ratings of Effortful Control were significantly correlated with parent-rated social competence ( $r = 0.45$ ), and teacher-rated Effortful Control was also significantly correlated with teacher-rated social competence ( $r = 0.64$ ). When studies examine across-rater relationships,



however, a smaller relationship is typically found. In Zhou, Main, & Wang's (2010) study, for example, parent-rated Effortful Control was significantly correlated with teacher-rated social competence ( $r = 0.22$ ) and vice versa ( $r = .24$ ). In some studies, these across-rater relationships reduced to insignificance, however (e.g., Eisenberg et al., 1993).

When studies have utilized alternative measures (e.g., laboratory tasks, observations, sociometric ratings) of either Effortful Control or social competence, findings have again been mixed. For instance, Raver et al. (1999) utilized laboratory tasks to measure Effortful Control in preschoolers. They found that performance on these tasks was a significant predictor of teacher ratings of social competence (Beta = 0.34) but was not significantly related to peer sociometric ratings of social competence. In a similar vein, Auerbach-Major's (1998) study found that parent ratings of Effortful Control were significantly correlated with naturalistic observations of prosocial behaviors ( $r = 0.25$ ) yet not with sociometric ratings. In contrast, Zhou, Main, & Wang (2010) did find significant correlations between parent- and teacher-rated Effortful Control and peer sociometric ratings ( $r = 0.26$  and  $0.38$ , respectively). Thus, again a situation emerges whereby findings vary depending on who is serving as the judge of socially competent behavior.

### **Interrelations amongst Temperament Dimensions**

As can be seen, each of the three components of temperament (Negative Affectivity, Surgency/Extraversion, and Effortful Control) have been found to significantly impact social competence. However, it is important to note that the nature of these relationships is further complicated by research that has indicated that

the three temperamental dimensions themselves are often interrelated. For example, consistent with the hypothesis that young children who are high in Surgency are more likely to have their goals blocked and/or to experience negative encounters with others, studies have confirmed a positive relationship between Surgency and Negative Affectivity, whereby high-Surgency children are particularly prone to experiencing frustration (e.g., Berdan, Keane, & Calkins, 2008; Rothbart, Derryberry, & Hershey, 2000). Perhaps not surprisingly, children who are high in Negative Affectivity and/or Surgency also tend to exhibit lower levels of Effortful Control (Rothbart, Derryberry, & Hershey, 2000; Sallquist et al., 2009). More specifically, Kochanska and Knaack (2003) found that proneness to both anger and joy predicted lower levels of Effortful Control, whereas proneness to fear predicted higher levels of Effortful Control.

Given these findings, many researchers have proposed that Effortful Control may mediate the relationships between the reactive dimensions of temperament and social competence. For instance, Eisenberg and Morris (2002) constructed a heuristic model that divides children into one of three styles of control: overcontrolled, undercontrolled, and optimally controlled. According to this model, overcontrolled individuals are prone to experiencing negative internalizing emotions, such as fear, anxiety, and depression, and are also high in behavioral inhibition, an important component of Effortful Control. These children are thought to be lower in social competence as they lack the ability to relax, be spontaneous, and be socially interactive in all but very familiar settings, thereby undermining their social attractiveness and peer status. In contrast, undercontrolled individuals tend to be prone to experiencing negative externalizing emotions, such as anger or frustration,

and/or may also be high in Surgency. Although they are high in general emotionality, they are low in Effortful Control, making them more likely to act aggressively and experience negative interactions with others, thus interfering with socially competent behavior. Lastly, optimally controlled children may be either low or high in emotionality but possess adequate regulatory abilities to control their emotions. They tend to be flexible, socially competent, and well adjusted. As Eisenberg et al. (2014) describe, such children are “resilient when faced with stress because they typically regulate their behavior in a goal-directed manner but can also be spontaneous and unconstrained” (p. 162).

### **Gender Differences**

Further obfuscating the nature of relationships between temperamental factors and social competence are inconsistent findings regarding gender differences. In particular, many studies investigating these constructs did not appear to examine potential gender effects at all (e.g., Rispoli et al., 2013; Strickland, 2012). Others did but concluded that there were no meaningful differences based on gender (e.g., Eisenberg et al., 1993; Sallquist et al., 2009). Generally, research has agreed that there are no significant gender differences in temperamental variables in infancy or early childhood (Blair et al., 2004). However, Degnan et al.’s study (2011) indicates that some may emerge later in life as children become increasingly socialized into their genders. For instance, in their study they examined temperament with kindergarten-aged children and found that boys were rated significantly higher in Surgency and lower in Effortful Control than girls.

Although gender differences in temperament were not generally found in reviewed studies, many did find gender differences in social competence. For example, Blair et al. (2004) found that girls were rated as being significantly higher in social competence than boys. In addition, some studies also found gender differences in regards to interaction effects. Auerbach-Major (1998), for instance, found that parent ratings of Negative Affectivity had a significantly stronger relationship with teacher ratings of social competence for girls than for boys. This lead the author to conclude that teachers may be more likely to expect and accept displays of negative emotions from boys than for girls. Overall, findings regarding the role of gender have been highly inconsistent and further research is required in this area.

### **Content Overlap**

Lastly, another methodological issue that may impact findings regarding links between temperament and social competence is that of potential content overlap. In particular, rating scales of temperament and social competence are likely to involve some identical or highly similar items, which has been criticized for artificially inflating correlations or even entirely accounting for findings. For instance, Sanson, Prior, and Kyrios (1990) conducted a study during which practicing child psychologists were asked to rate items from various temperament and behavior checklists for their ability to capture the constructs as intended. According to their expert ratings, temperament items were generally unconfounded, though items of internalizing behavior problems were more likely to be rated as better measurements of temperament. Ultimately, based on the expert consensus, potentially confounding items were removed from the scales. Although most correlations between

temperament dimensions and social competence were only minimally affected, some were significantly reduced.

Building on this work, Lengua, West, and Sandler (1998) and Lemery, Essex, and Smider (2002) conducted similar studies that utilized both expert raters and factor analyses in order to identify overlapping items. Interestingly, these two methods often identified different items as potentially confounding. Thus, both methods were utilized, and the patterns of findings were similar. Behavior items relating to internalizing problems and hyperactivity/distractibility were most likely to be judged as confounded, whereas temperament items generally were not. Ultimately, even when confounded items were removed, the pattern and magnitude of correlations between temperament and behavior problems did not change significantly.

Sheeber (1995) also addressed the issue of potential content overlap although in a less direct way through a treatment-outcome study. Specifically, parents in the experimental group participated in an intervention program focused on increasing parenting and behavior management skills. At the conclusion of the intervention, parents who had received the treatment reported fewer internalizing and externalizing problems than parents in the control group. Further, post-intervention temperament assessments did not change for either the experimental or control group. Given these findings, Rothbart & Bates (2006) argue that measurement confounding does not account for the observed relationships between temperament and social competence, behavior problems, or adjustment.

## **Emotion Understanding**

Although it has been established that temperamental factors are related to social competence, the fact that only modest relationships and effect sizes have been found between the two suggests that other factors are also likely to contribute to the development of social competence. Indeed, other research has found that factors such as parent disciplinary styles (e.g., Auberach-Major, 1998), daycare quality (e.g., Kolak et al., 2013), and attachment security (e.g., Rispoli et al., 2013) can all also impact later social competence. In the current study, however, the construct of emotion understanding is posited as an important contributor.

### **Defining Emotion Understanding**

Emotion understanding has received increased attention in recent years, but several inconsistencies as to how it is defined and conceptualized are still evident in the literature. For instance, though “emotion understanding” is the term used in the present investigation, previous studies have offered many other terms, including emotion knowledge and affective perspective taking. Definitions of these terms have similarly varied with some offering definitions that focus on specific skills, such as Cassidy, Werner, Rourke, & Zubernis’s (2003) definition of “the ability to understand another’s emotional state based on a given situation in the world” (p. 203). In contrast, other researchers offer broader definitions, such as “knowledge about feelings” (Southam-Gerow & Kendall, 2000, p. 319). These differences are common in the literature, and how emotion understanding is defined is often ultimately informed by how it is operationalized within each study.

## **Development of Emotion Understanding**

The inconsistency and lack of a clear definition in the literature may be in part due to the fact that the skills that characterize emotion understanding change with development. Indeed, several theoretical models of emotion understanding development have been proposed. For instance, Denham (1998) and Pons, Harris, & de Rosnay (2004) both propose models that incorporate increasingly complex emotion understanding skills. Early stages include basic skills such as the abilities to recognize facial expressions or to identify stereotypical emotion-eliciting situations. In contrast, later stages entail higher-order skills, including understanding moral and mixed emotions and utilizing emotion regulation strategies.

According to both models, children experience an age-related progression of skills from infancy into childhood, which has also been supported by research. Studies suggest that children first become able to label facial expressions around the age of 18 months (Bretherton, McNew, & Beeghly-Smith, 1981), although they are likely to recognize and change their behavior based off them even earlier in infancy. Generally, facial expressions of happiness are recognized first, while the ability to distinguish between negative expressions of sadness, anger, and fear develops later (Denham & Couchoud, 1990; Camras & Allison, 1985). Though recognizing and labeling facial expressions is theorized to be the most basic emotion understanding ability (Denham, 1998), it appears to be one of particular importance, as it “represents the early utilization of social cues in which children’s subsequent interpretations and behavioral responses will depend” (Pollak, Cicchetti, Hornung, & Reed, 2000, p. 680).

The next emotion understanding skill that is theorized to develop involves the ability to identify emotions likely to be elicited in various situations, which research suggests emerges during the preschool years. This ability appears to be supported by children's cognitive and theory of mind abilities, which are also increasing at this age, as these allow them to better understand the perspectives of others (Cutting & Dunn, 1999). A study by Gnepp, McKee, and Domanic (1987) supported this, finding that children as young as four years of age are able to understand that almost everyone feels the same way in unequivocal situations and that individual differences influence one's reactions to more equivocal situations. These findings suggest that preschool-aged children are able to consider how another might feel instead of basing answers on their own viewpoint. Thus, it is around this age that emotion understanding abilities become increasingly sophisticated and important. It is also during this developmental period that children become able to verbalize more coherently and fluently about the causes of their own and others' emotions (Denham, 1986; Denham & Couchoud, 1990), making the preschool age a common focus in emotion understanding investigations.

### **Measuring Emotion Understanding**

Given that the skills that contribute to emotion understanding change with development, how it is measured also tends to change depending on the age population of focus. As discussed, at the preschool ages, emotion understanding is typically theorized to involve two abilities: the identification of others' emotions from facial expressions and the identification of emotions that are likely to be elicited by common social situations. Tasks that examine the ability to identify emotions



from facial expressions are often referred to as “emotion identification” tasks, during which children are asked to label various emotions from photographs and/or line drawings. In contrast, the ability to identify emotions likely to be elicited by common social situations has been measured through tasks that have been referred to as both “affective perspective taking” (e.g. Denham et al, 2001) and “emotion situation knowledge” tasks (e.g., Fine, Izard, & Trentacosta, 2006). During these types of tasks, children are presented with short vignettes that describe various situations and are required to identify an associated emotion. Given that most of the vignettes depict stereotypical situations (e.g., a birthday party, a grandfather passing away, losing a pet, etc.), children can likely correctly answer most items by relying on their own reactions rather than truly having to infer the internal state of another. As such, the term “emotion situation knowledge” appears to be a more accurate description than “affective perspective taking” and is thus the term utilized in this paper. Importantly, both the emotion identification and the emotion situation knowledge tasks are presented in a multiple-choice format such that children are presented with several emotions to choose from when responding.

A vast majority of research investigating emotion understanding in preschoolers have utilized these measurement methods, although there have been slight variations in the number of vignettes or pictures used, content of vignettes, and scoring systems (for a review, see Verron, 2014). Regardless, results from these studies have indicated that performance on emotion identification and emotion situation knowledge tasks are highly correlated, and as a result, researchers often combined scores from the two tasks to form an overall emotion understanding

aggregate. Though this aggregate tends to demonstrate moderate to high internal consistency (Denham, 1986; Dunn & Hughes, 1998; Youngblade & Dunn, 1995), this practice has been criticized for portraying emotion understanding as a unidimensional construct and as obscuring relationships between particular emotion understanding abilities and later child outcomes. Indeed, more recent factor analytic research has confirmed that emotion identification and emotion situation knowledge are two related yet distinct facets of emotion understanding (Bassett, Denham, Mincic, & Graling, 2012). Further, findings suggest that emotion identification abilities for basic emotions are already substantially developed by preschool age. Thus, emotion situation knowledge appears to be especially important at this age, as more individual differences are present. Indeed, studies that have considered emotion identification and emotion situation knowledge performance separately have often found that performance on the emotion situation knowledge tasks is a significantly better predictor of later outcomes (e.g., Denham, McKinely, Couchoud, & Holt, 1990; Garner, 1999; Bassett et al., 2012).

