

2011-06-16

Preschool Predictors of Social Problem-Solving and Their Relations to Social and Academic Adjustment in Early Elementary School

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UNIVERSITY OF MIAMI

PRESCHOOL PREDICTORS OF SOCIAL PROBLEM-SOLVING AND THEIR
RELATIONS TO SOCIAL AND ACADEMIC ADJUSTMENT
IN EARLY ELEMENTARY SCHOOL

By

Olga Lydia Walker

A DISSERTATION

Submitted to the Faculty
of the University of Miami
in partial fulfillment of the requirements for
the degree of Doctor of Philosophy

Coral Gables, Florida

June 2011

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Preschool Predictors of Social Problem-Solving
and Their Relations to Social and Academic
Adjustment in Early Elementary School

(Ph.D., Psychology)
(June 2011)

Abstract of a dissertation at the University of Miami.

Dissertation supervised by Professor Heather Henderson.
No. of pages in text. (59)

The current study took a multi-method approach to examine the influence of temperament on children's social problem solving (SPS) abilities and, in turn, whether SPS skills are a mechanism through which early temperament influences later social and academic adjustment. Participants included 270 children. Maternal reports of temperament were collected when the children were 2, 3, and 4 years old. At age 5, children were observed while interacting with an unfamiliar peer during an SPS task. At age 7, children were directly assessed on their academic achievement and completed measures of social adjustment. Both reactive and self-regulatory aspects of temperament related to the development of SPS, however, SPS did not relate to adjustment outcomes. Future studies may consider the use of a global SPS coding scheme that captures the integration of various SPS related skills. There was no direct effect of shyness on academic achievement, adding to the mixed literature on the relation between shyness and academics. There was also no direct effect of shyness on child self-report of social adjustment, suggesting that children rated high in shyness are likely forming mutual friendships with their peers, leading to self-perceptions of good friendship quality. Taken together, results suggest that shyness may not always be a risk factor for poor developmental outcomes. There was a positive direct effect of self-regulation on academic achievement, however, no effect on social adjustment. These results suggest

that the various dimensions of self-regulation may relate differently to developmental outcomes.

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CHAPTER 1: INTRODUCTION

Preschool Predictors of Social Problem-Solving and Their Relations

to Social and Academic Adjustment in Early Elementary School

Success in school is comprised of success in both social and academic domains. However, there is considerable variability in functioning in both of these domains. The goal of the current study was to examine the core skills that may account for this wide range of variability in social and academic functioning. Social problem solving (SPS) abilities have been linked to children's social adjustment and academic success (Dubow & Tisak, 1989; Dubow, Tisak, Causey, Hryshko, & Reid, 1991). Furthermore, early temperamental predispositions have been found to be predictors of children's SPS skills (Stewart & Rubin 1995) and social and academic adjustment (Caspi, Henry, McGee, Moffitt, & Silva, 1995; Schoen & Nagle, 1994). Thus, children's SPS skills may be one mechanism through which temperament affects children's social and academic success in school. The purpose of this study was to longitudinally examine (1) the influence of temperament (ages of 2-4 years) on children's SPS abilities (age 5 years) and social and academic adjustment (age 7 years) and (2) whether SPS skills mediate the relations between early temperament and later social and academic adjustment (see Figure 1). A secondary goal of this study was to examine whether gender moderates the associations in the model.

Theoretical Framework

Urie Bronfenbrenner's Bioecological Theory of developmental processes describes a child as being fully immersed within an entire social network (Bronfenbrenner & Morris, 2006). That is, the individual child develops within various

ecological systems ranging from the microsystem, described as the activities and interactions of the child's immediate environment, to the broader macrosystem, which includes the influences of culture and public policy. All ecological systems are interrelated, meaning that they interact with each other to influence the individual. Pianta and colleagues have applied the broader theory to understand how the systems in which children are embedded contribute to their developmental and educational experiences. Children's experiences contribute to their development as a result of interactions with others, settings, and institutions (Pianta & Walsh, 1996). Social interactions within multiple systems have been described as one of the mechanisms influencing children's development and success upon entry into school (Mashburn & Pianta, 2006). These theories were used as a conceptual framework guiding the current project, as this study examined child characteristics as well as children's interactions with peers, as important contributors to social and academic adjustment.

Temperament

Temperament describes relatively stable, biologically based individual differences in the quality and intensity of children's emotional reactions (Rothbart & Bates, 2006). Temperamentally based behaviors can be classified into one of two domains: reactivity and self-regulation. Reactivity is the speed, strength and valence of behavioral and physiological responses to environmental stimuli (e.g., shyness) and self-regulation describes neural or behavioral processes that modulate or manage a child's reactivity (Rothbart & Bates, 2006; Rothbart & Derryberry, 2002). It has been suggested that both reactive and regulatory processes result from inborn differences in central nervous system (CNS) activity and possibly from prenatal influences on the developing brain (Bates,

1989; Goldsmith et al., 1987). Studying temperament in early childhood is important because of the long lasting influence of temperament on development throughout childhood and into adulthood (Capsi et al., 2003).

Shyness. Shyness has been defined as fear and anxiety in response to novel social situations, perceived social evaluation and threat, and sensitivity to challenge (Bruch & Cheek, 1995; Coplan & Armer, 2007; Kagan, 1998). Various studies have found that infants displaying high levels of motor activity and negative affect in response to novel visual and auditory stimuli at 4 months of age display high levels of social reticence during the preschool years. For example, infants displaying negative reactivity during an observational temperament task at 4-months displayed behavioral inhibition at 14-months in the laboratory, displayed wariness during peer play at 4 years of age, and were rated as high in shyness by their mothers at 4 years of age (Schmidt et al., 1997). Shy children also displayed greater morning salivary cortisol, which is a measure of stress sensitivity (Schmidt et al., 1997). In addition, other studies have found associations between shyness and right frontal EEG asymmetry from infancy through adulthood, suggesting that shy infants, children, and adults may have a disposition towards responding to stressful social situations with negative affect and social withdrawal (Fox, Henderson, Rubin, Calkins, & Schmidt, 2001; Henderson, Marshall, Fox, Rubin, 2004; Schmidt, 1999).

Although researchers have found evidence for the biological bases of temperament, a child's environmental influences (e.g., peer relationships) may interact with biological factors to influence and strengthen the stability of temperament (Calkins, 1994; Rubin, Burgess, & Hastings, 2002; Rubin, Wojslawowicz, Rose-Krasnor, Booth-LaForce, & Burgess, 2006). Despite these environmental influences, children rarely

change from one extreme of shyness or sociability to the other (Fox et al., 2001; Pfeifer, Goldsmith, Davidson, & Rickman, 2002), and are likely to respond similarly within a few years of assessment or even into adulthood (Caspi & Silva, 1995; Caspi et al., 2003; Rothbart, Ahadi, & Evans, 2000). Therefore, studying the social interaction patterns of shy children at young ages is especially important since temperament has been directly linked to children's peer relationships and academic success (Bramlett, Scott, & Rowell, 2000; Rubin, Stewart, & Coplan, 1995; Schoen & Nagle, 1994).

Shyness and social and academic adjustment. Shy children are at risk for poor peer relationships (Rubin, Stewart, & Coplan, 1995), possibly due to the effects of shyness on children's ability to act in socially assertive ways. This is consistent with observations of shy children who rather than joining in play, tend to stay outside of activities with other children (Crozier, 2000). Shyness is also associated with greater loneliness and social dissatisfaction, possibly resulting from ineffective or unsuccessful social behavior during peer interaction (see Gambrill 1996, for a review). One study found that social withdrawal in second grade predicted feelings of loneliness in adolescence, providing longitudinal evidence for the association between shyness and loneliness (Rubin, Chen, McDougall, Bowker, & McKinnon, 1995). Thus, it appears that poor peer interactions may be a mechanism through which shyness is associated with greater loneliness and social dissatisfaction.

While shyness has been associated with general feelings of loneliness and social dissatisfaction, this may not be the case for perceived quality of specific friendships. Friendships have been found to serve as a protective factor for shy children (Burgess, Wojslawociz, Rubin, Rose-Krasnor & Booth-LaForce, 2006), however, friendships may

not protect against victimization. Rubin et al. (2006) found that shy children with a best friend were no less victimized than shy children without a best friend. Furthermore, shy children with a best friend were more victimized than shy children with a non-shy best friend. Rubin et al. (2006) concluded that those shy children's best friends may also be shy, making both children in the dyad less able to defend themselves and their friend during victimization and thus decreasing the protective factor of their friendship. Given the social difficulties associated with shyness, the current study examined the contribution of temperament to children's social adjustment.

As children continue through the school years, shy children begin to lag behind resilient children in the school performance (Asendorff & van Aken, 1999). In preschool and kindergarten, shy children spend more time displaying wary behaviors, such as staring, more time in solitary passive play, and less time interacting with their peers in the classroom (Asendorff, 1991; Gersten, 1989; Rimm-Kaufman & Kagan, 2005). Furthermore, shy children are less likely to speak upon arrival to school and during breaks and are less likely to volunteer or blurt out answers in teacher-guided activities, as it can be embarrassing and socially uncomfortable (Asendorff & Meier, 1993; Rimm-Kaufman & Kagan, 2005). Perhaps this is because shy children are more likely to experience fear in response to intense stimulation, which interferes with processing cognitive material, engagement in learning, and leads to increased self-focused attention (Duval & Wicklund, 1972; Henderson & Fox, 1998; Rothbart & Jones, 1998). For example, if a shy child is asked to discuss a topic in front of the class, or fears s/he will be called on during a lesson, the fear and anxiety associated with these tasks may lead them to focus attention on themselves rather than on peer interaction or the class lesson.

