Cognitive, Affective, and Regulatory Skill Contributions to Social Problem Solving: Developmental Relations Across Elementary School

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Abstract

Strong relationships in childhood are related to immediate and long-term positive social, emotional, and physical health outcomes. Social Problem Solving (SPS), or how youth understand, evaluate, and respond to social situations, is a key skillset that develops during middle childhood and relates to how youth make, navigate, and maintain social relationships. Better understanding of SPS may help researchers design more effective interventions to support the development of positive peer relationships. Recent work in the field has recognized the essential role of affective and regulatory skills in youth functioning and called for their integration into understanding of SPS to augment traditionally cognitive-behavioral models. The present study examined how key affective (empathic concern), socio-cognitive (perspective-taking), and regulatory (self-control) skills related to SPS concurrently and SPS development across one school year in samples of older (grades 4,5) and younger (grades 2,3) elementary school students. In addition, this study examines how these relationships are influenced by developmental social-ecological factors such as student perceptions of classroom peer relationship climate and differ qualitatively by developmental stage. Multilevel regression analyses were applied to examine direct effects, longitudinal growth effects (isolating baseline SPS and examining relation to outcome SPS), and the moderating effects of perceived classroom peer relationship climate. Results indicated significant direct effects for empathic concern, perspective-taking, and self-control to SPS concurrently. Fewer significant effects were found relating these skills to growth in SPS. Moderating effects for perceived classroom peer relationship climate were identified for the older elementary, but not younger elementary group. In the older elementary group, when perceived classroom peer relationship climate was high, self-control was negatively associated with SPS. Further qualitative developmental consistencies and inconsistencies between the two grade level groups were identified and discussed. Overall,

results support the interrelation of cognitive, affective, and regulatory skills with SPS, offer promising directions for future research, and present possible avenues for tailoring youth prevention and intervention efforts as informed by developmental stage and socioemotional context.

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APPROVAL OF THE DISSERTATION

This dissertation, ("Cognitive, Affective, and Regulatory Skill Contributions to Social Problem Solving: Developmental Relations Across Elementary School"), has been approved by the Graduate Faculty of the University of Virginia School of Education and Human Development in partial fulfillment of the requirements for the degree of Doctor of Philosophy.

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Chapter One – Introduction/Significance of the Problem

The extent and quality of one's social relationships significantly impact both mental and physical health (Umberson & Karas Montez, 2010). This impact begins in childhood and cascades throughout the lifespan, with earlier relationship experiences predicting later relationship quality and long-term mental health (Umberson & Karas Montez, 2010). How youth feel supported by and connected to others is related to numerous aspects of their immediate and subsequent social, emotional, and physical wellbeing (Bryan et al., 2013). For example, positive peer relationships in childhood have been linked to emotional well-being, positive self-concept, prosocial behavior, social competence, and academic engagement and achievement (Rubin et al., 2006; Wentzel, 2017). Conversely, peer relationship challenges have been associated with an increased risk of both internalizing and externalizing disorders, delinquency, school attrition, and substance use (Adrian et al., 2010). As such, proactive interventions to support youth competency for building positive peer relationships during childhood may pose a promising opportunity for shaping more engaged students, happier and healthier individuals, and ultimately more civically active and prosocial citizens.

Many processes can be singled out in the study of how youth make and maintain peer relationships, with childhood serving as a likely critical period for the emergence and development of many essential skills (Malik & Marwaha, 2021). As children enter school, they have to learn how to navigate the complexities of the social world. They are faced with the exciting opportunity to make new friends and for some, connect for the first time with same-aged peers and individuals outside of their family system. Yet, there are natural accompanying challenges. Inevitably, conflicts and disagreements will arise that test these relationships. Whether or not a child can resolve these conflicts with their relationships intact is important for

how they feel about themselves, function at home and at school, and maintain social connections in this stage of life and in the future. Social Problem Solving (SPS) is one such skillset that focuses on this process of responding to and resolving socially-oriented challenges. It is conceptualized as a multi-component process comprised of social, emotional, and cognitive skills that aid youth in understanding, evaluating, and responding to social situations. When applied adaptively, SPS has been shown to contribute to healthy peer relationship development, as well as social, academic, and emotional well-being (Landry et al., 2009). When applied maladaptively, SPS has been implicated in internalizing and externalizing disorders, aggression, and lower social competence (Adrian et al., 2010). SPS is complex and warrants further study to understand how exactly it interrelates with other social and emotional competencies and how it might best be promoted.