## **Emotion Understanding and Social Competence**

A great deal of research has indicated that emotion understanding development is tightly intertwined with that of social competence (see Table D for a summary of reviewed studies), as children's abilities to identify and respond appropriately to emotional cues are likely to influence the success of their social interactions. As Campbell et al. (2016) note, "children's emotional knowledge is both antecedent to and concurrently developing and expanding in tandem with their social competence" (p. 20). The two constructs are thus related yet nonetheless

distinct in that, although some base level of emotion understanding abilities are likely necessary, they are not sufficient in and of themselves to ensure socially competent behavior. Rather, social competence is conceptualized as the enactment, or behavioral manifestation, of emotion understanding abilities together with other important competencies, such as self-regulation and communication skills.

Findings from studies examining relationships between emotion understanding and social competence provides support for the interwoven nature of these constructs. For instance, Schultz, Izard, Ackerman, & Youngstrom (2001) conducted a study where children completed both emotion identification and emotion situation knowledge tasks. Results revealed that performance on the emotion situation knowledge measure demonstrated moderate and significant negative correlations with teacher ratings of social problems ( $r = -0.32$ ) and social withdrawal ( $r = -0.37$ ). Similar results were also found in Schultz, Izard, and Bear (2004), where emotion understanding was significantly correlated with lower levels of teacher-reported aggression ( $r = -0.16$ ), and in Cassidy et al (2003), where emotion understanding was significantly correlated with teacher-rated social skills ( $r = 0.32$ ). Izard et al. (2001) took these findings even further by conducting a longitudinal study, and results revealed that an emotion understanding measure completed at age five was a significant predictor of later teacher ratings of cooperation (Beta = 0.46) and internalizing problems (Beta = -0.45) at age nine.

As can be seen, findings consistently indicate significant and moderate relationships between emotion understanding and teacher ratings of social competence. However, results from studies that use other measures of social

competence are somewhat mixed. For instance, in Cassidy et al. (2003), preschool participants completed an emotion situation knowledge task, and social competence was measured through three different ways: teacher ratings, sociometric ratings, and classroom observations. Results indicated that performance on the emotion situation knowledge task demonstrated significant and moderate correlations with both teacher ratings of social skills ( $r = 0.32$ ), as well as observed spontaneous prosocial behaviors ( $r = 0.27$ ). However, task performance was not significantly correlated with the sociometric ratings obtained by peers. In contrast, Denham, McKinely, Couchoud, & Holt (1990) did find that emotion situation knowledge performance was significantly correlated with peer sociometric ratings ( $r = .41$ ). These differences again bring to the forefront Rose-Krasnor's (1997) and Dirks, Treat, and Weersing's (2007) notions that social competence as judged by adults versus children are likely to be discrepant.

## **Temperament and Emotion Understanding**

Although there is a great deal of research supporting the links between emotion understanding and social competence, less is known about what factors support the development of emotion understanding. As Fine, Izard, and Trentacosta (2006) point out, most of the research that has examined predictors of emotion understanding have focused on environmental and family characteristics. For instance, parental expressiveness and parental use of emotional language have been shown to support the development of emotion understanding abilities in early childhood (Denham, Mitchell-Copeland, Strandberg, Auerbach, & Blair, 1997; Bailey, Denham, & Curby, 2013), as has the emotional responsiveness of siblings

(Sawyer, Denham, DeMulder, Blair, Auerbach-Major, & Levitas, 2002). However, there is a paucity of research examining individual child characteristics that may contribute to emotion understanding proficiency. In this study, the temperamental dimensions of Surgency, Negative Affectivity, and Effortful Control are examined as factors that play an important role.

Although theory supports hypotheses regarding links between temperament and emotion understanding, very little research has directly investigated these relationships. In addition, the studies that have been done are ridden with inconsistent findings and are thus difficult to interpret, perhaps again related to varying methodological and analytical practices. In this paper, an attempt is thus made to summarize the general patterns of findings across the limited research body in the context of these methodological differences. To further build the theoretical base for links between temperament and emotion understanding, in some instances other relevant research that has investigated similar constructs is also reviewed, such as studies that have established links between psychopathology and deficits in emotion understanding.

### **Surgency and Emotion Understanding**

According to Izard's (1991) differential emotions theory, the experiences of different discrete emotions tend to motivate particular perceptions, thoughts, and behaviors. For example, the experience of positive emotions such as happiness tends to motivate approach and prosocial behaviors, whereas experiencing negative emotions may inhibit empathic or prosocial responding. Over time, a person's tendency to experience these emotions can theoretically impact his/her schema

development (Lohr, Teglassi, & French, 2004) and processing of information, leading to “stable affective-cognitive patterns” (Schultz, Izard, & Bear, 2004). Indeed, research has confirmed that the experience of positive feelings facilitates the speed of information processing (Carlson, Felleman, & Masters, 1983), as well as the ability to make associations between stimuli (Isen, 1999). As Fredrickson (2001) reviews, people experiencing positive affect have been shown to be more open to information and to show more flexible, integrative, and efficient thinking. According to her Broaden-and-Build theory, the experience of positive emotions broadens thought, which further stimulates building of personal and social resources. In this way, it is theorized that children who generally experience happy moods may tend to process emotion information more quickly and may make associations between facial expressions, behaviors, and situations more readily. In other words, a general tendency towards happiness is likely to foster emotion understanding development.

Given that positive emotionality is considered an aspect of the temperamental dimension of Surgency, it further stands to reason that some Surgency traits are related to emotion understanding development. Unfortunately, however, little direct research has investigated this claim, and the studies that have been done yield mixed findings, which may be related to methodological differences. For instance, Schultz and colleagues (2004) measured the tendency for first- and second-grade children to display happiness through both teacher ratings and peer nominations, which were aggregated into a single “happiness” composite. To measure emotion understanding, the students also completed emotion identification and emotion situation knowledge tasks, which were again aggregated into a single composite. Results revealed that

happiness was indeed significantly correlated with performance on the emotion understanding tasks ( $r = 0.19$ ). In contrast, in Laible's (2004) study, parent ratings of preschool children's Surgency on the CBQ were not significantly correlated with children's performance on an emotion situation knowledge task. As was the case when examining relationships between Surgency and social competence, it is possible that different profiles of Surgency sub-factors relate differentially to emotion understanding development. In particular, it is expected that those examining positive emotionality (e.g., Smiling/Laughter on the CBQ) would be a positive predictor of emotion understanding abilities.

### **Negative Affectivity and Emotion Understanding**

Similar to the way that positive emotionality may support emotion understanding, Izard and colleagues (e.g., Izard, 1991; Fine, Izard, & Trentacosta, 2006) also posit that the frequent experience of negative emotions can disrupt emotion understanding. For example, Fredrickson (2001) reviewed studies that showed that negative emotions tend to "narrow people's attention, making them miss the forest for the trees" (p. 221). Additionally, people may be likely to "systematically misattribute emotion states to others, especially negative ones, based on the degree to which people have either experienced different emotion states themselves" (Schultz, Izard, & Bear, 2004, p. 372). Some support for this claim has been found, with research studies showing that children from home environments that place them at risk for experiencing greater levels of anger (e.g., physically abusive or depressed caregivers, unstable family environment) display biases towards perceiving anger in others' facial expressions and behaviors (Schultz et al., 2001; Pollak et al.,

2000). Children high in Negative Affectivity thus also may be likely to display similar misattribution biases. Indeed, in Schultz, Izard, and Bear's (2004) study, children who were rated by their teachers and identified by their peers as displaying more anger were found to be more likely to exhibit anger attribution biases when presented with vignettes describing ambiguous social situations. Similarly, fear-prone children showed greater fear attribution bias.

Beyond these misattribution tendencies, children high in Negative Affectivity may also have their emotion understanding disrupted at a more basic level. For instance, those who are likely to experience intense negative emotional reactions to low-level stimuli may become so overwhelmed by their own emotional responses that they are not able to attend to how emotions are expressed in others or to emotionally-relevant aspects of the situation. This is a hypothesis that gained support in Fine, Izard, and Trentacosta's (2006) research. They conducted a longitudinal study where children's negative emotional intensity was assessed through parent ratings at preschool age. They then administered emotion situation knowledge tasks to the children every other year up until fifth grade. Overall, they found that children's negative emotional intensity was not a significant predictor of their initial emotion understanding in first grade. However, it was a significant predictor of their growth in emotion understanding over time ( $\text{Beta} = -0.26$ ). In other words, children who were rated as being higher in negative emotional intensity demonstrated slower emotion understanding development over their elementary years. This led the researchers to conclude that "intense negative reactions may prevent children from learning from emotion-eliciting situations ... because they may be overwhelmed by



their own emotional responses” (p. 747). A similar finding was also found in a study conducted by Leerkes et al. (2008) where children who were rated by their parents as being higher in emotional lability/negativity tended to perform worse on an emotion situation knowledge task ( $r = -0.17$ ). Thus, the limited research available does overall suggest a negative relationship between Negative Affectivity and emotion understanding.

### **Effortful Control and Emotion Understanding**

Effortful Control is perhaps the temperament variable most studied in relation to emotion understanding, and studies largely support the existence of a positive correlation between the two. For instance, Schultz et al. (2001) investigated two constructs captured under the umbrella of Effortful Control: attentional persistence and behavioral control. They hypothesized that children who possessed limited abilities to sustain attention would experience a slower acquisition of emotion knowledge than other children, as they would be likely to fail to perceive emotion expressions or other important components of situations. In contrast, behavioral control, which was defined as the ability to plan and sustain purposeful actions, was thought to change the nature of a child’s interactions with family members in a manner that would be less conducive to acquiring emotion knowledge. In particular, children low in behavioral control would be more likely to provoke anger from caregivers, resulting in limited opportunities to acquire emotion knowledge. To investigate these hypotheses, they collected parent ratings of attentional persistence and behavioral control when children were preschool-aged and then administered emotion identification and emotion situation knowledge tasks to the children when

they were in first grade. Results revealed that attentional persistence was a significant predictor of performance on the emotion situation knowledge task ( $\text{Beta} = 0.23$ ), as was behavioral control ( $\text{Beta} = 0.23$ ). In other words, strong abilities to focus, sustain attention, and control behavior were correlated with better performance on emotion understanding tasks.

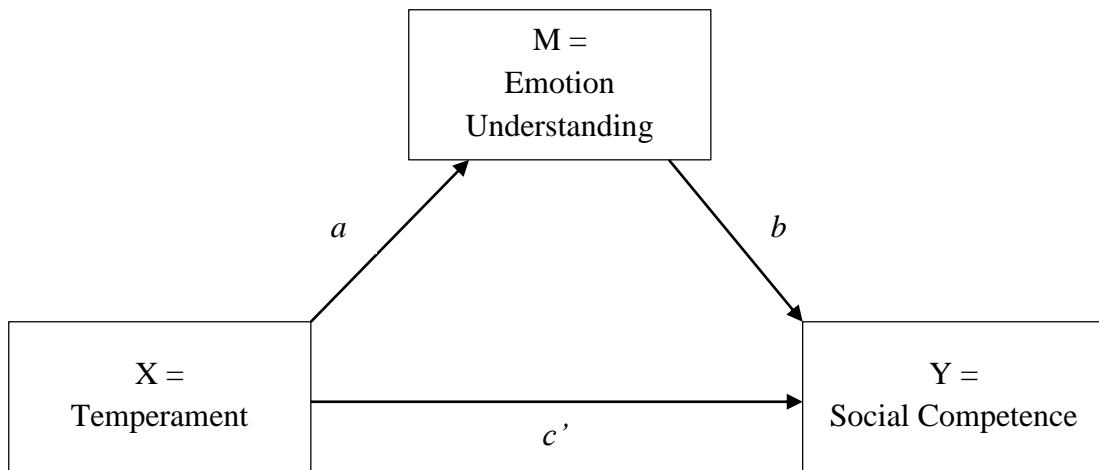
Similar results were also obtained in other studies. For instance, in Fine, Izard, & Trentacosta's (2006) study, children who were rated by their parents as higher in behavioral control in preschool later performed better on emotion situation knowledge tasks in first grade ( $\text{Beta} = 0.34$ ). Similarly, in Leerkes et al.'s (2008) study, preschool-aged children were rated by their parents in terms of their ability to regulate their emotions, which subsequently correlated with children's performance on both emotion identification ( $r = 0.25$ ) and emotion situation knowledge ( $r = 0.21$ ) tasks. Interestingly, in Labile's (2004) study, although she initially set out to examine links between temperament and mother-child discourse, findings also revealed a link between Effortful Control and performance on an emotion situation knowledge task ( $r = 0.43$ ).