Furthermore, if shy children are spending less time exploring their environment and interacting with peers, then they have fewer opportunities to gain the social and academic competencies associated with peer play and exploration at early ages (Coplan, Gavinski-Molina, Lagace-Seguin, & Wichmann, 2001; Rubin, Fein & Vandenberg, 1983).

One issue that has been raised in the shyness literature concerns the methodology behind measuring shy children's academic achievement. Some have argued that direct assessments of achievement with shy children will result in poorer performance not because of a lack of knowledge but simply because assessments are conducted by research personnel, whom are typically unfamiliar adults. Crozier and Hostettler (2003) examined the association between shyness and test performance in both face-to-face and group testing condition using a between-subjects design. The authors found that shyness in middle childhood was associated with poorer performance in the vocabulary face-to-face condition but not the group condition. There is still some uncertainty as to whether the poor performance reflects a true measure of ability (Crozier & Hostettler, 2003).

However, various studies have found that teacher-report of achievement also result in significantly lower performance ratings for shy children. For example, shyness has been associated with social reticence in the classroom throughout the school year (Coplan, 2000; Coplan et al., 2001; Coplan & Rubin, 1998; Rimm-Kaufmann & Kagan, 2005). Children displaying greater social reticence also display poorer social and academic competence as rated by parents, teachers, and direct assessment (Coplan et al., 2001). Therefore, it is possible that shyness influences academic achievement indirectly through its influence on social-emotional development in the classroom (Henderson & Fox, 1998), rather than a reticence to interact with an unfamiliar assessor.

Self-Regulation. The second domain of temperament is self-regulation. Self-regulation functions to modulate or manage a child's reactivity (Rothbart & Bates, 2006; Rothbart & Derryberry, 2002). There are various dimensions of self-regulation, such as effortful, or voluntary, control, which describes the ability to plan, detect errors, and inhibit a dominant response in favor of a subdominant response (Jones, Rothbart, & Posner, 2003). Emotion regulation is a child's ability to modulate internal emotions and includes children's attempts to regulate internal states through physiological, attentional, motivational and behavioral methods (Eisenberg & Spinrad, 2004). Behavioral regulation is another dimension describing the skills necessary for success in all contexts, such as paying attention, following directions and instructions, and inhibiting inappropriate actions (McClelland, Cameron, Wanless, & Murray, 2007). The current study will combine cognitive dimensions of regulation including interest-persistence, attention span, and effortful control to create an overall measure of cognitive self-regulation.

Self-regulation and social and academic adjustment. Various studies have examined the relations between self-regulation and social and academic adjustment, however, studies have used different dimensions of self-regulation. A recent study examined the influence of self-regulation, composite formed from measures of cognitive and emotional self-regulation, on various measures of adaptive functioning in a cross-sectional study of 8- to 18-year-old low-income children (Buckner, Mezzacappa, & Beardslee, 2009). The authors found that self-regulation was positively associated with maternal report of social competence, direct assessment of academic achievement, and grades and negatively associated with problem behaviors, and self- and maternal-report of depression and anxiety. Other studies have also examined specific aspects of self-

regulation and their relations to academic and social adjustment. Behavioral self-regulation is associated with teacher report and direct assessment of achievement in areas such as math and sound awareness (Matthews, Ponitz, & Morrison, 2009). Behavioral regulation positively predicted literacy, vocabulary, and math in the fall and spring of preschool after controlling for age, gender, and language in which the child was assessed (McClelland et al., 2007). Furthermore, increases in children's ability to regulate their behaviors were associated with growth in literacy, vocabulary, and math across the preschool year (McClelland et al., 2007). Another study found that cognitive regulation, measured in the fall of kindergarten, predicted better academic achievement but not interpersonal skills in the spring (Ponitz, McClelland, Matthews, & Morrison, 2009).

Perhaps children's peer interactions in the classroom mediate the relation between self-regulation and academic achievement. Valiente, Lemery-Chalfant, Swanson, and Reiser (2008) found that social competence partially mediated the associations between effortful control and change in GPA in 7- to 12-year-old children. It is important to investigate the specific aspects of social competence (e.g., SPS abilities, prosocial behavior) that may be responsible for this association. The current study extended this finding by examining whether children's SPS abilities, specifically, mediate the associations between self-regulation and children's social and academic outcomes.

Social Problem-Solving as a Mechanism Linking Temperament to Adjustment

One of the first social tasks presented to a child at the beginning of the school year is to meet, approach, and interact with unfamiliar peers and adults and to become integrated into a developing network of peer relationships (see Ladd, Birch, & Buhs, 1999; Ladd, Herald, & Kochel, 2006). A variety of studies suggest that the ability to

easily engage with peers in a socially competent manner is an important factor contributing to children's early adjustment to the classroom setting. One aspect of children's social competence that may influence adjustment is the ability to solve problems during challenging social interactions. Social problem-solving (SPS) abilities have been defined as the strategies used to achieve a personal goal (e.g., strategies for getting a peer to comply during challenging social interactions) and successful outcomes of these strategies (e.g., successfulness of the initiations made to get peer to comply) during social situations (Rubin & Krasnor, 1986). SPS skills appear to develop and function independently of IQ (Janusz, Kirkwood, Yeates, Taylor, 2002).

SPS skills are important for young children's adjustment in school, as peer interaction and conflict are a daily occurrence in day care and school settings. One study found that third through fifth grade children's SPS skills were related to their behavioral adjustment and GPA (Dubow & Tisak, 1989). Moreover, as children develop more competent SPS skills over time, they are rated as better adjusted behaviorally and academically (Dubow, Tisak, Causey, Hryshko, & Reid, 1991).

Shyness and Social Problem-Solving. This study examined whether observations of children's SPS skills mediate the relations between temperament and social and academic outcomes, as researchers suggest that children's SPS competency is an important developmental correlate of social and academic adjustment in school. In a recent study, Moas, Henderson, Degnan, and Fox (under revision) examined the influence of temperament on children's SPS by longitudinally observing children's SPS skills from two through four years of age. Two same-sex children, unfamiliar with one another, were brought to the laboratory to participate in various tasks. During one task, a

toy was brought into the room and the children were instructed to share and take turns. Moas et al. found that maternal report of 2-year shyness predicted less time spent engaged with the toy and fewer attempts to get the toy from a peer across all ages. Of the attempts made to get the toy, shy children's attempts were significantly less active and more passive than less shy peers at all ages, although shyness did not relate to their rates of success. Thus, it appears that the inhibited nature of shy children and their reticence in social encounters influence their SPS skills in challenging social situations.

Shyness is one aspect of social withdrawal, which is behavioral solitude or children that play alone rather than with other children (Rubin & Asendorf, 1993; Rubin Coplan, & Bowker, 2009). Rubin and colleagues have found that social withdrawal in preschool-aged children was associated with poor problem-solving skills (Rubin & Borwick, 1984; Rubin, Daniels-Bierness, & Bream, 1984). Similar to our findings in younger children, socially withdrawn children's requests in a challenging social situation were less assertive, less direct, and more likely to fail, than peers that are more sociable. Likewise, Stewart and Rubin (1995) found in a cross-sectional study that children who were socially withdrawn in kindergarten, second grade, and fourth grade were less likely to initiate interactions with an unfamiliar peer and made fewer SPS attempts than more sociable peers at each age. Of the attempts that were made, withdrawn children made more indirect requests, fewer commands, and were more likely to fail than sociable peers, suggesting that they were more likely to use subtle means to attain their goals (Stewart & Rubin, 1995).

In summary, it appears that as early as toddlerhood, shy children approach socially challenging situations more passively than their peers and later experience less

success in attaining their social goals, suggesting that shy children have difficulty executing socially assertive and competent social initiations. It is likely that shy children are capable of generating competent strategies to solve social problems, however, have difficulty developing competent ideas into competent behaviors (Rubin & Rose-Krasnor, 1992; Wichmann, Coplan, & Daniels, 2004). This suggests that shy children may be at an increased risk for social and academic maladjustment given their difficulty interacting with peers. Since shy children display deficits in their SPS skills and SPS skills have been linked to behavioral and academic adjustment (Dubow, Tisak, Causey, Hryshko, & Reid, 1991), SPS skills may be one of the mechanisms through which temperament influences school adjustment. Thus, this study focused on SPS observations rather than standard interview measures that use responses to hypothetical vignettes, in order to capture children's *actual* behavioral responses during a challenging social situation.

Self-regulation and Social Problem-Solving. It has been suggested that the combination of a child's reactivity and regulation may be a better predictor of social outcomes than either one alone (Eisenberg et al., 1997). While various studies have examined the association between shyness and SPS outcomes, fewer studies have examined the influence of self-regulation on SPS. As previously mentioned, Buckner, Mezzacappa, and Beardslee (2009) examined the influence of self-regulation on various measures of adaptive functioning in a cross-sectional study of 8- to 18-year-old low-income children. In this study, Buckner et al. (2009) also measured children's social problem solving by asking them how they responded to three specific life events they had experienced in the last 12 months as well as to three hypothetical events. Their responses were coded as adaptive (e.g., the child is told to imagine their mother no longer wants

him or her to play with a best friend, the child might respond that s/he would talk to their mother about the situation) or maladaptive (e.g., yell at their mother or demand they should play with their friend). Results indicated that children with better self-regulation, created as a composite of cognitive and emotional regulation, gave more adaptive responses for both hypothetical and retrospective events than children with poorer self-regulation (Buckner, Mezzacappa, & Beardslee, 2009). Therefore, while shyness may negatively influence social and academic outcomes, self-regulatory abilities may serve as a protective factor for these outcomes.