There is substantial evidence that SPS is related to positive outcomes across many domains of youth functioning, yet it does not appear to be an insular, standalone process. Specifically, models of SPS and related empirical work have increasingly emphasized the value of understanding how SPS may depend on co-occurring social and emotional factors such as emotional state and understanding, evaluation of emotional and social consequences, and capacity for self-regulation (Denham et al., 2014; Lemerise & Arsenio, 2000). That is, how a child is already feeling when they encounter a social challenge, how well they are able to acknowledge and identify their own and others' emotional responses, and if they can inhibit their immediate urges to respond reactively. There is also empirical evidence to support the likely interrelation of SPS with empathy (Findlay et al., 2006; Hirn et al., 2019), self-control/executive control (Denham et al., 2014), perspective-taking (Bailey & Im-Bolter, 2020), and emotion knowledge (Bierman et al., 2008). However, much of this work has focused simply on

identifying and verifying associations between skills (Adrian et al., 2010). While this extant work has been essential for identifying skills that may be cross-sectionally related to and potentially implicated in the process of SPS, more exploration is needed to understand the factors that might facilitate SPS growth and promotion longitudinally. Further, interventions aimed at promoting SPS often involve the aforementioned social, emotional, and cognitive skills (Barnes et al., 2018; Merrill et al., 2017), however examination of the mechanisms through which these interventions promote growth or which specific targeted skills actually relate to observed changes in SPS ability is lacking. Thus, advances in theoretical and empirical work exploring SPS and notable gaps in our understanding of factors influencing SPS promotion point to the value of further exploring the relation of SPS to concurrent social and emotional skillsets, thus deepening and solidifying understanding of this essential process (Lemerise and Arsenio, 2000).

Schools are a primary setting in which social relationships are formed and have impact on children and adolescents. Less effective SPS in the school setting is thought to make students vulnerable to misinterpreting and responding ineffectively to peers and teachers, and in doing so, diminishes opportunities for essential positive social connection and learning (Jones & Bouffard, 2012; Wentzel, 2017). As such, schools are promising venues for prevention and intervention efforts targeting SPS and other social and emotional skills. In addition, theoretical models and youth-oriented studies of SPS acknowledge the influence of social and ecological contextual factors, such as peer relationships (Rubin et al., 2015) and classroom social climate (Rimm-Kaufman & Hulleman, 2015) on the process of SPS (Crick & Dodge, 1994; Lemerise & Arsenio, 2000) and the development of children's social and emotional skills more broadly (Weissberg et al., 2015). SPS skills are essential for thriving in the school context academically, socially, and emotionally; making the study of these processes within school peer groups particularly valuable

for informing how schools might promote competence (Durlak et al., 2011; Jones & Bouffard, 2012). Classrooms form natural dynamic social networks and contribute to variations among students in peer acceptance, conflict, social relationship skills, and development opportunities. Demands on SPS are continuous throughout the school day as students encounter social demands and ambiguous social situations in the classroom, playground, hallways, and more. This consideration may be particularly informative for understanding how school settings influence the way children access and apply social emotional skills and how these skills may differentially predict SPS in different social climates.