### **Studies with Clinical Samples**

Given the paucity of research that has directly examined links between temperament and emotion understanding, it is helpful to consider studies conducted with clinical samples, such as children with Attention-Deficit/Hyperactivity Disorder (ADHD) or mood disorder (e.g., anxiety, depression). Such psychopathologies have been characterized by extreme maladaptive temperament traits (Nigg, 2006; White, 1999). For instance, research has suggested that children with ADHD often are rated

as exhibiting higher levels of Surgency and Negative Affectivity, as well as lower levels of Effortful Control (Martel, 2016; Martel, Gremillion & Roberts, 2012; Graziano & Garcia, 2016; Barkely & Fischer, 2010; Nigg, 2006). In turn, children with ADHD have been found to perform significantly worse on emotion understanding tasks than control samples. For instance, a recent meta-analysis by Graziano and Garcia (2016) examined 77 research studies ( $n = 32,044$ ) and determined that youth diagnosed with ADHD demonstrated moderate impairments in emotion understanding when compared to community samples ( $d = 0.64$ ), even after controlling for conduct problems and difficulties with emotion regulation, leading the authors to conclude that children with ADHD experience basic difficulties in “encoding and processing emotional information” (p. 9).

Although fewer studies have been conducted with children diagnosed with mood disorders, research that is available suggests that they also tend to exhibit higher levels of Negative Affectivity and lower levels of Effortful Control (Nigg, 2006; Snyder et al., 2015). Further, such children have similarly been documented to exhibit deficits in their emotion understanding abilities (Casey, 1996; Bernstein, 2009). Thus, there is evidence from both direct and indirect research studies that support potential links between temperamental factors and emotion understanding development.



*Figure 1: Proposed Mediation Model*

## Current Study

The current study aims to examine relationships between temperament, emotion understanding, and social competence in concert. In particular, it hypothesizes that emotion understanding will mediate the relationships between temperament and social competence, as depicted in Figure 1. Additionally, several previous studies have been conducted using the dataset, and findings from these studies are reviewed when relevant.

### **Temperament and Social Competence: Teglasi et al. (2015) Study**

As reviewed, a great deal of previous research has supported links between temperamental factors and social competence, though results from many of these studies have been inconsistent or difficult to interpret due to varying methodological approaches. In a vast majority of these investigations, temperament has been measured by relying solely on parent ratings. However, as has been demonstrated,

parent and teacher ratings of temperament often demonstrate low agreement (e.g., Kagan, Snidman, McManis, Woodward, & Hardway, 2002), thus leading the field to increasingly value the use of multi-informant temperament measures.

Another issue prevalent in previous research on links between temperament and social competence is that studies often have relied on constricted measurements of temperamental constructs. For instance, within the CBQ, the broad factor of Negative Affectivity actually consists of five subfactors, including Anger/Frustration, Discomfort, Fear, Sadness, and Soothability. Instead of considering all these areas, however, some studies investigating Negative Affectivity have done so by only utilizing scores on the Anger/Frustration subfactor (e.g., Zhou, Main, & Wang, 2010). Similarly, studies investigating Effortful Control have often exclusively utilized one or two of the four subfactors (typically Attentional Focusing and/or Inhibitory Control; e.g., Fine, Izard, & Trentacosta, 2006). In several instances, results from these two subscales were aggregated into an Effortful Control composite (e.g., Gunnar et al., 2003; Rudasill & Konold, 2008), failing to distinguish between them and ignoring other Effortful Control subfactors: Perceptual Sensitivity and Low Intensity Pleasure. On the opposite end of the spectrum, however, a vast majority of studies have only conducted analyses using broad factor scores from the CBQ (e.g., Blair et al., 2004; Chen, Deater-Deckard, & Bell, 2014; Mathieson & Banerjee, 2010; Degnan et al., 2011), bypassing the examination of subfactors altogether. These practices of utilizing only specific subfactors, aggregating limited subfactors into a composite, or relying only on broad factor scores thus have likely limited and

obscured the findings regarding links between temperamental constructs and social competence.

In order to address these issues of limited informants and constricted temperament measurements, Teglasi et al. (2015) conducted a study using the same preschool dataset, as well as data from a set of kindergarten students, which examined correlations between both parent and teacher ratings of temperament and teacher-rated social competence. In addition, these relationships were examined across all subfactors of the CBQ for both parent and teacher informants. Results are summarized in Table 1. As expected, more links between temperament subfactors and social competence were found when examining within-informant correlations (teacher-rated temperament to teacher-rated social competence) than between-informant correlations (parent-rated temperament to teacher-rated social competence). Specifically, within-informant correlations were significant for all Effortful Control and Negative Affectivity subfactors, as well as two Surgency subfactors (Shyness and Smiling/Laughter). In contrast, between-informant correlations were only significant for one Surgency subfactor: Shyness. Overall, results were consistent with previous research and confirmed that Effortful Control is positively related with social competence, whereas both internalizing and externalizing aspects of Negative Affectivity exhibit a negative relationship with social competence. Within Surgency, on the other hand, positive emotionality and lower levels of shyness were positively related to social competence, though a negative correlation between Activity Level/Impulsivity and social competence was not supported.

Table 1: *Correlations between Parent and Teacher Ratings of Temperament and Teacher-Rated Social Competence from Teglasi et al. (2015)*

CBQ Scales	Temperament Rater	
	Parent	Teacher
Effortful Control		
Attentional Focusing	.11	.48**
Inhibitory Control	.21	.45**
Low-Intensity Pleasure	.02	.31**
Perceptual Sensitivity	.06	.31**
Negative Affectivity		
Anger/Frustration	-.04	-.39**
Discomfort	.07	-.24*
Fear	-.08	-.37*
Sadness	.10	-.25*
Soothability	.06	.43**
Surgency		
Activity Level	-.01	.01
Approach/Positive	.09	.11
High-Intensity Pleasure	.13	.11
Impulsivity	.16	.08
Shyness	-.24**	-.36***
Smiling Laughter	.12	.46**

\* $p < .05$ , \*\* $p < .01$ , \*\*\* $p < .001$

## Emotion Understanding and Social Competence: Verron (2014)

### Study

Positive links between performance on emotion understanding tasks and social competence have been well-established in the literature (e.g., Bassett et al., 2012; Izard et al., 2001). In particular, previous studies with preschool samples have suggested that emotion identification skills are often mastered by that age and that performance on such tasks is not significantly correlated with measures of social competence. In contrast, more individual differences appear to be present on emotion situation knowledge tasks, and performance on these types of tasks has been shown to

be a significant predictor of social competence (e.g., Denham et al., 1990; Schultz et al., 2001).

In a previous study conducted by the author (Verron, 2014), the same dataset was utilized to examine relationships between emotion understanding (as measured by both emotion identification and emotion situation knowledge tasks) and teacher-rated social competence (see Table 2 for a summary of pertinent results). Consistent with previous studies, performance on the emotion identification task was not significantly correlated with social competence, though scores from the emotion situation knowledge task were. The study also examined a new method of assessing emotion understanding whereby children were asked to explain the reasoning behind their answers on some emotion situation knowledge items that were judged to be ambiguous. Their open-ended responses were then recorded and coded for their quality of reasoning. These coded scores were referred to as “emotion situation reasoning” scores, which were also significantly correlated with social competence. Also in line with previous research, results found that both emotion situation knowledge and emotion situation reasoning scores were significantly correlated with age and verbal ability. As such, partial correlations were utilized to examine how these scores correlated with social competence when the effects of age and verbal ability were controlled. Results revealed that the emotion situations reasoning scores continued to be significantly correlated with social competence ( $r(73) = .43, p < .001$ ), whereas the emotion situation knowledge scores did not ( $r(73) = .16, p = .18$ ).



Table 2: *Correlations among Emotion Understanding, Verbal Ability, and Age from Verron (2014)*

	1.	2.	3.	4.	5.
1. ECT: Emotion Identification	---				
2. ECT: Situations	.39***	---			
3. ECT: Situations Reasoning	.27**	.66***	---		
4. WPPSI-III Scaled Score	.14	.34***	.35**	---	
5. SCBE Social Competence T-Score	.07	.23*	.40***	.15	---
6. Age	.31**	.35***	.34**	.21*	-.05

\* $p < .05$ , \*\* $p < .01$ , \*\*\* $p < .001$

### **Hypotheses #1-4: Temperament and Emotion Understanding**

As reviewed, although links between emotion understanding and social competence are well documented in the literature, minimal research has been done investigating potential links between temperament and emotion understanding. Additionally, the little research that has been done almost exclusively has relied on parent ratings of temperament. The current study thus adds to the research base by studying these relationships utilizing both parent and teacher assessments of temperamental factors. Given that the measures of emotion understanding used in the current study are performance based, this is a particularly worthwhile area to explore, as any relationships found are not attributable to shared-method variance. No specific hypotheses are thus offered regarding differences in findings when examining parent versus teacher ratings of temperament.

As previously mentioned, the ability to identify basic emotions (happy, sad, mad, scared) based on facial expressions are likely to be well-developed by

preschool, and minimal individual differences are thus likely to be present on measures that tap this skill (e.g., Denham et al., 1990; Schultz et al., 2001). As such, it is expected that there will not be any significant correlations between temperamental factors and performance on the emotion identification task (Hypothesis #1). Rather, it is predicted that most findings will emerge when examining performance on an emotion situation knowledge task. In particular, as reviewed above, previous research with preschool samples has supported the existence of positive relationships between Effortful Control (particularly abilities to sustain attention and control behavior) and emotion understanding (e.g., Fine, Izard, & Trentacosta, 2006; Labile, 2004; Leerkes et al., 2008; Schultz et al., 2001). As such, it is hypothesized that the Attentional Focusing and Inhibitory Control subfactors from the CBQ will be positively correlated with emotion situation knowledge and emotion situation reasoning scores (Hypothesis #2). In addition, theory suggests that positive emotions may support emotion understanding development, whereas frequent experience of negative emotions may disrupt such development (e.g., Frederickson, 2001; Isen, 1999; Izard, 1999). However, to the author's knowledge, only two studies have directly examined these potential links (Schultz, Izard, & Bear, 2004; Labile, 2004), which yielded mixed findings. Overall, it is predicted that the Smiling/Laughter subfactor of Surgency will be positively correlated with emotion situation knowledge and emotion situation reasoning (Hypothesis #3) and that both externalizing (e.g., anger/frustration) and internalizing (e.g., sadness) aspects of Negative Affectivity will be negatively correlated with these scores (Hypothesis #4). Relationships between other temperamental subfactors not

already specified (e.g., Activity Level, Perceptual Sensitivity, etc.) and emotion understanding will also be examined, though no particular hypotheses are offered.

### **Hypothesis #5: Emotion Understanding as Mediator**

Perhaps the most unique aspect about the current study is that it examines relationships between temperament, emotion understanding, and social competence simultaneously. Given that theory and previous research supports links between these three constructs separately (i.e., between temperament and social competence, between temperament and emotion understanding, and between emotion understanding and social competence), it is hypothesized that emotion understanding will mediate the links between temperament and social competence. In psychological research, a mediating variable is conceptualized as one “that transmits the effect of one variable to another variable,” thereby explaining why or how one variable impacts another (MacKinnon, Fairchild, & Fritz, 2007, p. 594). In this way, it is hypothesized that temperamental factors will exert their influence on social competence partly through emotion understanding. In other words, it is posited that aspects of children’s biologically-based temperamental characteristics will impact the development of their emotion understanding skills, which will in turn influence their demonstration of social competence. Given that other variables may also mediate the relationship between temperament and social competence, such as parenting styles, it is expected that emotion understanding will partially rather than completely mediate the relationship (Hypothesis #5). In other words, it is expected that temperamental factors will continue to exert a significant direct effect on social competence, as well as an indirect effect through their influence on emotion understanding.