Moas and Henderson (under revision) reanalyzed the NICHD data set on early childcare to examine the contributions of both preschool shyness and self-regulation to SPS in preschool and academic skills in both kindergarten and first grade. The authors found that higher ratings of shyness by parents and teachers predicted less SPS competence, however, higher ratings of self-regulation predicted higher SPS competence. They also found links between temperament, SPS, and academic outcomes. Specifically, there was evidence that SPS skills mediated the relations between both shyness and self-regulation on teacher report of children's math and language abilities in kindergarten and first grade (Moas & Henderson, under revision). Interestingly, the mediation model for shyness indicated no direct effect of shyness on academic skills (Moas & Henderson, under revision). These results taken together with other studies finding a total effect of shyness on academic skills (e.g., Coplan et al., 2001), suggests that the relation between shyness and academic skills was fully mediated by SPS skills (Moas & Henderson, under revision). On the other hand, there was still a direct effect of self-regulation on academic skills, suggesting partial mediation. The current study sought to extend these findings by

1) examining adjustment in the social domain, 2) using a longitudinal design spanning a longer age range (ages two through seven) and 3) utilizing observations of SPS rather than a hypothetical interview.

Gender Differences

Various studies have examined mean level differences between boys' and girls' temperament, SPS, and social and academic outcomes. Minimal to no differences have been found between boys and girls on the dimension of shyness, however, girls tend to score higher than boys on various dimensions of self-regulation (Else-Quest, Hyde, Goldsmith, & Van Hulle, 2006; Rubin, Coplan & Bowker, 2009). In a meta-analysis, Else-Quest et al. (2006) examined sex differences in temperament, and found that girls are rated as better able to regulate their attention and impulses. Furthermore, Matthews, Ponitz, and Morrison (2009) found that girls were more regulated than boys on a direct assessment and a teacher report measure of behavioral regulation. Studies that examined sex differences in SPS have found that girls give more alternate solutions to hypothetical social problem scenarios and are less likely to use aggressive strategies than boys (Rubin & Krasnor, 1983). Similarly, Walker, Irving, and Berthelsen (2002) found that girls' responses to hypothetical social problem scenarios were more competent and they were less likely to report using retaliation or aggression than boys. Overall, girls tend to be rated as more socially competent by mothers and day care teachers than boys between the ages of 12 and 36 months (Carson, Wagner, & Schultz, 1987).

Findings regarding gender differences in academic skills are mixed. One study examined child, teacher and parent report, and direct assessment of academic skills in children from kindergarten to fifth grade (Herbert & Stipek, 2005). Results indicated that

teachers agreed with direct assessments on math and literacy ability, finding no gender differences on math yet girls scoring higher on literacy than boys. Parent and child ratings of academic skills were discrepant with teacher report and direct assessment, such that parents' reports and children's self-reports revealed no gender differences on literacy, however, boys scored higher on math (Herbert & Stipek, 2005). Another study found no gender differences on five scales of the Woodcock-Johnson III Tests of Achievement (Matthews, Ponitz, & Morrison, 2009).

Others have found girls to outperform boys in many subjects. A cross-sequential study examined three cohorts of children in three waves of data collection over 18 months: Children in fourth, fifth, and sixth grade (Pomerantz, Altermatt, & Saxon, 2002). They found that girls had better grades in language, social studies, math, and science compared to boys. They also found that the stability of results were different based on subject area. That is, while an advantage for girls in science increased over time, their advantage in math decreased, yet differences in language and social studies remained stable (Pomerantz, Altermatt, & Saxon, 2002).

While mean levels of temperament, SPS, and academic skills may differ between boys and girls, little is known about whether the paths linking these constructs also differ between children. Coplan, Gavinski-Molina, LaGacé-Séguin, and Wichman (2001) found that displays of reticent behavior in the kindergarten classroom are positively associated with shyness and negatively associated with social and academic competence in both boys and girls. In addition, Moas & Henderson (under revision) found that while some mean differences existed between boys and girls, the direction and magnitude of the associations between temperament, SPS, and academic achievement were similar for

boys and girls. The current study extended previous findings by longitudinally examining whether the associations between temperament, SPS, and academic and social adjustment differed for boys and girls (see Figure 1).

Current Study

The current study adds to the developmental literature by 1) examining the contribution of both shyness and self-regulation to social and academic adjustment, 2) using an observational measure of SPS behaviors in order to capture children's actual behaviors, 3) examining the relation between the predictors and mediator on both social and academic adjustment, and 4) utilizing a longitudinal design which followed the children from two- to seven-years of age. It was expected that *shyness*, measured at 2, 3, and 4 years, would negatively predict 5-year *SPS* abilities while *self-regulation* would positively predict *SPS* abilities. I expected to find a direct effect of toddler shyness on 7-year *social* but not *academic adjustment*. In addition, I expected a direct effect of self-regulation on both 7-year social and academic adjustment. It was also expected that children's *SPS* would mediate the relation between temperament and *social* and *academic adjustment* (see Figure 1). Based on the results of Coplan et al. (2001) and Moas and Henderson (under revision), I did not expect the associations between the constructs to differ for boys and girls.

CHAPTER 2: METHOD

Participants

Two hundred and seventy children (126 males, 144 females) were included in the current study. Children were brought to the laboratory at the University of Maryland at the ages of two ($M = 2.18$, $SD = 0.21$), three ($M = 3.10$, $SD = 0.13$), four ($M = 4.12$, $SD = 0.11$), five ($M = 5.30$, $SD = 0.32$) and seven ($M = 7.84$, $SD = 0.31$). Child ethnicity was reported as follows: 66% Caucasian, 13% African-American, 14% multiracial, 3% Hispanic, 2% Asian, and 2% as other. Mothers participating in this study represented a highly educated sample. Sixteen percent of the mothers graduated from high school, 42% from college, 37% from graduate school, 4% from other educational programs, and 1% did not report.

Children participating in this study were recruited at the age of 4 months based on their temperament to participate in a longitudinal study in the Child Development Laboratory at the University of Maryland (see Hane, Fox, Henderson & Marshall, 2008). Participants were recruited by letters sent to parents in the community using commercially available mailing lists. Interested parents contacted the laboratory to schedule a visit for their child. Children returned to the laboratory at various time points to participate in electrophysiological assessments, peer interactions, and mother-child interactions.

Two hundred and ninety-one target children were enrolled in the larger study at 4 months of age. Twenty children were missing data at all ages on constructs of interest to the current study. *Mplus* 6.0 uses full information maximum likelihood (FIML) to estimate parameters (Muthén & Muthén, 1998-2010), thus, only cases with missing data

on all variables are excluded from analyses. Furthermore, one case was found to be an outlier and excluded from analyses. Therefore, two hundred and seventy children were included in analyses. See Table 1 for the number of children with data at each time point. Children with missing data on all variables and the outlier case were compared to children with at least some data. No differences were found between the groups on gender, $\chi^2(1, N = 291) = .11, p = .74$, child ethnicity, $\chi^2(5, N = 291) = 8.26, p = .14$, or maternal education, $\chi^2(1, N = 289) = 1.90, p = .17$.

At the 5-year visit, target children were randomly paired with a same-sex, same-age unfamiliar peer from the community to participate in various social activities. The pairing was random rather than based on temperament because the goal of this pairing strategy was to mirror the natural variation in peer interaction typical of school and other social settings. Furthermore, behavioral displays of social withdrawal during peer play are not influenced by peer temperament (Moas et al., in preparation). There were no differences between target children recruited in infancy and children recruited as control peers from the community on age, $t(410) = -.08, p = .94$, gender, $\chi^2(1, N = 412) = .01, p = .92$, ethnicity, $\chi^2(4, N = 412) = 2.15, p = .71$, maternal education, $\chi^2(4, N = 410) = 4.00, p = .41$, SPS behaviors (p 's $> .05$), or maternal report of shyness (p 's $> .05$) and self-regulation (p 's $> .05$) at 5 years using the appropriate scales from the Children's Behavior Questionnaire and the Colorado Child Temperament Inventory¹.

¹ Maternal report of temperament was also collected at the age of five. However, it was only used to compare target children and control peers and was not included in analyses to preserve temporal order in the models.

Procedure

Maternal report of temperament was collected using the Toddler Behavior Assessment Questionnaire (Goldsmith 1996) at 2 and 3 years, the Colorado Child Temperament Inventory (Buss & Plomin, 1984; Rowe & Plomin, 1977) at ages 3 and 4, and the Children's Behavior Questionnaire (Rothbart, Ahadi, Hershey, & Fisher, 2001) at age 4. Temperament questionnaires were selected at each age to reflect age-appropriate behaviors. See Table 1 for descriptive statistics and internal consistencies for the current sample.

At the 5-year visit, target children and control peers met for the first time during an unstructured 10-minute play session that was followed by a 5-minute clean-up task prior to the SPS task. During the SPS task, the two children were seated at a small table in a laboratory playroom. The experimenter came into the room, gave the children a Nintendo DS, and told them that there was only one so they had to share and take turns. They were given 5 minutes to play and negotiate during this task. Their problem solving behaviors were recorded from behind a one-way mirror and digital videos were sent to the University of Miami for behavioral coding.

Social adjustment measures included The Friendship Quality Questionnaire (Parker & Asher, 1993), The Peer Social Support, Bullying, and Victimization questionnaire (Ladd, Kochenderfer, & Coleman, 1996; Kochenderfer & Ladd, 1997), and The Children's Loneliness Questionnaire (Asher, Hymel, & Renshaw, 1984). These measures were collected during a laboratory visit at age 7 via self-report interview. Academic achievement was directly assessed by trained graduate students and research

staff using the Woodcock-Johnson III Achievement Test (Woodcock, McGrew, & Mather, 2001) during a laboratory visit at age 7.