Children also encounter different social dilemmas based on their developmental stage and related cultural/contextual differences in expectations for their independence, interaction, and engagement. Changes in the nuance and complexity of social demands as development progresses suggest that demands on social cognition processes, such as SPS, also increase as children age (Brizio et al., 2015). For example, as children enter and progress through elementary school, they are increasingly expected to navigate free play with peers, group learning experiences in the classroom, and are exposed to more and more time with peers unmediated by adults. For example, around ages 5 and 6 children begin to spend time in peer groups and relate to groups of friends (Malik & Marwaha, 2021). Between ages 7 and 8, children take on more responsibilities, understand rules, and begins to experience more peer interactions that may challenge their established ideas or beliefs (Malik & Marwaha, 2021). Children also begin to orient more toward peers as preferred companions and influences, beginning in middle childhood (Lam et al., 2014). Between the ages of 9 and 10 peers and friend groups typically begin to take precedence over familial influences and children are expected to take on greater responsibility for independent decision-making and responsibility (Malik & Marwaha, 2021).

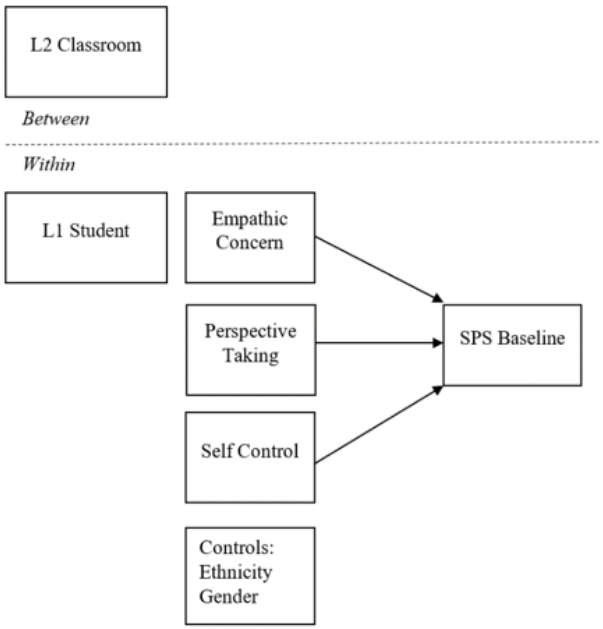
With so much rapid development and change in children's social worlds during this time, developmental influences are of essential consideration.

Further, it may be that different skills vary in when they begin to emerge, how quickly or linearly they develop, or how interdependent/reliant they are on each other at different development stages (Su et al., 2020; Zajdel et al., 2013). Thus, the interrelation with and strength of influence of various skills on SPS may differ as children age in part due to differences in their emergence, presence, or strength at different timepoints. Understanding developmental consistencies and inconsistencies in these relations can help improve the impact of intervention and prevention efforts targeted for different age groups.

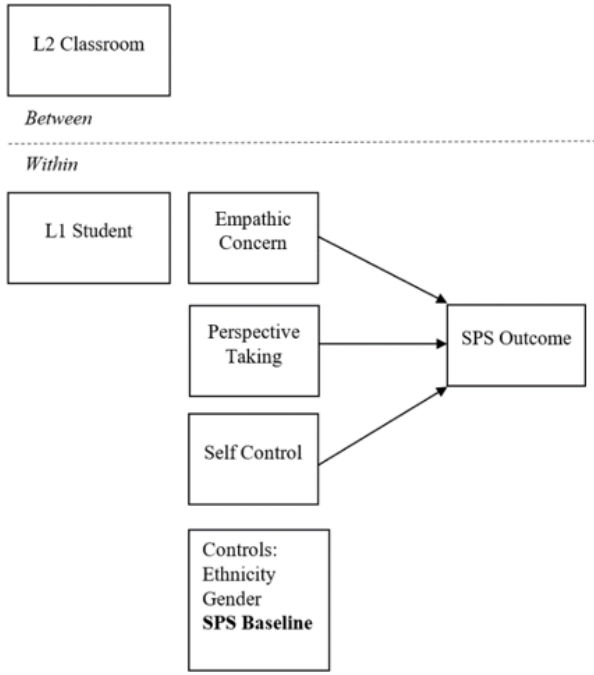
The present study aims to improve understanding of how SPS may be related to other key emotional, cognitive, and regulatory skills (i.e., empathic concern, perspective-taking, and self-control). By looking at SPS across one school year, this study will contribute to the current understanding of associations between empathic concern, perspective-taking, and self-control to SPS both concurrently and as they relate to change in SPS over time. Further, the present study will assess how skill relations to growth in SPS may depend on student perceptions of classroom peer relationship climate, which is a key proximal social-ecological influence on youth development. Finally, this study will also qualitatively explore how consistent patterns are among key variables within the study when comparing two age groups; younger (grades 2,3) and older (grades 4,5) elementary students. Figure 1 outlines the models used in this study to test these relations.