## Chapter 3: Methods

### **Participants**

Participants included 142 children (47.5% male), ranging in age from 38 months to 82 months ( $M = 57.38$  months,  $SD = 10.71$  months). All participants attended the Center for Young Children (CYC) at the University of Maryland, College Park, which offers early education programs for children at the preschool and kindergarten levels. The children were largely from middle class families that were affiliated with the university in some capacity. The only basis for selection was whether parental permission was received for the child. Overall, 46% of the sample were European American, 12% African American, 12.5% Asian, 12.5% Other, and 17% were Unknown. Participants also included the student's parents ( $n = 106$ , primarily mothers, some of which had multiple children involved in the study) and their classroom teachers ( $n = 14$ ). All classroom teachers were female, looked of European descent, and held Bachelors degrees; however, no age or ethnicity data were available.

### **Procedures**

In accord with the approved IRB protocol, informed consent forms were disseminated to the parents of all children that attended the CYC, along with informational cover letters describing the study. Signed permission forms from either parents or guardians constituted informed consent on behalf of the child. Each child

was also given the opportunity to decline participating each time they were approached to complete study tasks by a member of the research team.

Once parental consent forms were received, a graduate student researcher met individually with each child to administer measures of emotion understanding and verbal ability. Tasks were administered during the school day and in a quiet, distraction-free room utilized exclusively for research purposes. Each researcher was trained on administering the measures to assure that standard procedures were kept. If the child appeared fatigued or requested to return to class at any point, data collection was stopped and continued in a subsequent session. Additionally, temperament rating scales were provided to each child's parent/guardian and classroom teacher to complete, and classroom teachers were asked to complete a measure of social competence, as well.

## **Measures**

### **Temperament**

In order to assess temperament, parents completed the CBQ-SF (Putnam & Rothbart, 2006), and teachers completed the corresponding teacher version (CBQ-TSF; Teglasi et al., 2015). Both the CBQ-SF and the CBQ-TSF were designed to measure individual differences in the reactive and self-regulatory aspects of temperament. They both include 94 items that are rated on a Likert scale from 1 (*extremely untrue of this child*) to 7 (*extremely true of this child*). Each rater also had the opportunity to indicate whether particular items did not apply (N/A). Both scales

include items that cluster in 3 broad factors and 15 subscales: Negative Affectivity (Anger/Frustration, Discomfort, Fear, Sadness, Soothability); Surgency (Activity Level, Approach/Positive Anticipation, High-Intensity Pleasure, Impulsivity, Shyness, Smiling/Laughter); and Effortful Control (Attentional Focusing, Inhibitory Control, Low-Intensity Pleasure, Perceptual Sensitivity). Composite scores were then calculated by averaging across items completed for each individual. If two or more items within a subscale were skipped or rated as “N/A,” related subscale composite scores were not calculated for that child. Such instances occurred for fewer than 5% of ratings, although occurred to a higher extent on parent ratings of fear (23%) and sadness (19%), as well as teacher ratings of fear (71%), sadness (30%), and perceptual sensitivity (22%).

In line with previous research using the CBQ-SF, data from the current sample yield internal consistency values for the 15 subfactors ranging between .61 and .86. In particular, nine of the subfactors demonstrate adequate internal consistency (defined as alpha values of .70), whereas six of them fall below .70 though above .60, which DeVellis (1991) suggests is undesirable but still acceptable. Results from the CBQ-TSF are similar, yielding internal consistency values ranging between .67 and .89. Thirteen of the scales fell above the .70 cut-off, and two fell slightly below.

### **Emotion Understanding**

Emotion understanding was assessed using the Emotion Comprehension Test (ECT), which was designed to capture the strengths of two of the most commonly used emotion understanding measures in the literature: the Assessment of Children’s

Emotional Skills (ACES; Schultz & Izard, 1998) and the Affect Knowledge Test (AKT; Denham, 1986). In particular, the ECT contains both emotion identification and emotion situation knowledge tasks. It utilizes life-like pictures of children's facial expressions, vignettes worded to be appropriate for preschool populations, and the use of puppets to aid in enacting vignettes.

***Emotion identification (EID).*** During the emotion identification task of the ECT, children were shown pictures of 21 faces. Pictures were presented one at a time, and children had to verbally indicate the correct emotion label out of five options (happy, sad, mad, scared, and neutral). As in many previous investigations assessing emotion understanding (e.g., Bassett et al., 2012; Denham, 1986; Denham et al., 1990; Fine, Izard, & Trentacosta, 2006; Leerkes et al., 2008), children's responses to these tasks were scored based on whether they chose the correct emotion and/or valence. Specifically, a three-point scale was used such that children were awarded three points for identifying the correction emotion, two points for identifying an incorrect emotion that was of the correct valence (positive or negative), and one point for providing an incorrect emotion of the incorrect valence. This EID task demonstrates adequate internal consistency ( $\alpha = .70$ ) and correlates as expected with related constructs (e.g., age; see Table 7).

***Emotion situation knowledge (ESK).*** During the ECT's emotion situation knowledge task, 15 vignettes were enacted with the aid of puppets by the examiner. After each vignette, children were asked to choose the emotion that best described how a character would feel out of the same five emotion options (happy, sad, mad, scared, or no feeling). As with the EID task, a three-point scale was used to scores

responses. The use of this task has demonstrated adequate internal consistency ( $\alpha = .80$ ) with this sample and correlates as expected with related constructs, including age, verbal ability, and social competence (see Table 7).

***Emotion situation reasoning (ESR).*** After the entirety of the emotion situation knowledge task was administered, the examiner returned to four of the vignettes that had a priori been judged to be more equivocal and likely to elicit differing answers. When returning to these items, the examiner re-read the vignette to the child and reminded them of the emotion response they had previously chosen. They then asked “Why do you think (insert character) felt (insert emotion selected)? Tell me more about about (insert character) feeling (insert emotion).” All responses to these open-ended follow-up questions were recorded verbatim and scored using a coding scheme that focused on the quality of reasoning provided. Scores were assigned on a five-point scale as follows: (a) 0 = no response (e.g. the child said “I don’t know”); (b) 1 = response is widely unrelated to the situation or self-contradictory; (c) 2 = response shows a slight misunderstanding of the presented situation but is congruent with the emotion chosen; (d) 3 = response is congruent with both the situation and the emotion chosen but has an imprecise explanation (e.g. the child said Green would feel sad because “Green would cry”); and (e) 4 = response is congruent with both the situation and the emotion chosen and is also well-explained (e.g., the child said Green would feel sad because “he did not get to go to the fair and he wanted to go to”). This coding system, developed by the authors, demonstrated adequate inter-rater agreement (Spearman’s Rho ranging from .73 to .92) and internal



consistency ( $\alpha = .77$ ). Further, the coded scores again correlated as expected with related constructs (e.g., verbal ability, age, social competence) as shown in Table 7.

### **Social Competence**

The Social Competence and Behavior Evaluation, Preschool Edition, Short Form (SCBE; LaFreniere & Dumas, 1996) was used to measure level of social competence and was completed by the classroom teacher for each child. The SCBE was designed to assess social competence, problem behaviors, and adjustment of children between 2.5 to 6 years of age. The SCBE is comprised of 80 total items, which yield four summary scales: Social Competence, Externalizing Problems, Internalizing Problems, and General Adjustment. Only the Social Competence composite was utilized in this study, which was comprised of ten items. These ten items were examined for potential content overlap with emotion understanding. Only one item (“Comforts or assists another child in distress”) was judged to be tangentially related, whereas the remaining nine items were considered to be distinct from emotion understanding abilities. Examples include those that tap specific behaviors (e.g., *helps with everyday tasks, shares toys*) and those that involve summary judgments (e.g., *works easily in groups, cooperates with others*). Each item is scored on a six-point scale (1 = *Almost never occurs* to 6 = *Almost always occurs*). Normative data were obtained on over 1,200 children, and the scale has been successfully used and validated in numerous studies (e.g. LaFreniere & Dumas, 1996; LaFreniere et al., 2002). The Social Competence subscale specifically measures levels of social integration, autonomy, and cooperation, and internal consistency values for the subscale range from .86-.90 (LaFreniere & Dumas, 1996).

## **Verbal Ability**

Previous research has demonstrated that verbal ability exhibits consistent links with both emotion understanding and social competence (e.g. Cassidy et al., 2003; Cutting & Dunn, 1999; Denham, Zoller, & Couchoud, 1994; Izard et al., 2001; Schultz et al., 2001). As such, in order to be able to control for the impact of verbal ability, each child was administered either the Receptive Vocabulary or Vocabulary subtest from the Wechsler Preschool and Primary Scale of Intelligence, Third Edition (WPPSI-III), depending on the child's age. Those under the age of four years completed the Receptive Vocabulary subtest, whereas those that were four years or older completed the Vocabulary subtest. The Receptive Vocabulary subtest requires children to point to pictures that best represent a word that is orally presented by the researcher, and the Vocabulary subtest requires children to define orally presented words of increasing difficulty. Both subtests have been shown to be reliable ( $r = .88$  and  $.89$ , respectively) and highly correlated with Verbal IQ as measured by the WPPSI-III ( $r = .92$  and  $.89$ , respectively) (Sattler, 2008).

## Chapter 4: Results

### **Preliminary & Descriptive Analyses**

Tables 3 presents the descriptive statistics for all temperament variables included in the study, and Table 4 does the same for all emotion understanding, verbal ability, and social competence measures. In order to explore potential confounds, independent sample t-tests were also run to examine any potential gender differences among all measures. As can be seen in Table 5, results did reveal some significant gender differences in temperamental factors, particularly when rated by teachers. Teachers rated boys as being significantly lower in all Effortful Control variables than girls and as higher in some Surgency variables (including activity level, high-intensity pleasure, and impulsivity). Only one significant gender difference was found on parent ratings of temperament, whereby boys were rated as having higher activity levels than girls. In contrast, no significant gender differences were found on any of the emotion understanding, verbal ability, or social competence measures (see Table 6).

Given that children were clustered within teachers, the effect of nested temperament ratings within teachers was examined. Two-way intraclass correlations (ICCs) were calculated with fixed effects for teachers and random effects for scores. All 15 ICCs were small and insignificant.

Table 3: *Descriptive Statistics for Temperament Variables*

CBQ Scales	Temperament Rater	
	Parent	Teacher
Effortful Control	21.47 (2.14)	19.80 (2.76)
Attentional Focusing	5.21 (.98)	5.10 (1.04)
Inhibitory Control	4.90 (.84)	4.80 (1.12)
Low-Intensity Pleasure	5.90 (.65)	4.93 (.82)
Perceptual Sensitivity	5.55 (.90)	5.01 (.84)
Negative Affectivity	21.50 (3.16)	18.60 (3.24)
Anger/Frustration	4.25 (1.17)	3.30 (1.39)
Discomfort	3.97 (1.36)	3.71 (1.19)
Fear	4.14 (1.24)	3.79 (1.07)
Sadness	4.29 (.93)	3.93 (.97)
Soothability	4.93 (1.05)	4.57 (1.13)
Surgency	28.59 (2.85)	26.38 (4.30)
Activity Level	4.78 (.84)	4.19 (1.39)
Approach/Positive	5.15 (.84)	4.54 (.97)
High-Intensity Pleasure	4.83 (1.05)	4.30 (1.40)
Impulsivity	3.97 (1.07)	4.00 (1.22)
Shyness	3.64 (1.34)	3.68 (1.31)
Smiling Laughter	5.98 (.64)	5.44 (1.07)

*Note:* Scores reported are means with standard deviations in parentheses.

Table 4: *Descriptive Statistics for Emotion Understanding, Verbal Ability, and Social Competence Variables*

	Mean	SD	Possible Range
Emotion Understanding:			
ECT: Emotion Identification (EID)	53.56	5.78	21 - 63
ECT: Situations (ESK)	35.12	5.89	15 - 45
ECT: Situations Reasoning (ESR)	11.05	4.68	0 - 16
Verbal Ability:			
WPPSI-III Scaled Score	12.19	2.99	1 - 19
Social Competence:			
SCBE Social Competence T-Score	49.62	8.09	0 – 100

Table 5: Examination of Gender Differences in Temperament Variables

CBQ Scales	Temperament Rater	
	Parent	Teacher
Effortful Control	-.69	-2.71**
Attentional Focusing	.89	-2.02*
Inhibitory Control	-.16	-2.36*
Low-Intensity Pleasure	-.89	-4.22***
Perceptual Sensitivity	-1.04	-2.85**
Negative Affectivity	-.07	-.16
Anger/Frustration	-.02	1.24
Discomfort	-1.80	-1.26
Fear	.39	-.59
Sadness	-.63	-1.11
Soothability	-.51	-1.51
Surgency	.87	2.19*
Activity Level	2.16*	3.93***
Approach/Positive	-.86	.75
High-Intensity Pleasure	1.51	3.91***
Impulsivity	1.51	1.98*
Shyness	-.33	.15
Smiling Laughter	-.80	-1.46

Note: Values reported are *t*-scores from independent samples *t*-tests

\* $p < .05$ , \*\* $p < .01$ , \*\*\* $p < .001$

Table 6: Examination of Gender Differences for Emotion Understanding, Verbal Ability, and Social Competence Variables

	Gender		<i>t</i>
	Male	Female	
Emotion Understanding:			
ECT: Emotion Identification (EID)	54.07 (5.66)	53.12 (5.92)	.82
ECT: Situations (ESK)	35.21 (6.02)	35.22 (5.77)	-.01
ECT: Situations Reasoning (ESR)	11.02 (4.07)	11.22 (4.96)	-.21
Verbal Ability:			
WPPSI-III Scaled Score	11.64 (3.26)	12.55 (2.70)	-1.47
Social Competence:			
SCBE Social Competence T-Score	49.60 (8.39)	49.65 (7.85)	-.04

Note: Scores reported are means with standard deviations in parentheses.