Measures

Temperament. The Toddler Behavior Assessment Questionnaire (TBAQ; Goldsmith 1996) is a 108-item parent questionnaire used to measure toddler temperament at ages 2 and 3. The TBAQ measures five dimensions of temperament in 16- to 36-month-old children: Activity level, pleasure, social fearfulness, anger proneness, and interest/persistence, using 7-point Likert scales (Goldsmith, 1996). Of particular interest in the current study was the dimension of social fearfulness, used as a measure of shyness and the dimension of interest/persistence, used as a measure of self-regulation. The social fearfulness scale measures inhibition, distress, and shyness in novel situations and the interest/persistence scale measures the amount of engagement on a task during solitary play (Goldsmith, 1996).

Goldsmith (1996) found that the TBAQ shows good convergent validity with the three most commonly used English language toddler temperament questionnaires (Infant Characteristics Questionnaire, Toddler Temperament Scale, EASI Temperament Survey for Children). Specifically, the social fearfulness scale correlated strongly with the Approach/Withdrawal scale on the Toddler Temperament Scale and moderately with the EASI Sociability scale. The five dimensions of the TBAQ temperament scales are independent of each other, supporting its discriminant validity. Internal consistency estimates were .83 and .87 for social fearfulness and .79 and .89 for the interest/persistence across different samples of toddler. In the current sample, internal

consistency estimates were .78 for social fearfulness at age 2 and .85 and .84 for social fearfulness and interest/persistent at age 3.

The Colorado Child Temperament Inventory (CCTI; Buss & Plomin, 1984; Rowe & Plomin, 1977) was used as a maternal report measure of temperament. The CCTI has 30 items, answered on a 5-point Likert scale, and yields scores on six dimensions of temperament: sociability, emotionality, activity, attention-span/persistence, soothability, and shyness. It was created based on factor analyses of temperament items from the New York Longitudinal Study (NYLS) and the emotionality, activity, sociability, and impulsivity (EASI) measures. The scale was validated for use with children 1- to 6-years of age and has good internal consistency and discriminant validity (Rowe & Plomin, 1977). The shyness and attention-span dimensions will be used as indicators of shyness and self-regulation, respectively. In the current sample, internal consistency estimates were .86 and .87 for shyness and attention-span at age 3 and .87 and .71 for shyness and attention at age 4.

The Child Behavior Questionnaire (CBQ) is a 236-item maternal report measure of temperament collected at age 4 (Rothbart, Ahadi, Hershey, & Fisher, 2001). The CBQ was developed to assess temperament in 4- to 7-year-old children. Items are answered on 7-point Likert scale, with one being extremely untrue and seven being extremely true. The measure gives scores on 15 scales: approach, high intensity pleasure, smiling and laughter, activity level, impulsivity, shyness, discomfort, fear, anger/frustration, sadness, falling reactivity, soothability, inhibitory control, attentional focusing, low intensity pleasure, and perceptual sensitivity. The shyness dimension, measuring slow or inhibited approach in novel situations, was used as an indicator of shyness. Factor analysis during

measure construction revealed a 3-factor solution of the items: Extraversion/surgency, negative affectivity, and effortful control. The effortful control factor combines information of various regulatory dimensions such as attentional focusing and inhibitory control, and thus will be used as a measure of self-regulation.

Convergent validity was established by examining temperament and socialization-relevant traits, internal consistency was established and parental agreement was also found to be high (Rothbart et al., 2001). Content validity was established based on Rothbart's theory of temperament, other measures of temperament, and parent interviews (Rothbart et al., 2001). In the current sample, internal consistency estimates were .93 and .83 for shyness and effortful control, respectively.

Social Problem-Solving Behaviors. Behavioral coding at age 5 was based on the coding scheme used by Rubin and Krasnor (1983) and Stewart and Rubin (1995). Three trained research assistants watched and coded the children's behaviors during an SPS task using an event-based coding scheme. Coders included the author (primary coder) and two trained undergraduate research assistants. In order to assess inter-rater reliability, coders overlapped on 47% of total coded cases. Disagreements on these double-codes were resolved through discussion.

Event-based codes were used to classify each social initiation made by a child. Each initiation was classified as an (1) attempt to get the toy, or (2) other initiation. An attempt to get the toy was defined as an attempt made by the child not in possession of the toy to gain control and/or make it clear to the child playing with the toy, that he or she wanted a turn. Other initiations were defined as any positive or prosocial initiation made that is not in regards to getting the toy. Examples included verbal initiations to share and

comments unrelated to the toy. Inter-rater reliability (Intraclass correlations) between the coders was .91 for attempts to get the toy and .87 for other initiations.

Each attempt to get the toy was coded in terms of the strategy used: Passive (pointing, hovering, or touching), active (shoving, hitting, grabbing, or taking), or verbal (asking or telling). Inter-rater reliability (Intraclass correlations) between the coders was .77 for passive, .93 for verbal, and .86 for active attempts. Each attempt was also classified by the method used: object acquisition, stop action, or agonistic. An attempt was coded as a stop action if it intended to stop the action of the child dominant over the toy. For example, a touch was classified as a stop action if the child touched the power button and turned off the toy, preventing the other child from using it. A touch was coded as object acquisition if the child touched any other part of the toy in an attempt to get the toy but not necessarily stop the action of the child currently playing with the toy. An attempt was coded as agonistic if the child used aggressive means to get the toy. Inter-rater reliability (Intraclass correlations) between the coders was .67 for stop action, .91 for object acquisition, and .62 for agonistic attempts.

Each initiation was also coded in terms of outcome. Specifically, each attempt to get the toy was coded as successful (i.e., when a child made an initiation and subsequently acquired the toy) or unsuccessful (i.e., when a child made an initiation and did not get the toy) were coded. Inter-rater reliability (Intraclass correlations) between the coders was .94 for successful attempts.

Social Adjustment. The Friendship Quality Questionnaire (FQQ; Parker & Asher, 1993) assesses six qualitative aspects of friendship. The FQQ is a 29-item self-report scale measuring the quality of a child's relationship with a friend. Responses are

coded on a 5-point Likert scale (1= not at all true, 5 = really true). Six subscales were identified using principle-components analyses: Validation and caring, conflict resolution, conflict and betrayal, help and guidance, companionship and recreation, and intimate exchange. Internal consistencies for each subscale (Cronbach's α) ranged from .73 to .90. Moderate to high correlations were found between the subscales, with the conflict and betrayal subscale correlating negatively with the others (Parker & Asher, 1993). In the current sample, internal consistency estimates ranged from .53 to .84.

The Peer Social Support, Bullying, and Victimization questionnaire is composed of 18-items drawn from three other questionnaires by Ladd and colleagues that was used in the NICHD Study of Early Child Care and Youth Development (Ladd, Kochenderfer, & Coleman, 1996; Kochenderfer & Ladd, 1997; NICHD Study of Early Child Care and Youth Development). This self-report measure captures aspects of the social environment in the child's classroom such as social support received at school, engagement in physical and verbal bullying behavior, and perceived victimization. Responses are coded on 5-point Likert scales (1 = Never, 5 = Always) reflecting how often certain events occur in the classroom. Three subscales are created with moderate to high internal reliability: Social support from peer (Cronbach's $\alpha = .92$), engagement in bullying behavior (Cronbach's $\alpha = .78$), and perceived victimization (Cronbach's $\alpha = .81$). In the current sample, internal consistency estimates were .86 for social support, .86 for bullying, and .72 for peer victimization.

The Children's Loneliness Scale (Asher, Hymel, & Renshaw, 1984) is a 24-item scale measuring self-perceived feelings of loneliness and social dissatisfaction. The scale contains 16 items relating to loneliness and social dissatisfaction and 8 filler items. These

eight filler-items were designed for children to feel open and relaxed, subsequently answering items more accurately. Responses are coded on 3-point Likert scales determining whether each item is not true (1) sometimes true (2) or true (3) of themselves. Using a sample of 506 children, this scale was validated for use with children in the third thru sixth grade. Factor analysis revealed a single factor composed only of the 16 loneliness items. The scale was found to be internally consistent (Cronbach's $\alpha = .90$) and reliable (split-half correlations = .83, Spearman-Brown reliability = .91, Guttman split-half reliability = .91). Loneliness correlated negatively with friendship nominations and play ratings from same-sex peers (Asher, Hymel, & Renshaw, 1984). In the current sample, internal consistency was .67 for loneliness.

Academic Adjustment. Four subscales from the Woodcock-Johnson III Tests of Achievement (WJ III ACH; Woodcock, McGrew, & Mather, 2001) were administered by trained graduated students and research staff to gather information on children's academic achievement. The four subscales were letter-word identification, math calculation, passage comprehension, and applied problems. Letter-word identification measures a participant's skill in identifying words, without requiring the child to know the meaning of the word. Calculation measures the performance of math computation and is therefore, a test of math achievement. Passage comprehension requires that participants point to a picture representing a phrase and identifying missing words within a passage. The applied problems subtest requires participants to analyze and solve mathematical problems. Internal consistency was .91, .85, .83, and .92 for each subscale, respectively, for children ages 5 to 19 (Mather & Woodcock, 2001). These four subscales were

selected as they represent the academic skills and academic applications clusters of the WJ III ACH (Mather & Woodcock, 2001).

The WJ III ACH can be used in various settings, such as educational, clinical, and research settings and has been found to show good internal consistency and test-retest reliability (Mather & Woodcock, 2001; McGrew & Woodcock, 2001). Furthermore, it is age-normed for use with children 2 years of age through adults over the age of 90 and has shown excellent predictive validity across the lifespan (Mather & Woodcock, 2001; McGrew & Woodcock, 2001). Standard scores were calculated by the author using the Compuscore and Profiles Program (Schrank, & Woodcock, 2001).