Figure 1

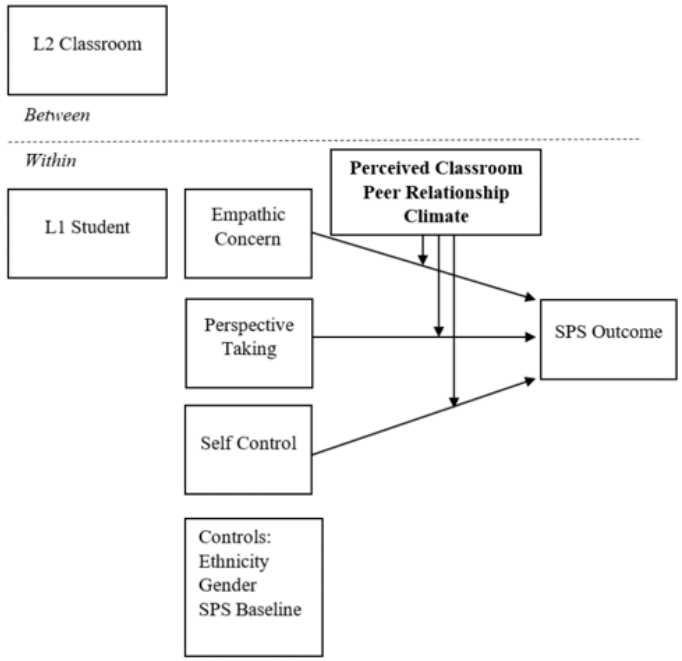
Model 1
Cross Sectional



Model 2
Longitudinal



Model 3
Moderation



Note: These three models were run separately by grade group for younger elementary (grades 2,3) and older elementary (grades 4,5)

Chapter 2 - Review of the Literature

Social Problem Solving and Development

Social Problem Solving has been implicated as important to child development due to its well supported positive relations to social and emotional wellbeing, social competence, and academic engagement and performance, as well as its negative relation to aggression (Adrian et al., 2010; Rubin et al., 2006). Social Problem Solving is a key area of study for understanding both how youth engage in social situations and how we might best intervene to promote social competence and skills for forming positive relationships. Extant work demonstrates the relation of SPS to key markers of positive youth functioning and provides strong preliminary evidence of its utility in youth development interventions.

Work across the fields of social, cognitive, and educational psychology has established SPS as strongly linked to positive social, emotional, and behavioral functioning. For example, an early meta-analysis by Denham and Almeida (1987) indicates that more behaviorally adjusted and socially competent children score significantly higher on measures of interpersonal cognitive problem solving than children who struggle socially and behaviorally. Further, results from a school-based study of a general sample of 259 first-, second-, and third-grade children (ages 6-9 years) by Dodge and Price (1994) indicated that the social information processing (SIP) components of SPS were significantly correlated with behavioral competence as reported by both peers and teachers. Children with stronger SPS skills have been shown to exhibit less aggressive and more prosocial behavior (Denham et al., 2014; Shure & Aberson, 2005). Later on in life, SPS continues to be related to mental health and social well-being. For example, in a study of 235 Chinese adolescents (Grades 7-9) by Siu and Shek (2010), results revealed SPS as closely linked to both depression and anxiety. This parallels extant work in the field that has identified

these associations in young adults and adults as well (e.g., Bell & D'Zurilla, 2009; Nezu, 1986). In a separate study of 1,462 Chinese adolescents (presented in the same Siu and Shek publication; 2010), researchers also identified SPS as associated with measures of family well-being and found that better overall SPS predicted better family functioning and fewer parent-adolescent conflicts. Thus, it is likely that the social importance of SPS extends later in life and into multiple social domains.