## **Correlations between Temperament and Emotion Understanding:**

### **Hypotheses #1-4**

#### **Parent-Rated Temperament**

Relationships between parent ratings of temperament and performance on emotion understanding measures were first analyzed. In particular, bivariate correlations were calculated between all CBQ scales and performance on the emotion identification measure (EID). In addition, given that Verron (2014) found that verbal ability is significantly correlated with performance on emotion situation knowledge (ESK) and emotion situations reasoning (ESR) tasks, partial correlations were calculated between CBQ scales and performance on these tasks in order to control for verbal ability. Results from these analyses are depicted in Table 7. As expected, there were no significant correlations between parent ratings of temperament and performance on the EID task. However, significant positive correlations did emerge between performance on the ESK task and parent ratings of attentional focusing and smiling/laughter, as well as overall Effortful Control. The ESR scores were also positively correlated with smiling/laughter and negatively correlated with fear.

Table 7: *Correlations between Parent-Rated Temperament and Emotion Understanding*

<b>CBQ Scales</b>	<b>EID</b>	<b>ESK</b>	<b>ESR</b>
Effortful Control	.047	.279*	.216
Attentional Focusing ( <i>n</i> =81)	.172	.237*	.204
Inhibitory Control ( <i>n</i> =79)	-.022	.154	.120
Low-Intensity Pleasure ( <i>n</i> =79)	-.057	.161	.162
Perceptual Sensitivity ( <i>n</i> =77)	.015	.018	-.131
Negative Affectivity	.216	-.180	-.178
Anger/Frustration ( <i>n</i> =80)	-.012	-.118	-.103
Discomfort ( <i>n</i> =80)	.071	.024	-.001
Fear ( <i>n</i> =61)	.035	-.226	-.324*
Sadness ( <i>n</i> =75)	.212	.047	.050
Soothability ( <i>n</i> =82)	-.196	-.094	-.044
Surgency	.066	.135	.049
Activity Level ( <i>n</i> =84)	.074	.029	-.047
Approach/Positive ( <i>n</i> =80)	.025	.091	.175
High-Intensity Pleasure ( <i>n</i> =78)	.068	.181	.082
Impulsivity ( <i>n</i> =77)	-.025	.061	.154
Shyness ( <i>n</i> =81)	-.009	-.129	-.209
Smiling Laughter ( <i>n</i> =81)	.135	.226*	.350**

*Note: Values reported for EID are bivariate correlations. Values reported for ESK and ESR are partial correlations controlling for verbal ability.*

\**p* < .05, \*\**p* < .01, \*\*\**p* < .001

### **Teacher-Rated Temperament**

Similar analyses were then run to examine relationships between teacher ratings of temperament and performance on emotion understanding tasks. Given that several significant gender differences emerged on teacher ratings of temperament, partial correlations were utilized in order to control for the effect of gender. Verbal ability was also again controlled for when examining correlations with performance on ESK and ESR tasks. Results are presented in Table 8. No significant correlations were found with performance on the EID task, as predicted. However, teacher ratings

of attentional focusing and sadness were positively and negatively correlated with performance on the ESK task, respectively. In contrast, anger/frustration was negatively correlated with ESR scores, whereas attentional focusing and smiling/laughter were positively correlated with ESR scores.

Table 8: *Correlations between Teacher-Rated Temperament and Emotion Understanding*

<b>CBQ Scales</b>	<b>EID</b>	<b>ESK</b>	<b>ESR</b>
Effortful Control	.066	.224	.236
Attentional Focusing ( <i>n</i> =90)	.033	.213*	.213*
Inhibitory Control ( <i>n</i> =81)	.069	.132	.138
Low-Intensity Pleasure ( <i>n</i> =81)	-.011	-.018	.201
Perceptual Sensitivity ( <i>n</i> =68)	.108	.051	.083
Negative Affectivity	.221	-.067	-.040
Anger/Frustration ( <i>n</i> =81)	-.030	-.121	-.242*
Discomfort ( <i>n</i> =82)	-.094	-.139	-.003
Fear ( <i>n</i> =24)	.279	-.026	.051
Sadness ( <i>n</i> =63)	.005	-.286*	-.095
Soothability ( <i>n</i> =91)	.003	.110	.031
Surgency	.146	.155	-.007
Activity Level ( <i>n</i> =92)	.152	.097	.109
Approach/Positive ( <i>n</i> =90)	.183	.112	-.109
High-Intensity Pleasure ( <i>n</i> =82)	.131	.189	.033
Impulsivity ( <i>n</i> =92)	.117	-.001	.120
Shyness ( <i>n</i> =91)	-.011	.011	-.109
Smiling Laughter ( <i>n</i> =88)	.102	.178	.216*

*Note: Values reported for EID are partial correlations controlling for gender. Values reported for ESK and ESR are partial correlations controlling for both gender and verbal ability.*

\* $p < .05$ , \*\* $p < .01$ , \*\*\* $p < .001$



## Mediation Analyses: Hypothesis #5

Mediation tests were conducted to examine the hypothesis that emotion understanding mediates the effects of temperament on social competence. Specifically, simple mediation (as depicted in Figure 1) was tested for using Preacher and Hayes' (2004, 2008) bootstrapping procedures for indirect effects. This method of examining mediation effects was chosen over Baron and Kenny's (1986) traditional causal steps model and the Sobel (1982) test, as it makes less assumptions about the distributions of indirect effects, requires less power, and provides a quantitative estimate of effect sizes (Hayes, 2013). As recommended by Preacher and Hayes, indirect effects were calculated on the basis of 5,000 bootstrap resamples. The significance of the indirect effects was then determined by examining bias-corrected 95% confidence intervals. If the confidence intervals did not contain zero, then the indirect effect was considered significant.

There is increasing consensus among statisticians that it is not necessary to establish a direct (total) effect between predictor and predicted variable (path  $c$ ) for tests of mediation (e.g., Hayes, 2009; Rucker et al., 2011; Shrout & Bolger, 2002). There are various reasons that explain why mediation effects are evident without significant direct effects. The total effect ( $c$ ) is understood as the sum of the direct effect and all indirect effects. Consider the possibility that various indirect effects might cancel each other out if one were to have a positive and the other were to have a negative correlation with the predicted. For instance, if a temperament variable such as fear has a negative impact on emotion understanding but a positive effect on behavioral inhibition, they would exert opposite influences on ratings of social

competence (albeit in different ways, depending on context and rater). In such cases, a test of indirect effects of a given variable would be more logical. Hence, statisticians now tend to prefer methods such as bootstrapping (MacKinnon, Lockwood, & Williams, 2004; Preacher & Hayes, 2004, 2008) for detecting indirect effects (mediation) that are more powerful, logically coherent, and make fewer assumptions of the data. Hayes (2013) argues that “It is a mistake to condition the hunt for indirect effects on evidence of a total effect of X. Researchers who insist on a statistically significant total effect of X before estimating and testing indirect effects will end up under analyzing their data and will fail to detect indirect effects when they are there.” (p. 170)

Given that a significant direct effect is not required, mediation analyses were conducted for all temperament variables that demonstrated the prerequisite significant correlations with emotion understanding measures that were also consistent with hypotheses and expectations based on prior research. Results from these analyses show that emotion situation knowledge did not significantly mediate the effects of parent or teacher temperament ratings on social competence (see Table 9). However, as illustrated in Tables 10-11 and Figures 2-5, significant mediation effects were found when considering emotion situation reasoning scores. In particular, although parent ratings of Fear and Smiling/Laughter were not directly related to teacher ratings of social competence, they were indirectly related through their impact on emotion situation reasoning. An examination of partially standardized indirect effects indicates that children who differ by one unit of parent-rated Fear or Smiling/Laughter differ by approximately one-tenth of a standard deviation in social

competence as a result of the effects of fear and positive emotionality on emotion situation reasoning (Fear:  $ab_{ps} = -.130$ , Smiling/Laughter  $ab_{ps} = .158$ ). In contrast, teacher ratings of Attentional Focusing and Anger/Frustration exhibited both significant direct effects on social competence, as well as indirect effects through emotion situation reasoning. In other words, children who were rated by their teachers as being higher in their abilities to regulate their attention or as exhibiting lower levels of anger tended to be rated as exhibiting greater social competence, regardless of the role of emotion situation reasoning. In addition, there was a small indirect effect, where one unit differences in these temperamental factors were associated with less than one-tenth of a standard deviation differences in social competence accounted for by the indirect influence of emotion situation reasoning (Attentional Focusing:  $ab_{ps} = .050$ , Anger/Frustration:  $ab_{ps} = -.055$ ).

Table 9: *Bootstrapping Simple Mediation Effects of Emotion Situation Knowledge on Social Competence*

Temperament Variables	Point	95% Confidence Interval*	
	Estimate	Lower	Upper
Parent Ratings:			
Effortful Control ( <i>n</i> =61)	.130	-.114	.498
Attentional Focusing ( <i>n</i> =73)	.183	-.083	.797
Smiling/Laughter ( <i>n</i> =72)	.381	-.102	1.75
Teacher Ratings:			
Attentional Focusing ( <i>n</i> =85)	.160	-.057	.725
Sadness ( <i>n</i> =61)	.167	-.235	1.10

\* Bias-corrected bootstrapping confidence intervals

Table 10: *Bootstrapping Simple Mediation Effects of Emotion Situation Reasoning on Social Competence*

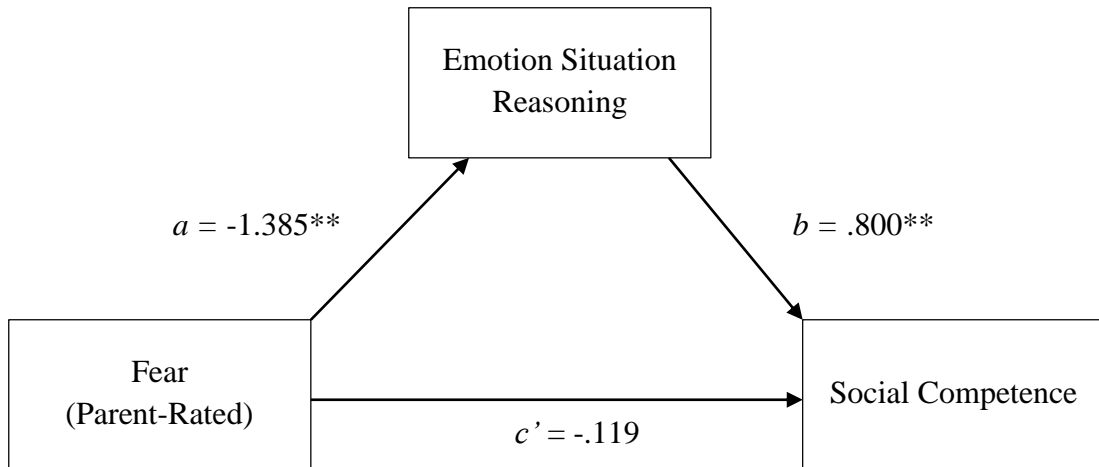
Temperament Variables	Point	95% Confidence Interval*	
	Estimate	Lower	Upper
Parent Ratings:			
Fear ( <i>n</i> =55)	-1.109	-2.402	-.398
Smiling/Laughter ( <i>n</i> =73)	1.302	.258	2.917
Teacher Ratings:			
Attentional Focusing ( <i>n</i> =83)	.379	.051	.968
Anger/Frustration ( <i>n</i> =75)	-.415	-.944	-.111
Smiling/Laughter ( <i>n</i> =82)	.469	-.040	1.17