Analytic Strategy

Prior to statistical analyses, associations between demographic and study variables were examined using correlations, t-tests, and MANOVA analyses. To test the hypothesized associations between temperament, SPS, and adjustment outcomes, a structural equation model (SEM) was analyzed using *Mplus* Version 6 (Muthén & Muthén, 1998-2010). Latent factors of shyness, self-regulation, SPS delay, academic achievement, and social adjustment were created to combine information from multiple informants and time points. The latent variables of shyness and self-regulation were then included in the model as predictors, SPS delay and the use of verbal strategies as mediators, and academic achievement and social adjustment as outcomes. Direct effects of temperament on SPS and adjustment variables, as well as direct effects of SPS on adjustment variables were tested. Indirect effects of the temperament variables on academic and social adjustment through SPS variables were also tested. A multiple group analysis was also examined to determine whether boys and girls differed on loadings and

paths. To test this, a multiple group analysis was conducted with all loadings and paths constricted to be equal between boys and girls. Then loadings for each latent variable or path were allowed to vary. A change in chi-square was evaluated for each parameter to determine whether the constricted model was a better fit than the model allowing the parameter to be free to vary. A non-significant change in chi-square suggests that the constricted model results in a better fit.

CHAPTER 3: RESULTS

Descriptive Statistics and Preliminary Analyses

Descriptive statistics for all variables are displayed in Table 1. Diagnostic analyses revealed that all variables had normal levels of skewness. Variables were also examined to identify outliers using Cook's D. One case was found to be influential on various variables used in analyses. Therefore, as previously mentioned, one child was not included in analyses.

Analyses were conducted to determine whether age, sex, ethnicity, or maternal education was related to any of the outcomes or predictors. First, age at each visit was correlated with variables collected at that time point (e.g., age at the 2-year visit was correlated with shyness at age two). Correlations indicated that age was not associated with any of the variables (p 's all $> .05$). Furthermore, multivariate analyses of variance revealed that neither maternal education nor ethnicity were related to any of the study variables (p 's all $> .05$).

Paired samples t -tests were conducted to determine whether sex differences existed on the variables. Results revealed significant differences only for validation and caring, $t(170) = -2.06, p = .04$; intimate disclosure, $t(169) = -2.39, p = .02$; and social support, $t(171) = -2.82, p = .005$, with girls rating themselves higher on validation and caring ($M = 2.96, SD = .98$), intimate disclosure ($M = 2.25, SD = 1.13$), and social support ($M = 4.15, SD = 0.66$) than boys ($M = 2.64, SD = 1.05$; $M = 1.82, SD = 1.18$; $M = 3.83, SD = 0.82$).

Structural Equation Modeling

Measurement model. Two latent variables were created using the maternal report of temperament data. The first latent variable was composed of TBAQ social fearfulness at ages 2 and 3, CCTI shyness at ages 3 and 4, and CBQ shyness at age 4. In order to account for shared method variance, since the TBAQ and CCTI were used at two ages and shyness data was collected twice at two of the ages, the errors of various indicators were collected. Specifically, the error of the TBAQ social fearfulness at age 2 years was correlated with the TBAQ error at age 3 ($r = .25, p = .005$), TBAQ age 3 shyness was also correlated with age 3 CCTI shyness ($r = -.02, p = .89$), CCTI shyness at age four was correlated with both the errors of age three CCTI shyness ($r = .34, p < .001$) and age four CBQ shyness ($r = .64, p < .001$). Despite the non-significant error correlation between age 3 CCTI shyness and age 3 TBAQ shyness, this correlation was retained in the model due to an improvement in model fit. Unstandardized loadings for the shyness variables were 1.00 for age 2 TBAQ social fearfulness, 1.63 for age 3 TBAQ social fearfulness, 1.25 for age 3 CCTI shyness, 1.41 for age 4 CCTI shyness, and 2.32 for age 4 CBQ shyness. See Figure 2 for standardized estimates.

The second latent variable was composed of TBAQ interest-persistence at 3, CCTI attention-persistence at ages 3 and 4, and CBQ effortful control at age 4. Age two interest persistence was dropped from the measurement model due to a very low loading (Loading $< .4$). Errors of CCTI attention-persistence at age four was correlated with errors of CCTI attention-persistence at age three ($r = .34, p < .001$) and effortful control at age four ($r = .31, p < .001$) due to shared method variance. Errors of the two age 3 self-regulation indicators were not correlated because the correlation was not significant and

retaining the error correlation in the model did not result in an improvement in model fit. Unstandardized loadings for the self-regulation variables were 1.00 for age 3 TBAQ interest persistence, .59 for age 3 CCTI attention-persistence, .56 for age 4 CCTI attention-persistence, and .47 for age 4 CBQ effortful control.

One mediating latent variable was created based on the age five SPS observational data. The mediator was labeled SPS delay and was composed of the amount of time in seconds it took for the target child to gain possession of the toy (i.e., latency) and the amount of time in seconds the child was engaged with the toy. Unstandardized loadings for the SPS variables were 1.00 for latency and -.81 for time engaged. See Figure 3 for standardized estimates. Exploratory and confirmatory factor analyses revealed a second SPS latent variable composed of attempts to get the toy, object acquisition, and the use of verbal strategies. While there was statistical evidence for the formation of this latent, conceptually it made more sense to only use verbal strategies as an indicator in the structural model as the use of verbal initiations are considered the foundation for social play and competent peer interactions (Eisenberg et al., 1994).

Two dependent latent variables were created based on the academic achievement and social adjustment data collected at the age of seven. The first latent variable was called academic achievement and was composed of the four tests collected from the Woodcock-Johnson: Letter-word identification, math calculation, passage comprehension, and math applied problems. Errors of math calculation and applied problems were correlated ($r = .51, p < .001$) and errors of the language variables were correlated due to shared method variance ($r = -.43, p = .99$). Unstandardized loadings for

the academic achievement variables were 1.00 for letter-word identification, .99 for calculation, .94 for passage comprehension, and .85 for applied problems. See Figure 4 for standardized estimates.

The second latent dependent variable was labeled social adjustment and was composed of companionship, validation and caring, help and guidance, and intimate disclosure from the Friendship Quality Questionnaire and social support from the Peer Social Support, Bullying, and Victimization questionnaire. The errors of caring were correlated with the error of companionship ($r = .54, p < .001$) and the errors of intimate disclosure was correlated with help and guidance ($r = .30, p < .001$). The loneliness score from the Children's Loneliness Scale did not load onto the social adjustment latent variable. Unstandardized loadings for the social adjustment indicators were 1.00 for companionship, 1.72 for validation and caring, 1.06 for help and guidance, 1.24 for intimate disclosure, and 1.05 for social support.

Model fit for the measurement model was good, $\chi^2(150) = 168.62, p = .14$, CFI = .99, RMSEA = 0.02 with CI_{95%} from .00 to .04, and SRMR = 0.06.

Structural model: Direct effects on adjustment. As expected, ratings of shyness were not associated with academic skills ($b = .001, SE = .10, p = .97$) and self-regulation was positively related to academic achievement ($b = .31, SE = .11, p = .005$). Contrary to expectations, however, neither shyness ($b = .05, SE = .10, p = .58$) nor self-regulation ($b = .006, SE = .10, p = .95$) were related to social adjustment. In order to control for mean differences in the indicators composing social adjustment, sex was included in the model and was significantly related to social adjustment ($b = .19, SE = .08, p = .01$). Neither SPS delay ($b = -.14, SE = .12, p = .25$) nor the use of verbal strategies ($b = -.08, SE = .09$,

$p = .41$) were directly related to academic achievement. Similarly, neither SPS delay ($b = -.10, SE = .11, p = .33$) nor the use of verbal strategies ($b = -.06, SE = .11, p = .55$) were related to social adjustment. See Figure 5 for standardized estimates.

Structural model: Direct effects on SPS. Interestingly, both shyness ($b = .26, SE = .10, p = .01$) and self-regulation ($b = .24, SE = .09, p = .005$) were positively related to SPS delay. That is, children high on self-regulation were more likely to wait and spent less time playing with the toy compared to less regulated peers. Contrary to expectations, however, neither shyness ($b = .03, SE = .08, p = .74$) nor self-regulation ($b = .13, SE = .08, p = .12$) were related to the use of verbal strategies.

Structural model: Indirect effects. There were no indirect effects of shyness on academic achievement ($b = -.04, SE = .04, p = .31; b = -.002, SE = .01, p = .75$) or social adjustment ($b = -.03, SE = .03, p = .35; b = .001, SE = .003, p = .90$) through SPS delay or the use of verbal strategies, respectively. There were no indirect effects of self-regulation on academic achievement ($b = -.03, SE = .03, p = .31; b = -.01, SE = .01, p = .48$) or social adjustment ($b = -.03, SE = .03, p = .37; b = .001, SE = .01, p = .90$) through SPS delay or the use of verbal strategies, respectively.

Structural model: Model fit. While the chi-square fit statistic indicated poor model fit, $\chi^2(184) = 250.20, p < .001$, the following fit indices provide evidence for good model fit: CFI = .97, RMSEA = 0.04 with $CI_{95\%}$ from .02 to .05, and SRMR = 0.06. Therefore, this model was retained as the final model. R^2 for the latent factor of academic adjustment was .10, meaning that 10% of the variance in academic adjustment was explained by the model. R^2 for the latent factor of social adjustment was .05, meaning that 5% of the variance in social adjustment was explained by the model.

Multiple Group Analysis

Change in chi-square was examined to determine whether boys and girls differed on loadings or paths. As expected, results revealed that chi-square change tests were all non-significant (p 's > .05), meaning that the associations between the variables were the same for boys and girls. Therefore, the more parsimonious model described above was retained as the final model.

CHAPTER 4: DISCUSSION

The purpose of the current study was to longitudinally examine the direct and indirect effects of temperament on academic and social adjustment. Results indicated that temperament is an important child characteristic related to children's SPS behavior and academic success over time. Specifically, maternal report of temperament in the toddler and preschool years was related to SPS behavior at age 5 and academic achievement at age 7. These results provide evidence for the importance of examining the lasting effects of temperamental reactivity and self-regulation on children's social and academic development.