SPS capability has also been connected to peer acceptance and rejection. For example, a study of 231 kindergarten and first-grade boys by Mayeaux and Cillessen (2003) found that more popular students (as rated by peer sociometric status) also demonstrated more effective, prosocial SPS and were less likely to use maladaptive SPS solutions such as avoidance, manipulation, or reliance on adults. Similarly, various studies have identified that unpopular children are more likely to implement aggressive SPS strategies compared to more accepted/popular peers (e.g., Asher & Renshaw, 1981). In a study of 48 third graders assessed by sociometric peer acceptance rating and computer-administrated hypothetical social vignettes, socially rejected students were found to provide more aggressive solutions to social problems than their socially accepted counterparts (Dorsch & Keane, 1994). Similar findings were revealed by Rubin and colleagues (1982) who identified a positive correlation between peer rejection and the number of agonistic strategies selected to solve hypothetical social problems in social story vignettes.

These relations endure through later childhood and adolescence. For example, in a study of 777 14-year-olds and 877 17-year-olds, Pakaslahti and colleagues (2002) found adolescent prosocial problem-solving to significantly predict social acceptance among peers and that socially rejected adolescents demonstrated lower levels of prosocial problem solving. Generally, these findings support a significant relationship between SPS and social acceptance/rejection,

thus highlighting the importance of understanding and harnessing SPS as a means of promoting positive social development and connection.

Social Problem Solving has also been linked to key academic and school functioning outcomes. For example, results of a longitudinal study of 101 students from preschool through kindergarten by Denham and colleagues (2014) indicated that SPS significantly predicted both preschool and kindergarten classroom adjustment and kindergarten academic readiness. Some work also suggests that SPS influences academic and school readiness outcomes by way of promoting social competence that then facilitates successful learning in the classroom and school engagement. For example, a study of 198 preschool-aged children sought to understand the links between social information processing (SIP; the socio-cognitive base of SPS), teacher-rated social competence and school readiness (represented by early literacy skills and teacher report of the child's approaches toward learning) across one year (Ziv, 2013). Results indicated that SIP skills promoted social and behavioral competence and school readiness, with social competence partially mediating the link between SIP and school readiness (Ziv, 2013). There is some evidence to indicate that these relations between SPS and school adjustment and academic functioning persist into young adulthood. A study of 104 first-year college students found that self-appraisal of SPS was an important predictor of an individual's psychosocial adjustment to university, stress, motivation toward work, academic behavior, and academic performance (Baker, 2003). Thus, SPS and perceived SPS ability appear to be related in some form to positive academic functioning and school adjustment at multiple stages across development. Given this likely enduring relation, SPS promotion in childhood may not only promote proximal improvements in youth functioning, but could also relate to distal and cascading benefits later on in life.

Training in SPS has also been successfully utilized to promote positive development through both preventative and therapeutic interventions with good effect (Adrian et al., 2010). Interventions designed to target and increase SPS competence have been shown to be successful in doing so. A meta-analysis by Barnes, Wang, and O'Brien (2018) examining 26 SPS interventions in preschool settings revealed statistically significant evidence for the efficacy of SPS interventions in reducing externalizing behaviors and increasing social competence (as observed by preschool staff and teachers). Another review by Merrill et al. (2017) of 18 SPS interventions indicated strong evidence of the benefits of SPS interventions, particularly universal interventions, for improving SPS skills, promoting positive behavioral and emotional outcomes, increasing peer acceptance, and reducing aggression, particularly for older and more at-risk students.