\* Bias-corrected bootstrapping confidence intervals

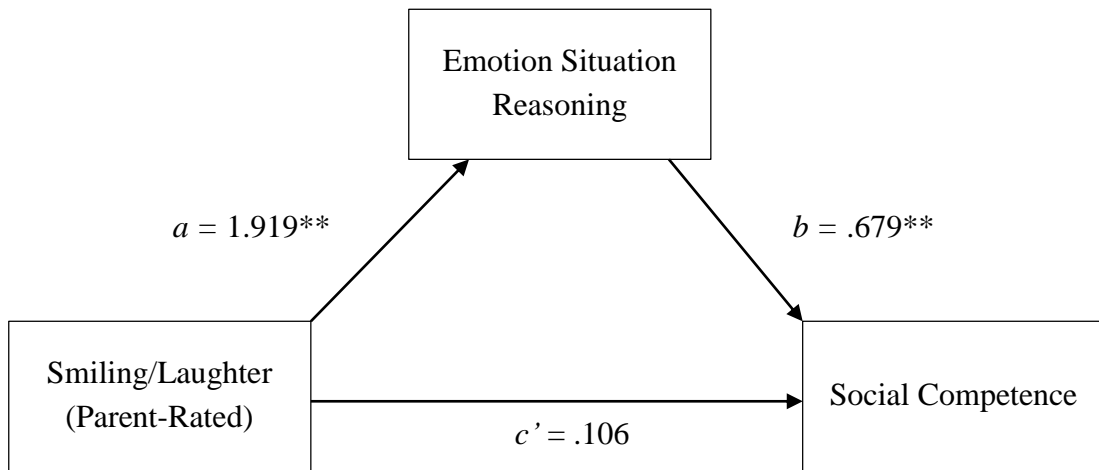
Table 11: *Unstandardized Direct and Indirect Effects of Temperamental Factors on Social Competence through Emotion Situation Reasoning*

Antecedent		Consequent						
		<i>M</i> (ESR)				<i>Y</i> (T-SC)		
		Coeff.	<i>SE</i>	<i>p</i>		Coeff.	<i>SE</i>	<i>p</i>
<i>Model 1:</i>								
<i>X</i> (P-Fear)	<i>a</i>	-1.385	.505	.009	<i>c'</i>	-.119	1.053	.910
<i>M</i> (ESR)		---	---	---	<i>b</i>	.800	.278	.006
<i>Model 2:</i>								
<i>X</i> (P-SL)	<i>a</i>	1.919	.706	.008	<i>c'</i>	.106	1.508	.944
<i>M</i> (ESR)		---	---	---	<i>b</i>	.679	.249	.008
<i>Model 3:</i>								
<i>X</i> (T-Attn)	<i>a</i>	.739	.403	.044	<i>c'</i>	3.43	.600	<.001
<i>M</i> (ESR)		---	---	---	<i>b</i>	.513	.162	.002
<i>Model 4:</i>								
<i>X</i> (T-Ang)	<i>a</i>	-.758	.333	.026	<i>c'</i>	-2.252	.531	<.001
<i>M</i> (ESR)		---	---	---	<i>b</i>	.548	.185	.004

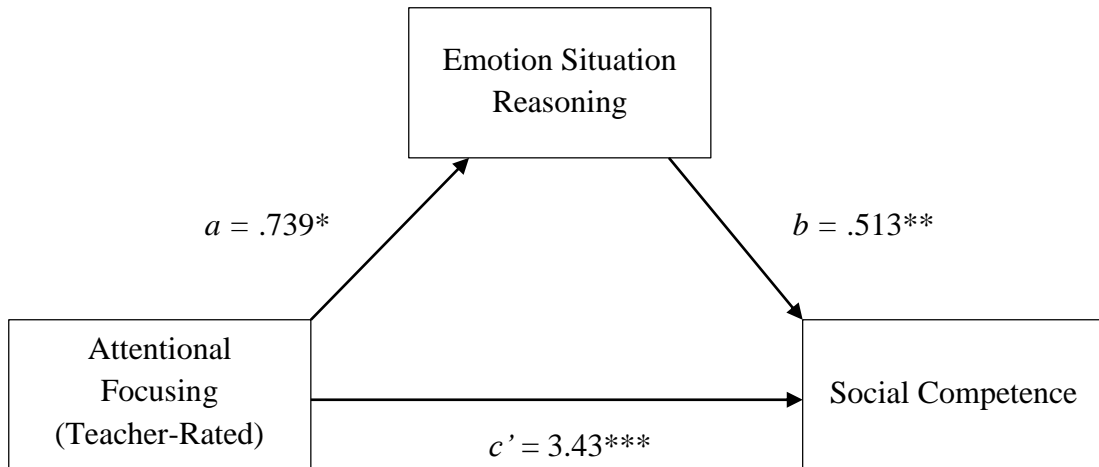
ESR = Emotion Situation Reasoning, T-SC = Teacher-Rated Social Competence, P-Fear = Parent-Rated Fear, P-SL = Parent-Rated Smiling/Laughter, T-Attn = Teacher-Rated Attentional Focusing, T-Ang = Teacher-Rated Anger/Frustration



*Figure 2.* Unstandardized regression coefficients for the relationship between parent ratings of Fear and social competence as mediated by emotion situation reasoning.  
 $^{**}p < .01$

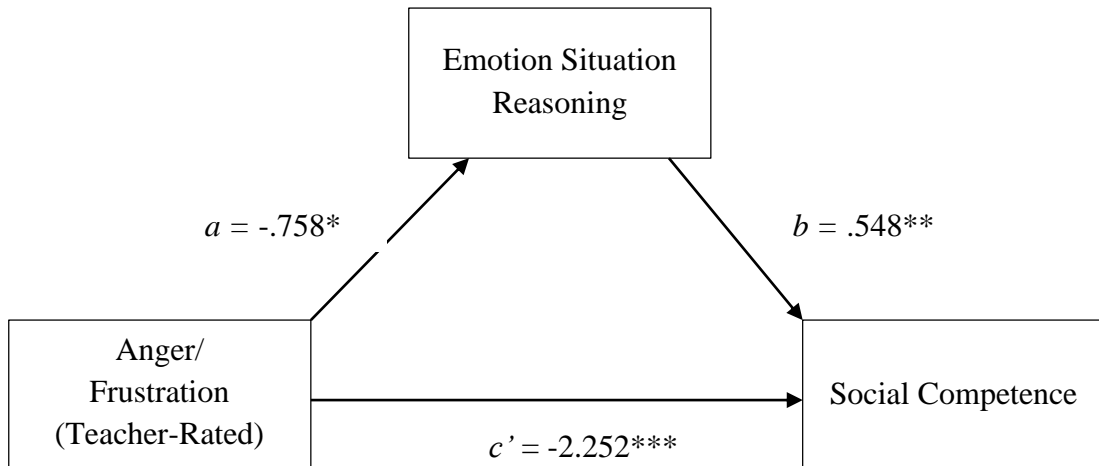


*Figure 3.* Unstandardized regression coefficients for the relationship between parent ratings of Smiling/Laughter and social competence as mediated by emotion situation reasoning.  
 $^{**}p < .01$



*Figure 4.* Unstandardized regression coefficients for the relationship between teacher ratings of Attentional Focusing and social competence as mediated by emotion situation reasoning.

\*  $p < .05$ , \*\* $p < .01$ , \*\*\* $p < .001$



*Figure 5.* Unstandardized regression coefficients for the relationship between teacher ratings of Anger/Frustration and social competence as mediated by emotion situation reasoning.

\*  $p < .05$ , \*\* $p < .01$ , \*\*\* $p < .001$

## Chapter 5: Discussion

Research has suggested that attainment of social competencies during early childhood is an important predictor of later adjustment and academic achievement. Given this recognized importance, it is crucial to understand how social competence is developed, as this will assist in identifying who may be at risk for social delays, as well as how to intervene and support deficits in this area. In this vein, previous research has indicated that temperamental factors, such as Effortful Control and positive emotionality, tend to be positively correlated with social competence, whereas some temperamental factors, including proneness to experiencing negative emotions, may disrupt social development. It has further been well established that emotion understanding abilities support socially competent behavior, as well. However, little research has directly investigated links between temperament and emotion understanding abilities, as well as the potential role that emotion understanding may play in mediating the effects of temperament on social competence.

Overall, as predicted in Hypothesis #1, results revealed that no temperamental factors significantly correlated with performance on a basic emotion identification task. It is important to note, however, that there was a high rate of missing data for teacher ratings of fear. This analysis was thus underpowered, and it is possible that a significant correlation may emerge within a larger sample. These results generally suggest that children's abilities to identify basic emotions (happy, sad, mad, scared) based on facial expressions are well-established by preschool-age, leaving little room

for individual differences in this skill to emerge. This finding provides further support for Bassett et al.'s (2012) study, which argued against the then-common practice of aggregating performance on emotion identification and emotion situation knowledge tasks into a single "emotion understanding" composite. As they mention, the two skill types reflect a developmental trajectory, and aggregating them together can obscure how theoretically different levels of emotion understanding differentially relate to child outcomes. In fact, findings from the current study suggest that the administration of basic emotion identification tasks after preschool age is likely not to provide much relevant information unless severe disruptions in emotional development are suspected. Future research is thus recommended to examine whether more individual differences would emerge at this age when emotion identification tasks that include more complex emotions (e.g., disgust, surprise) are utilized.

Consistent with Hypotheses #2-4, several significant correlations emerged between temperamental factors and other emotion understanding measures: emotion situation knowledge and emotion situation reasoning. Consistent with prior studies (e.g., Schultz et al., 2001; Fine, Izard, & Trentacosta, 2006; Leerkes et al., 2008), current results suggest that children who are better able to maintain their attention as rated by parents and teachers demonstrate greater emotion understanding abilities. In addition, in line with Izard's (1991) differential emotions theory and Fredrickson's (2001) Broaden-and-Build theory, findings indicate that a tendency to experience positive emotions as reported by parents and teachers supports emotion understanding development, whereas proneness to experiencing negative emotions, particularly



anger/frustration (teacher-rated) and fear (parent-rated), may disrupt emotion understanding development.

Consistent with Hypothesis #5, results additionally indicate that emotion understanding abilities partially mediate the relationships between some temperamental factors and social competence. Specifically, children who were rated by their parents as being more fear-prone or by their teachers as being more prone to anger/frustration were found to be less socially competent, which was a relationship partially explained by their weaker emotion situation reasoning skills. In the other direction, children who were rated by their parents as experiencing more positive emotions or by their teachers as having greater attention tended to be more socially competent, which was partially explained by their possession of higher emotion situation reasoning abilities.

The finding that different temperamental factors emerged as important to emotion understanding and social competence development based on parent versus teacher ratings is an interesting phenomenon consistent with previous findings that parent and teacher ratings typically demonstrate low levels of agreement (e.g., Teglasi et al., 2015; Kagan, Snidman, McManis, Woodward, & Hardway, 2002). As reviewed by De Los Reyes and Kazdin (2005) and Teglasi et al. (in press), this is likely related to a variety of reasons, including that ratings are subject to be influenced by both the relevance of the trait in the current setting, as well as the availability of the trait to be observed by the rater in that setting. For instance, teacher ratings of attentional focusing and anger/frustration came up as particularly important predictors of emotion understanding and social competence, fitting in with

the idea that these are factors especially relevant to functioning in school settings. Attentional demands are typically higher in school versus home settings, and although expressions of anger and frustration may be acceptable at home, they tend to be particularly problematic at school. Similarly, fear and positive emotionality emerged as important factors on parent ratings, consistent with the notion that emotional expressions are typically more acceptable at home rather than school. In fact, in the current study, teachers circled “Not Applicable” to one or more of the fear-related items when completing temperament ratings for a large majority of the participants, indicating that they did not have enough information to provide ratings in this area. One teacher even commented that she tries to eliminate potential sources of fear in the classroom.

Another interesting finding from the current study is that only emotion situation reasoning scores significantly mediated relationships between temperament and social competence, whereas performance on the emotion situation knowledge task did not. This is likely best explained by considering the differing skillsets that these tasks tap. Emotion situation knowledge tasks, which are by far the most common emotion understanding measure used in early childhood investigations, present children with various vignettes describing social situations and require them to identify how a character in each vignette would feel out of a several given options. This method designates which answers are “correct” for each vignette *a priori*. This practice assumes that most children will react the same to the given situations, an assumption that has generally gone unexamined. However, an examination of responses given in the current study reveals that the modal response represented 70%

or more of the participants on only five of the fifteen vignettes administered. On several of the vignettes, responses were split across two or more emotions, suggesting that students in early childhood do not perceive and react to situations as uniformly as previously assumed. Recognizing this, the emotion situation reasoning tasks allowed children to explain their responses. For instance, in a vignette depicting a situation where parents did not take their child to the carnival, some children explained that the child would feel “mad” because the parents broke their promise, and others responded “sad” as they really wanted to go but were now missing out. Further, some students even responded that the child would feel happy or neutral, explaining that the child did not really want to go to the carnival in the first place. In other words, results suggest that during early childhood, it is particularly important for children to be able to reason about emotions and to understand connections with their causes.