The temperament measures at the ages of 2, 3, and 4 came together to form shyness and self-regulation latent variables. This is consistent with the past literature documenting that maternal reports of shyness are relatively stable across development, especially between 2 and 4 years of age (Lemery, Goldsmith, Klinnert & Mrazek, 1999). This stability is also evidenced by the fact that children rarely change from one extreme of observed social withdrawal versus sociability to the other (Fox et al., 2001; Pfeifer et al., 2002), and when assessed in toddlerhood are likely to respond similarly within a few years of assessment and even into adulthood (Caspi & Silva, 1995; Caspi et al., 2003; Rothbart, Ahadi, & Evans, 2000). In contrast to temperamental reactivity and consistent with the measurement model, self-regulation significantly develops over the toddler and early school years, particularly after age three (Posner & Rothbart, 2000; Rothbart, Ellis, Rueda, & Posner, 2003; Rothbart & Rueda, 2005) and is more amenable to training (Rueda, Rothbart, McCandliss, Saccomanno, & Posner, 2005). In the absence of training or intervention, individual differences in self-regulation remain stable over the lifespan

(Rothbart et al., 2003). Taken together, the measurement model for temperament provides further evidence for the stability of both shyness and self-regulation over the toddler and preschool years.

In contrast to several prior studies reporting significant associations between shyness and academic achievement or school readiness (Asendorff & van Aken, 1999; Coplan et al., 2001), early shyness was unrelated to academic achievement at 7 years of age in the current study. It is possible that there were no direct effects of shyness on academic achievement because children were tested using a direct assessment of academic achievement. Hughes and Coplan (2010) examined the relations between shyness and academic achievement, using both teacher-report and direct assessment of academic achievement. They found that shyness was related to teacher-report but not direct assessment of academic achievement and concluded that shyness may inhibit children's academic performance in the classroom, possibly biasing teacher perception of shy children's achievement (Hughes & Coplan, 2010). Crozier and Hostettler (2003), however, found that shy children perform better in a more anonymous group condition rather than direct assessment. They concluded that shy children may be more comfortable in a group rather than being singled out and tested by an unfamiliar assessor (Crozier & Hostettler, 2003). In the current study, however, children were examined by an experimenter after interacting with the experimenter for various tasks. Therefore, the assessor in the current study was not completely unfamiliar as is the case in other assessment contexts. Taken together, results from the present and prior studies suggest that the context of assessment may play a role in the relation between shyness and

academic achievement and more research is needed to untangle the effects of both temperament and assessment context on academic achievement.

Self-regulation has been found to be related concurrently and longitudinally to literacy and math as early as preschool (Buckner et al., 2009; Graziano et al., 2007; Matthews et al., 2009; McClelland et al., 2007; Ponitz et al., 2009). Consistent with these studies, early self-regulation was related to academic achievement at the age of seven in the current study. These lasting effects suggest that early self-regulation may be an important behavioral and cognitive skill for children to use in the classroom. That is, a child's ability to self-regulate may be an important predictor of social and academic functioning in school (Buckner et al., 2009; Eisenberg & Spinrad, 2004; Graziano et al., 2007; McClelland et al., 2007), because it facilitates formal classroom learning and informal learning in peer and classroom contexts. Perhaps one way to increase academic success for children at-risk for poor achievement is through training self-regulation. Successful self-regulation allows children to adapt to their social environment and achieve individual social goals (Eisenberg & Spinrad, 2004). It has been suggested that education programs emphasizing cognitive and behavior regulation may be more successful at promoting success in school than programs that emphasize academic content alone (Blair & Diamond, 2008). In addition, these skills should be taught at early ages, since results demonstrated that early self-regulation has lasting effects on academic achievement and self-regulation is rapidly developing during this time (Rothbart et al., 2003). Thus, the toddler and preschool years appear to be an important time to learn these skills so they can apply them as they transition to elementary school and use them as a foundation for further development. Moreover, adaptive self-regulatory abilities can be

taught across many contexts, such as at home, in the classroom, at the school level, and in the community (Boekaerts & Corno, 2005; Ylvisaker & Feeney, 2008) promoting the generalization of these skills.

Unexpectedly, shyness was unrelated to later social adjustment. This lack of association may be due to the exclusive focus on friendship quality as opposed to overall social competence, which would include social behavior in both familiar and unfamiliar contexts. Shy children are just as likely as less shy peers to form mutual and stable best friendships (Rubin et al., 2006). Shy children are less likely to blame themselves and are more capable of regulating their emotional reactions when a problem arises with a mutual best friend than when interacting with an unfamiliar peer (Burgess et al., 2006). Therefore, it is likely that there was no relation between shyness and social adjustment in the current study because children rated high in shyness may self-perceive their friendships as competent social relationships.

While having a mutual best friend is beneficial for children rated high on shyness in many ways, having a mutual friend does not protect shy children against all social difficulties. For example, children rated high in shyness with mutual friends are still at-risk for peer victimization and are just as likely to use avoidant coping strategies even when interacting with a mutual friend compared to interacting with an unfamiliar peer (Burgess et al., 2006; Rubin et al., 2006). Perhaps intervention efforts could use the mutual friend context as a less intimidating social situation for children rated high in shyness to practice more assertive and socially competent behaviors. More research is needed in this area to better understand how shy children's social interactions with familiar peers compare to those with unfamiliar peers.

Contrary to hypotheses, early self-regulation was also unrelated to children's self-report of social adjustment. Similar to the current study results, Ponitz, McClelland, Matthews, and Morrison (2009) found that self-regulation was related to academic but not social functioning. The authors concluded that the lack of findings from self-regulation to interpersonal skills were likely a result of an emphasis on attentional skills and working memory, which are aspects of self-regulation and executive function that are more closely related to cognitive and not social functioning. The ability to self-regulate behaviors and emotions, in contrast to cognitive dimensions of self-regulation, may allow for more competent and successful peer interactions (Calkins, 2007). Buckner et al (2009) did find that self-regulation was related to social competence, however, the authors used a global measure of self-regulation composed of both emotion regulation and executive functions (i.e, attention regulation and inhibitory control). In the current study, self-regulation was composed of attention skills, interest-persistence, and effortful control, which are measures of self-regulation more closely associated with cognitive abilities. These results suggest that self-regulation is a multi-component construct which differentially relates to child adjustment outcomes. In fact, one study found that concurrent measures of cognitive, emotional, and behavioral measures of self-regulation were related to one another, however, only cognitive self-regulation predicted theory of mind one year later (Jahromi & Stifter, 2008). Future studies should examine the various aspects of self-regulation (e.g., cognitive, emotional, behavioral) separately to better understand their unique relations to social and academic outcomes. In addition, the current study relied solely on the use of self-report of social adjustment. Future studies should also examine peer report and behavioral observation to document the

characteristics of shy children's friends and whether feelings about friendship quality are reciprocated by their friends.

Both shyness and self-regulation were positively related to waiting for the toy and spending less time playing. This result was interesting because these behaviors can be both protective and a risk factor. That is, children rated high in shyness can be described as overregulated (Caspi et al., 2003; Henderson, 2010; Zimmermann & Stansbury, 2004). Therefore, they may have waited longer to play with the toy and spent little time playing with the toy due to their non-assertive and non-confrontational style of interaction (Moas et al., under revision; Rubin & Borwick, 1984; Rubin, Daniels-Bierness, & Bream, 1984; Stewart & Rubin, 1995). When examining self-regulation, however, waiting to get the toy may represent sharing, turn-taking, and following the instructions given by the experimenter. Therefore, children high on self-regulation may wait their turn, resulting in a longer latency, and share with their peer, resulting in less time engaged. Children rated high on shyness, however, may not get the toy from their peer, resulting in a long latency, and may not spend much time playing with the toy if the peer is not sharing and they are not being assertive. Future studies should conduct dyadic analyses examining both target children's SPS behaviors and their peers' responses to these behaviors to determine whether children high in self-regulation are sharing and turn-taking during social problem situations and if this results in positive social outcomes. Conversely, it is also important to know whether children rated high on shyness are also sharing, or whether their non-assertive style of interaction prevents them from competently acquiring the toy from their peer, resulting in less time playing with the toy and likely negative social outcomes.

Using verbal requests and prompts, as opposed to passive or aggressive means of solving a social problem, are considered a competent way of socially interacting with a peer (Eisenberg et al., 1994). Children rated high in shyness tend to make fewer verbal initiations with others (Moas, Henderson, Degnan, & Fox, under revision) and self-regulation is related to more competent SPS (Buckner, Mezzacappa, & Beardslee, 2009; Moas & Henderson, under revision). Surprisingly, neither shyness nor self-regulation was related to the use of verbal strategies during the SPS task. Furthermore, Moas and Henderson (under revision) found that children's responses to a hypothetical SPS test mediated the relations between both shyness and self-regulation on academic achievement. However, this pattern of associations was not replicated in the current study. It is possible that the detailed coding children's SPS behavior resulted in a failure to notice overall patterns of SPS behavior. That is, a measure intended to capture overall patterns of social behavior (e.g., SPS competence as opposed to latency to get the toy) may provide richer information about children's SPS behavior than various specific SPS variables. Landry, Smith, and Swank (2009) developed an assessment of SPS which yields a single competence score based on middle-school children's ability to integrate social, cognitive, and verbal skills during SPS. They found that children with high SPS scores on this more global measure were better able to collaborate with peers and solve conflicts in early adolescence (Landry et al., 2009). Therefore, a measure that quantified how children are integrating these various skills during SPS may be more informative than examining children's scores on any one of the variables alone (Landry et al., 2009).