## **Implications**

Overall, findings from the current study offer several important implications for those serving early childhood populations. Specifically, results suggest that children who exhibit significant difficulties with maintaining attention and controlling anger/frustration at school may be at risk for experiencing further delays in their social/emotional and academic development. Parents who report that their children exhibit fearful tendencies may be at increased risk, as well, and as such, it is important to carefully consider information from both teacher and parent perspectives. Results further suggest that these at-risk children may possibly benefit from interventions that focus on building their emotion understanding abilities, including the abilities to reason about emotions and to connect them with potential

causes. Given that findings indicate that emotion understanding abilities mediate relationships between temperamental factors and social competence, intervening at this level may help mitigate cascading risk factors and place at-risk children on a more positive developmental trajectory. Hence, it will be important for future research to explore this area.

## **Limitations**

Despite its important implications, it is necessary to note that there are several limitations to the current study. One such limitation is that although the sample used was ethnically diverse, most participants came from well-educated and relatively affluent families. They also demonstrated generally high language abilities. In these respects, the sample is likely not reflective of the general population, and further investigations will thus be necessary to examine how findings may generalize to other populations.

Future studies would also benefit from addressing several measurement issues. For instance, the emotion situation reasoning measure used in this study is still relatively new and has only been investigated in its use with the current sample. As such, continued research is needed to confirm its validity by examining its use with more items and with other samples and by continuing to examine its relations with other hypothesized predictors and outcome variables. Another limitation was that only teacher ratings of social competence were collected in the current study, whereas both teachers and parents rated child temperament. Although emotion situation reasoning emerged as a significant mediator regardless of informant, there was shared variance in the direct effects due to similarity of the informant for

teachers. Future studies would thus benefit from including parent and teacher ratings for all informant measures.

Finally, future consideration should be given to the measurement of fear in school settings. In the current study, the teacher version of the CBQ was utilized (Teglasi et al., 2015), which slightly modifies items from the parent version. However, as previously mentioned, teachers in the current study often indicated that they were unable to complete Fear-related items due to limited opportunities to observe the required behaviors (e.g., being afraid of the dark). This is consistent with the notion that early education teachers specifically design their classroom environments in order to minimize fear. As such, it may be beneficial to refine items and to develop other approaches to measuring fear in early education settings.

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## Tables A-E

Table A: *Summary of Studies Investigating Negative Affectivity (NA) and Social Competence (SC)*

Author(s)	Sample Size & Age	Sample Characteristics	NA measure	SC measure	Other Factors Investigated	Relevant Findings
Auerbach-Major (1998)	N = 96 Preschool (M = 45 months)	Predominantly from Caucasian, middle-class families	Parent ratings (CBQ)	Teacher ratings, sociometric ratings, naturalistic observations	Parent discipline styles	Investigated anger/frustration and sadness/fearfulness separately. Neither were significantly correlated with sociometric ratings. Anger/frustration was negatively related to teacher-rated SC ( $r = -.20$ ) and observations of SC ( $r = -.17$ ), whereas sadness/fearfulness only correlated with teacher-rated SC ( $r = -.18$ ).



Blair, Denham, Kochanoff, & Whipple (2004)	N = 153  Preschool (M = 44 months)	Predominantly from Caucasian, middle-class families	Parent ratings (CBQ)	Teacher ratings (SCBE)	Emotion regulation	Investigated anger/frustration and sadness/fearfulness separately. Neither were significantly correlated with SC.
Chen, Deater- Deckard, & Bell (2014)	N = 149  Between the ages of 3 and 7 (M = 58 months)	Ethnically and socioeconomica lly diverse	Parent ratings (CBQ)	Parent ratings	Maternal negativity and positivity, household chaos	NA correlated with maladjustment/peer difficulties ( $r = 0.54$ ).
Eisenberg, et al. (1993)	N = 93  Preschool (M = 61 months)	Predominantly from Caucasian, middle-class families in suburbs of a large city	Parent ratings	Sociometric ratings, as well as school ratings (teacher and observer ratings combined into a composite)	Child coping	Negative relationships between NA and school ratings of SC ( $r = -.39$ ), as well as NA and sociometric ratings ( $r = -$ .43), but only for boys.

Kolak, Frey, Brown, & Vernon-Feagans (2013)	N = 110  Two years of age	Children from two-parent families that attended daycare in central Pennsylvania. Mostly Caucasian and middle-income.	Parent ratings received from mother and father separately but averaged into one composite	Parent ratings (SCBE) received from mother and father separately but averaged into one composite	Child illness, daycare quality	Investigated anger/frustration & fearfulness separately. Moderate negative relationships between anger/frustration and SC ( $r = -.44$ ), as well as fearfulness and SC ( $r = -.32$ )
Mathieson & Banerjee (2010)	N = 106  Nursery school (M = 30 months)	Diverse sample recruited from day nurseries in the UK	Parent ratings (CBQ)	Parent and teacher ratings	Emotion understanding	Within parent ratings, NA demonstrated small to moderate relationships with conduct problems ( $r = .40$ ) and peer problems ( $r = .24$ ). However, no significant relationships emerged across parent and teacher raters.

	N = 6,850					
Rispoli, McGoey, Koziol, & Schreiber (2013)	Longitudinal study with measures administered at preschool and kindergarten waves	Nationally representative, from the ECLS-B	Semi-structured observation	Parent ratings	Parenting, attachment security	Small negative relationship between NA at preschool and SC at kindergarten (Beta = -.06)
Rothbart, Ahadi, & Hershey (1994)	N = 80 Six to seven years old	All Caucasian, but represented a range of socioeconomic backgrounds	Parent ratings (CBQ), laboratory measures obtained during infancy	Parent ratings	N/A	Investigated anger/frustration and fearfulness separately. Anger/frustration was positively correlated with aggression (r = .45). Fear was negatively correlated with aggression (r = -.34), but positively associated with empathy (r = .42).

	N = 199					
Sallquist et al. (2009)	Longitudinal study with participants recruited between kindergarten and third grade, then followed every other year for 6 years	Largely from Caucasian and middle-class families	Parent and teacher ratings	Teacher ratings	N/A	Moderate to strong negative relationships between NA and SC within teacher ratings ( $r = -.39$ to $-.59$ ). Smaller negative relationships between NA and SC across parent and teacher ratings ( $r = -.15$ to $-.22$ ).
	N = 580					
Strickland (2012)	Longitudinal study with measures administered in kindergarten and first grade	Diverse sample recruited from Chicago area	Parent ratings (CBQ)	Parent ratings (SSRS)	Parenting	Small negative relationships between NA and SC within the same year ( $r = -.10$ ) and longitudinally ( $r = -.07$ ).
	N = 382					
Zhou, Main, & Wang (2010)	Longitudinal study with measures	Largely from low to middle-income families in urban China	Parent and teacher ratings	Parent and teacher ratings, sociometric ratings	Academic performance	Small to moderate negative relationships between NA and SC when within same raters (parent $r = -.22$ , teacher $r$

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administered at  
first/second  
grades and  
fifth/sixth  
grades

= -.30). Across raters,  
small negative  
relationship between  
teacher NA and parent  
SC ( $r = -.13$ ), but no  
significant relationship  
between parent NA and  
teacher SC. Small  
negative relationship  
between teacher NA to  
peer-rated SC ( $r = -.15$ ),  
but parent NA not  
significantly correlated  
with peer SC.

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Table B: *Summary of Studies Investigating Surgency/Extraversion (Surg) and Social Competence (SC)*

Author(s)	Sample Size & Age	Sample Characteristics	Surg measure	SC measure	Other Factors Investigated	Relevant Findings
Berdan, Keane, & Calkins (2008)	N = 200  Part of a longitudinal study where children were assessed in preschool and then a year later in kindergarten	Diverse sample recruited from day care centers, county healthy department, and local Women, Infants, and Children program	Parent ratings (CBQ)	Parent ratings (CBCL), teacher ratings (BASC-2), sociometric nominations	Perceived acceptance	Within parent ratings at preschool, Surg positively correlated with externalizing behavior problems ( $r = .25$ ). Parent ratings of Surg at preschool were also correlated with sociometric ratings and teacher-rated aggression ratings at kindergarten ( $r = -.21$ and $r = .20$ , respectively).
Calkins, Fox, & Marshall (1996)	N = 207 Longitudinal study where participants were assessed at 4, 9, and 14 months	Primarily Caucasian and from middle-class backgrounds	Laboratory observations and parent ratings at 9 and 14 months	Parent ratings	EEG asymmetry	Observed Surg was related with greater parent-reported anger

Chen, Deater-Deckard, & Bell (2014)	N = 149 Between the ages of 3 and 7 (M = 58 months)	Ethnically and socioeconomically diverse	Parent ratings (CBQ)	Parent ratings	Maternal negativity and positivity, household chaos	Surg correlated with maladjustment/peer difficulties (r = 0.21).
Degnan et al. (2011)	N = 291 Longitudinal study where participants were assessed at 4 months, 9 months, 2 years, 3 years, and 5 years of age	Diverse sample recruited from a large metropolitan area of Mid-Atlantic region	Laboratory tasks at 9 months, 2 years, and 3 years; parenting ratings at 5 years (CBQ)	Laboratory tasks at 5 years; parent ratings at 5 years (CBCL)	EEG asymmetry	Laboratory measures of Surg in infancy and toddlerhood were positively associated with laboratory social competence measures at 5 years of age (Beta = .29), as well as with parent-rated externalizing problems (Beta = .25).
Gunnar, Seabanc, Tout, Donzella, & van Dulmen (2003)	N = 83 3 to 5 years old (M = 4.01 yrs)	Primarily Caucasian and from middle-class, educated backgrounds	Teacher ratings (CBQ)	Teacher ratings, Peer sociometric ratings	Cortisol levels	Surgency was correlated with aggression (r = .51) but not with sociometric ratings

Hirshfeld-Becker et al. (2007)	N = 284  Participants original recruited between 21 months to 6 years, then followed up 5 years later	Some of the sample was purposefully recruited to include children with parents being treated for anxiety or depressive disorders	Laboratory tasks and observations	Parent interviews	Parental mood disorders	Surg in preschool was related to development of mood and disruptive behavior disorders in later childhood (Odds Ratio = 8.44)
Mathieson & Banerjee (2010)	N = 106  Nursery school (M = 30 months)	Diverse sample recruited from day nurseries in the UK	Parent ratings (CBQ)	Parent and teacher ratings	Emotion understanding	Surg negatively correlated with peer problems ( $r = -.22$ ) and positively correlated with prosocial behaviors ( $r = .21$ ) within parent ratings. Between raters, parent-rated Surg negatively correlated with teacher-rated disconnected play ( $r = -.21$ ).



	N = 150					
Putnam & Stifter (2005)	Longitudinal study where participants were assessed at 6, 12, and 24 months	Primarily Caucasian	Laboratory observations	Parent ratings (CBCL)	N/A	Surg significantly correlated with externalizing behavior problems ( $r = .27$ ) but not internalizing behavior problems
Rothbart, Ahadi, & Hershey (1994)	N = 80 Six to seven years old	All Caucasian, but represented a range of socioeconomic backgrounds	Parent ratings (CBQ), laboratory measures obtained during infancy	Parent ratings	N/A	Surg was positively correlated with aggression ( $r = .54$ ) and negatively with guilt ( $r = -.24$ )
Sallquist et al. (2009)	N = 199 Longitudinal study with participants recruited between kindergarten and third grade, then followed every other year for 6 years	Largely from Caucasian and middle-class families	Parent and teacher ratings	Teacher ratings	N/A	Within teacher ratings, Surg negatively correlated with SC ( $r = -.20$ to $-.24$ ). No significant relationship between parent-rated Surg and teacher-rated SC.

	N = 72					
Stifter, Putnam, & Jahromi (2008)	Longitudinal study with participants assessed at 2 years and in preschool	Predominantly from Caucasian, educated, middle-class families	Laboratory observations	Parent ratings (CBCL)	Effortful Control	Surg related to greater externalizing behaviors (Betas between .26 and .41) and greater internalizing behaviors (Betas between .31 to .44).