Similarly, Moas and Henderson (under revision), used a hypothetical SPS test that gave a global SPS competence score. The score was created based on children's verbal

report of prosocial behavior (e.g., sharing, politeness, waiting etc.), SPS flexibility, and the variety of solutions to hypothetical social problems that children generated. Thus, the SPS test gathers a variety of information about children's self-report of SPS to create a variable of overall SPS competence. Moreover, Dubow and colleagues also used an SPS competence composite score created based on the number of solutions children generate to hypothetical social problems and the effectiveness of those solutions (Dubow & Tisak, 1989; Dubow et al., 1991). Based on prior studies, Dubow and colleagues preferred the use of a summary measure because it integrated various SPS skills to give a more general picture of children's SPS abilities. While both shyness and self-regulation have been found to be related to specific and more global SPS behavior, it is likely that an assessment that captures how children integrate and use a variety of SPS skills is a better measure of SPS as a mechanism that links temperament to social and academic functioning.

As expected, there were no differences between boys and girls in the associations between the constructs. These results replicate those of Coplan et al. (2001) and Moas and Henderson (under revision), who found that temperament is related to social and academic outcomes in the same way for boys and girls. Therefore, while boys and girls may differ on mean levels of certain constructs, the associations between the constructs are comparable. Therefore, interventions designed to improve children's self-regulation and social problem-solving skills should be designed for both boys and girls.

Limitations and Future Directions

Future studies should compare the use of a more global SPS competence measure that captures children's overall patterns of interaction during problem situations to a more

detailed measure of SPS behaviors. Understanding children's overall patterns of SPS may provide more important information when examining the relations between temperament and social and academic adjustment over time. Therefore, it may be more beneficial for future prevention and intervention efforts to better understand how children incorporate a variety of SPS skills and how their approach is responded to by their peer, rather than examining different SPS behaviors separately.

Another future direction is to examine both overall social competence and friendship quality in relation to shyness. While children rated high in shyness have difficulty interacting socially with peers, the results of this study supports prior work suggesting that they are able to form mutual friendships with others. While these friendships are protective in many ways, shy children continue to experience some social difficulties even within the context of a close mutual friend. More research is needed in this area to further understand the effects of interaction partner characteristics and social environments on shy children's experiences. In addition, it is also important to use a multi-method approach to measure social adjustment by including observations, peer reports, and parent/teacher reports of social behavior. Further research may inform prevention efforts for children rated high in shyness aimed at improving their social interactions with peers and mutual friends. In addition, research has found that as early as the kindergarten years, children can distinguish between different types of social withdrawal and perceive the behaviors of shy children as less intentional (i.e., they notice that social withdrawal is due to fear and distress rather than social disinterest) and are more sympathetic towards shy peers (Coplan, Girardi, Findlay, & Frohlick, 2007; Findlay, Girardi, & Coplan, 2006; Goossens, Bokhorst, Bruinsma, & van Boxtel, 2002).

Prevention efforts can include children's mutual friends to show them how to help their friends during problem situations and provide the social support they may need during peer interaction.

The sample in the current study was mainly comprised of Caucasian children (i.e., 66%) with highly educated mothers (i.e., 79% graduated from college or graduate school). The environmental factors associated with poverty places low-income preschoolers are at risk for poor language and literacy skills, cognitive functioning, and social and school adjustment when compared to their more advantaged peers (Arnold & Doctoroff, 2003; Rimm-Kaufman, Pianta, & Cox, 2000; Stipek & Ryan, 1997). However, few studies have examined the relations between temperament and SPS on academic and social adjustment in a low-income sample of children. Future studies should aim to examine whether the associations between the constructs differ for low-income children compared to their more advantage peers. Findings may inform whether prevention efforts could be more broadly applied to various groups of children or individually tailored to meet specific needs.

Conclusion

In summary, temperament had a lasting effect on children's SPS skills and academic achievement for both boys and girls. Furthermore, findings provided evidence that children rated high in shyness are likely forming mutual friendships with their peers, leading to self-perceptions of good friendship quality. Therefore, findings suggest that shyness may not always be a risk factor, yet it is still important to understand individual differences in temperament as different children will process the same social environment (e.g., classroom peer interaction) differently (Rothbart & Jones, 1998). In addition, it

appears that self-regulation is a multi-component construct which differentially relates to child adjustment outcomes. Prevention and intervention efforts may be designed to improve self-regulation and subsequently improve academic achievement for children with poor self-regulation.

Table 1

Descriptive statistics

	Age	<i>N</i>	Min	Max	<i>M</i>	<i>SD</i>	α
TBAQ	2						
Shyness		245	1.89	6.42	3.81	0.83	.78
TBAQ	3						
Shyness		242	1.30	6.42	3.44	0.96	.85
Interest-Persistence		242	2.73	6.55	4.74	0.67	.84
CCTI	3						
Shyness		250	1.00	4.60	2.29	0.73	.86
Attention-Persistence		247	1.60	5.00	3.50	0.59	.87
CCTI	4						
Shyness		219	1.00	4.80	2.28	0.86	.87
Attention-Persistence		218	1.60	4.80	3.36	0.63	.71
CBQ	4						
Shyness		227	1.08	6.23	3.50	1.27	.93
Effortful Control		227	3.11	6.36	5.07	0.50	.83
SPS Observations	5						
Latency		205	1.00	300.00	73.33	101.56	--
Time Engaged		205	0.00	300.00	164.71	96.45	--
Verbal Attempts		205	0.00	1.00	0.36	0.35	--
WJIII Achievement	7						
Letter-Word ID		147	72.00	145.00	113.07	11.88	--
Calculation		145	38.00	162.00	111.78	17.92	--
Passage Comprehension		147	59.00	130.00	104.72	11.11	--
Applied Math Problems		140	78.00	152.00	114.92	13.96	--
Social Adjustment	7						
Companionship		163	0.33	3.83	2.25	0.76	.57
Validation and Caring		172	0.20	4.00	2.82	1.02	.84
Help and Guidance		170	0.00	4.00	2.02	0.89	.53
Intimate Disclosure		171	0.00	4.00	2.06	1.17	.64
Social Support		173	1.40	5.00	4.01	0.75	.86
Children enrolled		291					
Missing on all variables/Outlier		21					
Children included in analyses		270					

Figure 1. Proposed Model

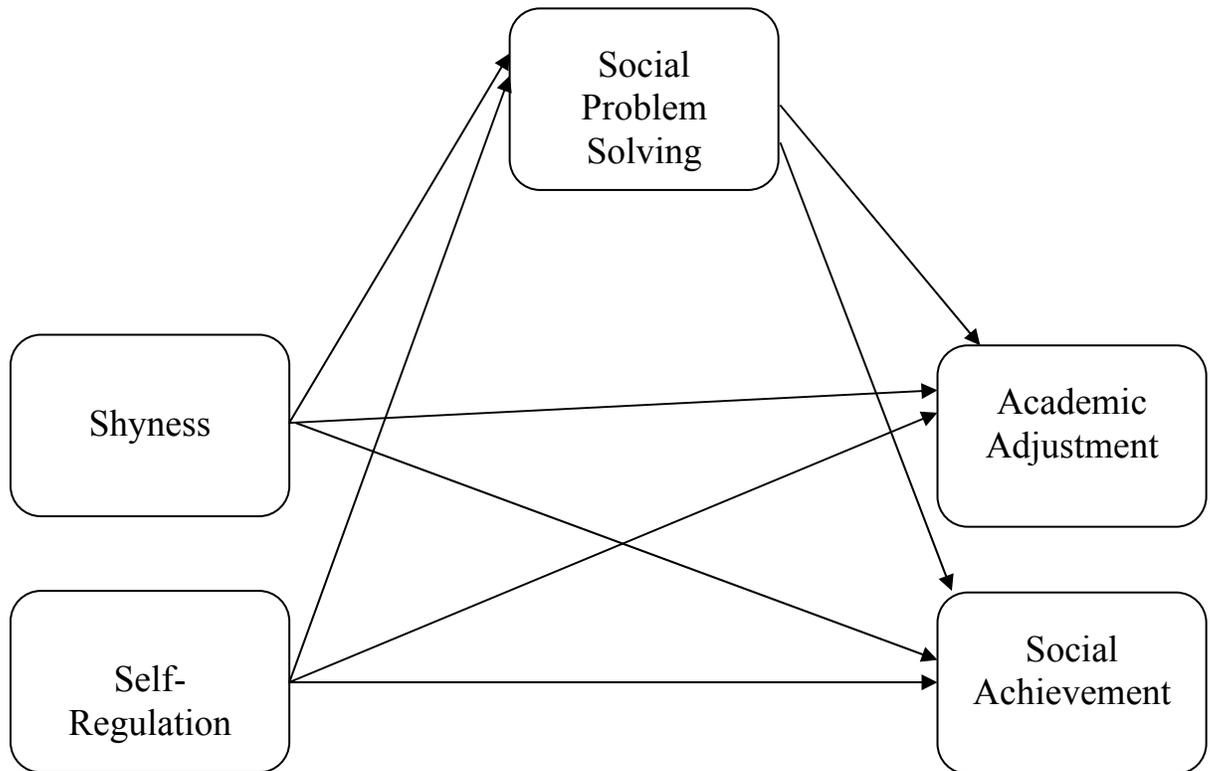


Figure 2. Temperament latent variables and indicators with standardized estimates

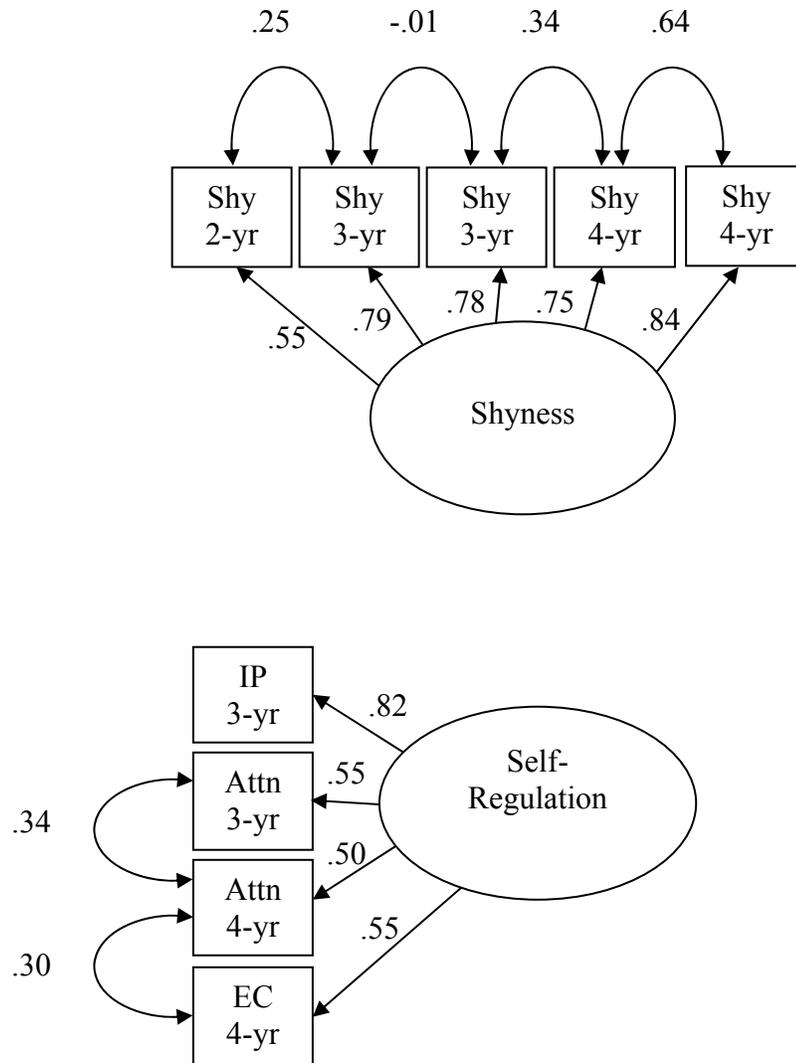


Figure 3. SPS latent variable and indicators with standardized estimates

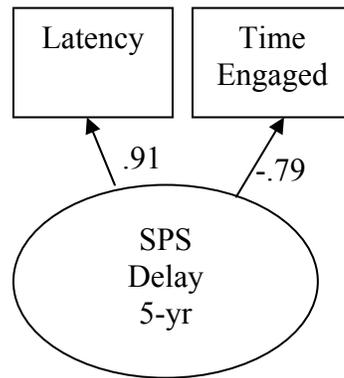
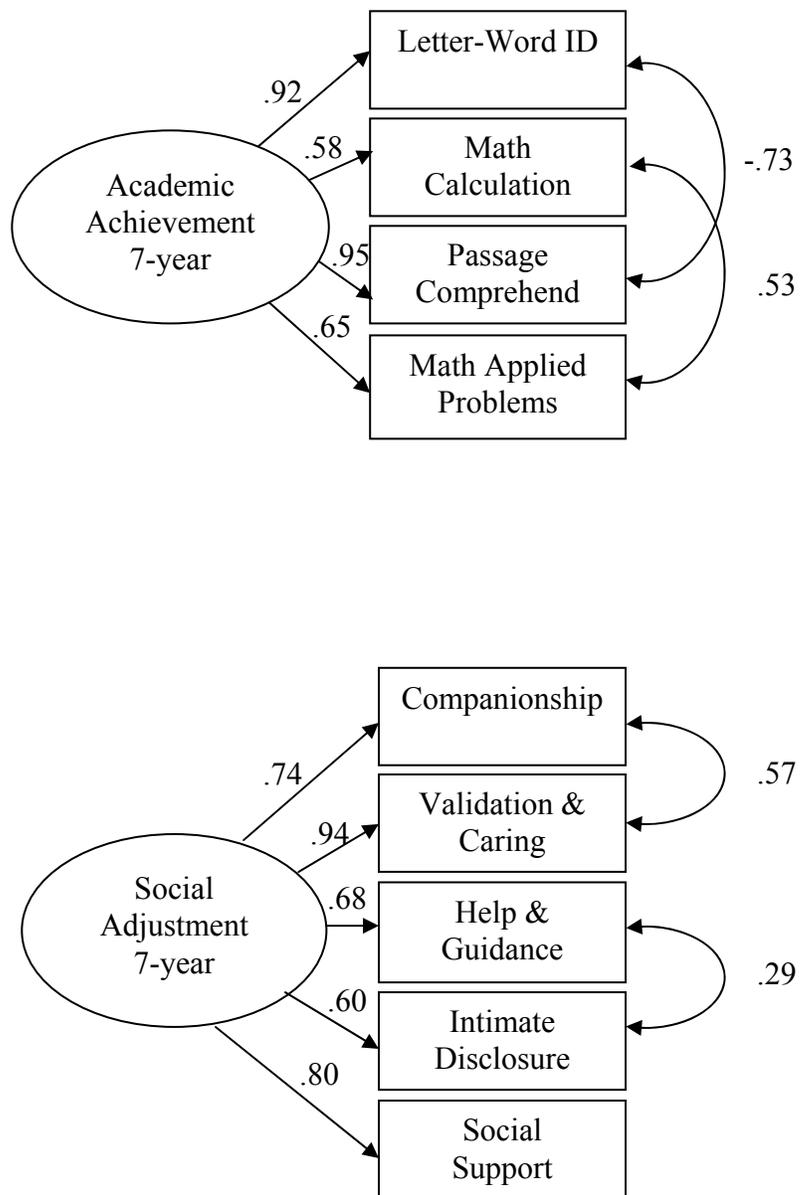


Figure 4. Adjustment latent variables and indicators with standardized estimates



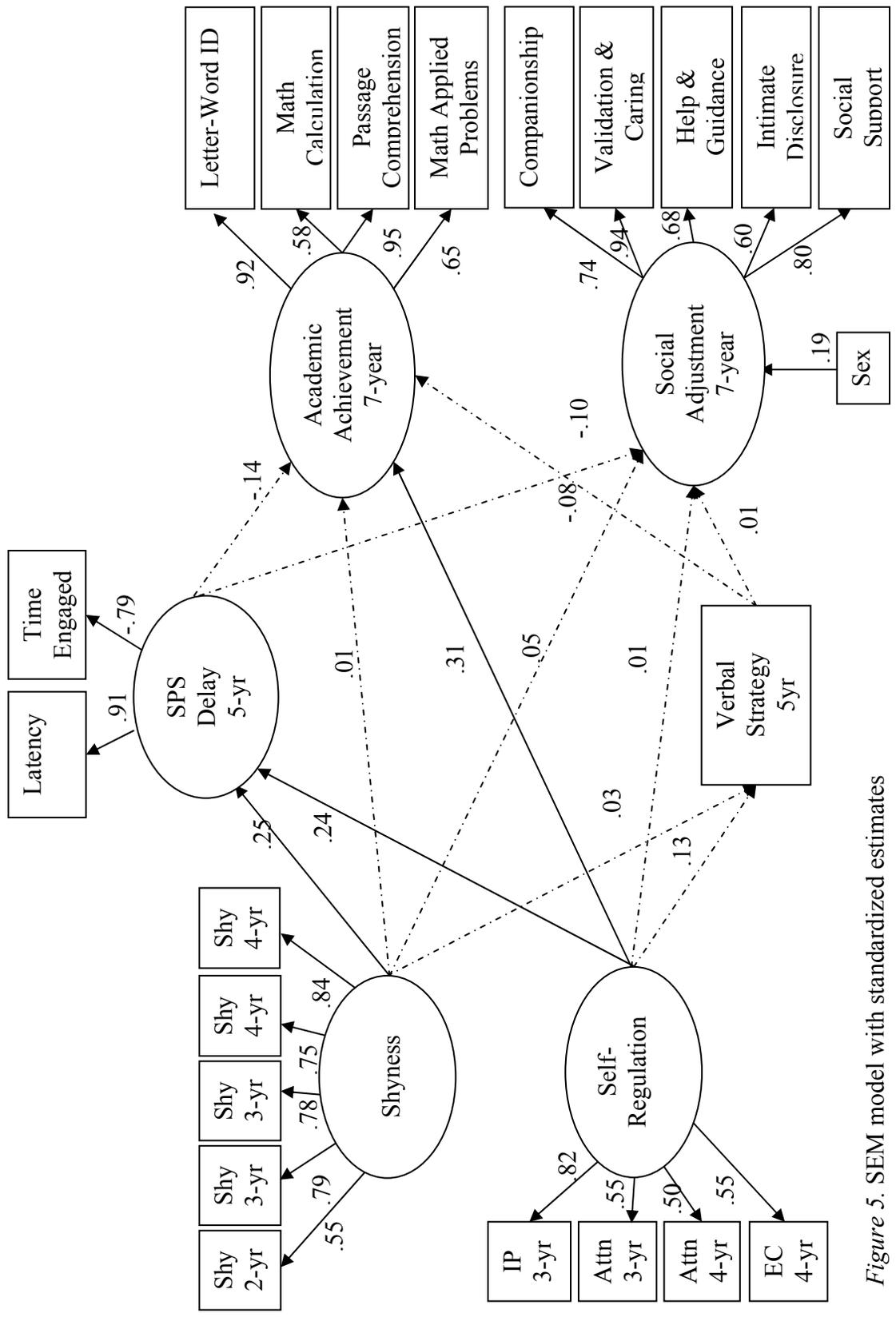


Figure 5. SEM model with standardized estimates

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