Table C: *Summary of Studies Investigating Effortful Control (EC) and Social Competence (SC)*

Author(s)	Sample Size & Age	Sample Characteristics	EC measure	SC measure	Other Factors Investigated	Relevant Findings
Auerbach-Major (1998)	N = 96 Preschool (M = 45 months)	Predominantly from Caucasian, middle-class families	Parent ratings (CBQ)	Teacher ratings, sociometric ratings, naturalistic observations	Parent discipline styles	Mother ratings of EC significantly correlated with observed prosocial behavior ( $r = .25$ ) and teacher-rated SC ( $r = .21$ ) but not sociometric status. Father-rated EC only significantly correlated with teacher-rated SC ( $r = .19$ ).
Blair, Denham, Kochanoff, & Whipple (2004)	N = 153 Preschool (M = 44 months)	Predominantly from Caucasian, middle-class families	Parent ratings (CBQ)	Teacher ratings (SCBE)	Emotion regulation	EC significantly correlated with social competence ( $r = .26$ ) and externalizing behaviors but for boys only ( $r = -.22$ ).

Chen, Deater-Deckard, & Bell (2014)	N = 149 Between the ages of 3 and 7 (M = 58 months)	Ethnically and socioeconomically diverse	Parent ratings (CBQ)	Parent ratings	Maternal negativity and positivity, household chaos	EC negatively correlated with maladjustment/peer difficulties ( $r = -.47$ ).
Eisenberg et al., (1993)	N = 93 Preschool aged (M = 61 months)	Predominantly from Caucasian, middle-class families	Parent and teacher ratings	Teacher and observer ratings obtained combined into one composite; sociometric ratings	Child coping	Teacher-rated EC related to sociometric status ( $r = .41$ ) and school-rated SC ( $r = .64$ ), but only for boys. Parent-rated EC not significantly related to any SC measures.
Gunnar, Sebanc, Tout, Donzella, & van Dulmen (2003)	N = 83 3 to 5 years old (M = 4.01 yrs)	Primarily Caucasian and from middle-class, educated backgrounds	Teacher ratings (CBQ)	Teacher ratings, Peer sociometric ratings	Cortisol levels	EC was correlated with aggression ( $r = -.51$ ) and peer rejection.
Mathieson & Banerjee (2010)	N = 106 Nursery school (M = 30 months)	Diverse sample recruited from day nurseries in the UK	Parent ratings (CBQ)	Parent and teacher ratings	Emotion understanding	Within parent ratings, EC correlated with prosocial behavior ( $r = .35$ ). EC was also a significant predictor of teacher-rated interactive play (Beta = .23).

Raver et al. (1999)	N = 41  Preschool (M = 4.85 years)	Low-income, recruited from Head Start	Laboratory tasks	Teacher ratings (SCBE), sociometric ratings	N/A	EC was a significant predictor of teacher-rated SC (Beta = .34) but not peer-rated SC.
Rothbart, Ahadi, & Hershey (1994)	N = 80  Six to seven years old	All Caucasian, but represented a range of socioeconomic backgrounds	Parent ratings (CBQ)	Parent ratings	N/A	EC was a significant predictor of empathy (Beta = .57).
Rudasill & Konold (2008)	N = 1,364  Longitudinal study with measures administered at 4.5 years, kindergarten, first, and second grades	Predominantly Caucasian	Parent ratings (CBQ)	Teacher ratings (SSRS)	N/A	Moderate relationships between EC factors and cooperation across time (r = .23 to .29). Small relationships between EC factors and self-control across time (r = .13 and .24).

N = 580						
Strickland (2012)	Longitudinal study with measures administered in kindergarten and first grade	Diverse sample recruited from Chicago area	Parent ratings (CBQ)	Parent ratings (SSRS)	Parenting	Large positive relationships between EC and SC within the same time period ( $r = .67$ ) and over time ( $r = .46$ )
N = 382						
Zhou, Main, & Wang (2010)	Longitudinal study with measures administered at first/second grades and fifth/sixth grades	Largely from low to middle-income families in urban China	Parent and teacher ratings	Parent and teacher ratings, sociometric ratings	Academic performance	Within parent ratings, EC was correlated with SC both within ( $r = .45$ ) and across time ( $r = .31$ ). The same pattern held for teacher ratings (within-time $r = .64$ , across-time $r = .55$ ). Parent-rated EC was also correlated with teacher SC within time ( $r = .22$ ) and across time ( $r = .23$ ). Teacher-rated EC related to parent-rated SC within ( $r = .24$ ) and across ( $r = .39$ ), as well. Parent- and teacher-rated EC

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were also related to peer-rated SC ( $r = .26$  and  $.38$ , respectively).

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Table D: *Summary of Studies Investigating Emotion Understanding (EU) and Social Competence (SC)*

Author(s)	Sample Size & Age	Sample Characteristics	EU measure	SC measure	Other Factors Investigated	Relevant Findings
Bassett, Denham, Mincic, & Graling (2012)	N = 324 M = 4.1 years	Recruited from Head Start and private child care centers. Racially and economically diverse.	Emotion identification and emotion situation knowledge tasks	Teacher ratings (SCBE)	Learning behaviors	EU a significant predictor of cooperativeness ( $r = .18$ )
Cassidy et al. (2003)	N = 76 M = 4.3 years	Recruited from middle- and working-class suburbs	Emotion situation knowledge task	Teacher ratings (SSRS), sociometric ratings, classroom observations	Theory of mind	EU significantly correlated with teacher ratings of social skills ( $r = .32$ ) and observed spontaneous prosocial behaviors ( $r = .27$ ), but not with sociometric ratings
Denham (1986)	N = 27 Between the ages of 2 and 4	Recruited from a rural community	Emotion identification and emotion situation knowledge tasks	Laboratory observations, daycare observations	Theory of mind	EU significantly correlated with laboratory observations ( $r = .51$ ) but not daycare observations



(combined into an aggregate)						
Denham, McKinley, Couchoud, & Holt (1990)	N = 65 M = 3.7 years	Recruited from a university preschool	Emotion identification and emotion situation knowledge tasks	Sociometric ratings	N/A	Emotion situation knowledge task was significantly correlated with sociometric ratings ( $r = .41$ ), but emotion identification was not
Izard et al. (2001)	N = 72 Longitudinal study with children tested at ages 5 and 9	Recruited from Head Start. Economically disadvantaged and racially diverse.	Emotion identification task	Teacher ratings (SSRS)	Temperament, academic competence	EU measured at age 5 was a significant predictor of cooperation ( $\text{Beta} = .46$ ) and internalizing problems ( $\text{Beta} = -.45$ ) at age 9
Schultz, Izard, & Bear (2004)	N = 182 First and second graders (M = 7.7 years)	Recruited from a rural and predominantly middle-class community	Emotion identification and emotion situation knowledge tasks (combined into aggregate)	Teacher report (semi-structured interview)	Emotionality	EU significantly correlated with aggression ( $r = -.16$ )

Schultz, Izard, Ackerman, & Youngstrom (2001)	N = 143  Longitudinal study with children tested in preschool and first grade	Recruited from Head Start. Economically disadvantaged and racially diverse.	Emotion identification and emotion situation knowledge tasks	Teacher ratings (CBCL)	Temperament	Emotion situation knowledge task was correlated with social problems ( $r = -.32$ ) and social withdrawal ( $r = -$ .37). Emotion identification was only correlated with social withdrawal ( $r = -.24$ ).
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Table E: *Summary of Studies Investigating Temperamental Factors and Emotion Understanding (EU)*

Author(s)	Sample Size & Age	Sample Characteristics	Temp Dimension & Measure	EU Measure	Other Factors Investigated	Relevant Findings
Fine, Izard, & Trentacosta (2006)	N = 111  Longitudinal study with measures administered at preschool age (M = 4.9 years), 1 <sup>st</sup> grade, 3 <sup>rd</sup> grade, and 5 <sup>th</sup> grade	Economically disadvantaged, recruited from Head Start	Negative Affectivity (negative emotional intensity) and Effortful Control (behavioral control) – parent ratings	Emotion situation knowledge	Verbal ability	EC was a significant predictor of initial EU scores (Beta = -.34) but not of growth in EU over time. NA was not a predictor of initial EU but was negatively related to growth in EU over time (Beta = -.26).
Laible (2004)	N = 51  Preschool aged (M = 48.9 months)	Predominantly Caucasian, middle-class	Surgency, Negativity Affectivity, and Effortful Control – parent ratings	Emotion situation knowledge	Attachment security, mother-child emotional discourse	EC significantly correlated with EU (r = .43), but Surg and NA were not.

Leerkes, Paradise, O'Brien, Calkins, & Lange (2008)	N = 141  M = 3.5 years	Racially and economically diverse	Negative Affectivity (soothability, lability/negativ ity), Effortful Control (emotional regulation) – parent ratings	Emotion identification, emotion situation knowledge	Cognitive understanding, cognitive control	Lability/negativity significantly correlated with performance on emotion situation knowledge task ( $r = -$ .17). Emotion regulation significantly correlated with performance on emotion identification ( $r$ $= .25$ ) and emotion situation knowledge task ( $r = .21$ )
Schultz, Izard, Ackerman, & Youngstrom (2001)	N = 143  Longitudinal study with measures administered at preschool age (M = 4.9 years) and 1 <sup>st</sup> grade (M = 6.9 years)	Economically disadvantaged, recruited from Head Start	Effortful Control (attentional control, behavioral control) – teacher and parent ratings	Emotion identification, emotion situation knowledge	Verbal ability	Attentional control predictive of emotion situation knowledge (Beta = -.23). Behavioral control predictive of both emotion situation knowledge (Beta = -.23) and emotion expression knowledge ( $r = -.17$ ).

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Schultz, Izard, & Bear (2004)	N = 180  First and second grade students (M = 7 years, 9 months)	Predominantly Caucasian	Negative Affectivity (sadness, anger, fear), Surgency (happiness) – teacher ratings and peer nominations	Emotion identification, emotion situation knowledge	Empathy	Surg significantly correlated with emotion attribution accuracy (r = .19)
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## Appendix A

Children's Behavior Questionnaire Scale (CBQ) Temperament Definitions and Sample Items (Rothbart, Ahadi, Hershey, & Fisher, 2001).

- *Activity Level*: Gross Motor activity, including rate and extent of locomotion. "Seems always in a big hurry to get from one place to another."
- *Anger/Frustration*: Negative affectivity related to interruption of ongoing tasks or goal blocking. "Has temper tantrums when s(he) doesn't get what s(he) wants."
- *Attentional Focusing*: Capacity to maintain attentional focus on task-related channels. "When picking up toys or other jobs, usually keeps at the task until it's done."
- *Discomfort*: Negative affectivity related to sensory qualities of stimulation, including intensity; rate; or complexities of light, movement, sound and texture. "Is not very bothered by pain."
- *Fear*: Negative affectivity, including unease, worry, or nervousness, which is related to anticipated pain or distress and/or potentially threatening situations. "Is not afraid of large dogs and/ or other large animals."
- *High Intensity Pleasure*: Pleasure or enjoyment related to situations involving high stimulus intensity, rate, and complexity, novelty, and incongruity. "Likes going down high slides or other adventurous activities."
- *Impulsivity*: Speed of response initiation. "Usually rushes into an activity without thinking about it."
- *Inhibitory Control*: Capacity to plan and to suppress inappropriate approach responses under instructions or in novel or uncertain situations. "Can lower his/her voice when asked to do so."
- *Low Intensity Pleasure*: Pleasure or enjoyment related to situations involving low stimulus intensity, rate, complexity, novelty, and incongruity. "Rarely enjoys being talked to."
- *Perceptual Sensitivity*: Detection of slight, low-intensity stimuli from the external environment. "Notices the smoothness or roughness of objects s(he) touches."
- *Positive Anticipation*: "Amount of excitement and anticipation for expected pleasurable activities. "Gets all worked up before an exciting event that s(he) has trouble sitting still."
- *Sadness*: Negative affectivity and lowered mood and energy related to exposure to suffering, disappointment, and object loss. "Cries sadly when a favorite toy gets lost or broken."
- *Shyness (versus social approach)*. Slow or inhibited (versus rapid) speed of approach and discomfort (versus comfort) in social situations. "Often prefers to watch rather than join other children playing."
- *Smiling/Laughter*- Positive affect in response to changes in stimulus intensity, rate, complexity, and incongruity. "Laughs a lot at jokes and silly happenings."
- *Soothability (and Falling Reactivity)*. Rate of recovery from peak distress, excitement, or general arousal. "Has a hard time settling down for a nap."