In sum, there is much support for viewing SPS as a contributor to positive child development across numerous domains and evidence that it can be effectively leveraged in intervention programming to promote positive outcomes and ameliorate difficulties. The accumulated literature also suggests that empirically studying the interrelation of SPS with other social and emotional skills and contextual influences would be valuable for deepening understanding of how these influences may vary or be best harnessed to promote positive developmental outcomes. The present study aims to better understand the association of other positive social and emotional skills to the process of SPS and gain insight into SPS development, specifically within the school context.

Theoretical Background Informing This Investigation

While the present study aims to evaluate the relation of key social and emotional skills to SPS rather than test or validate a particular theoretical model, understanding the progression of

various theories of SPS helps to elucidate why this extension from a purely cognitive-behavioral understanding into emotional and regulatory domains is so necessary.

The examination of social cognition (the base of social information processing and social problem solving) first gained eminence in the field of psychology in the late 1960's and early 1970's (Shantz, 1975). While it predominantly originated from the field of cognitive psychology, its importance to human functioning across many domains has made it a key area of focus in cognitive, social, developmental, and educational psychology. This work has been built upon significantly across the past five decades through both theoretical modeling and empirical investigation, leading to a more multifaceted understanding of potential factors influencing social information processing during SPS.

Generally, examination of SPS began as a predominantly cognitive-behavioral model of social information-processing (SIP) in adults (D'Zurilla & Goldfried, 1971) before expanding into a more developmentally-informed exploration of SPS at different stages of the lifespan (Spivack & Shure, 1974). This work also began to highlight prerequisite cognitive skills for engagement in SPS, particularly in child populations (Shure & Spivack, 1980). These developmental considerations led to the model of social information-processing proposed by Crick and Dodge (1994), which is currently the most well-recognized and cited theory of SIP.

Crick and Dodge's 1994 model posits a biologically- and developmentally-rooted process of six reciprocally informing steps. Crick and Dodge (1994) suggest that in a social scenario, children's biology and prior social experiences interact with input from their environment as they process the situation. Specifically, this model posits that children observe what is happening (encoding of cues), interpret why it is happening (interpretation of cues), decide what they would like from the situation (clarification of goals), consider how they might achieve this outcome

(response access or construction), evaluate these options for doing so in relation to both the demands of the situation and their self-efficacy for applying them (response decision), and then select the most positively evaluated action to carry out (behavioral enactment) in rapid and reciprocally-informing succession (Crick & Dodge, 1994). This process then spurs a parallel process within the child's peer, ultimately generating a response that becomes a novel cue, and the cycle continues anew. This process, if applied effectively (as defined by developers) would result in a child accurately taking in information from their environment, interpreting clues correctly to obtain a realistic and factual read of the situation, and ultimately evaluating, selecting, and enacting a response that helps solve the social conflict with their relationship intact and maximizes the needs of all parties. One common and well-studied impediment to this process, hostile intent attribution bias (Nasby et al., 1980), occurs during the interpretation phase and posits that youth who respond maladaptively or with aggression may do so because they are biased to perceive malicious intent from others. Studies suggest it can arise as an attempt to adapt to a hostile environment (Nasby et al., 1980) but hostile intent attribution has also been implicated in peer rejection and aggression (Crick & Dodge, 1994). This is just one of many ways the process of SPS can be derailed, but given its extensive literature and likely relation to social ecological factors, can be important for understanding SPS in context.

While well-respected and empirically examined, the Crick and Dodge model does not address additional skill domains that have come to be recognized as strongly linked to successful SPS – specifically, a comprehensive integration of affective reactivity and self-regulation. In 2000, Lemerise and Arsenio presented an integrated model of affective, regulatory, and cognitive processes in social information processing. Lemerise and Arsenio (2000) hypothesize that "individual differences in emotionality and emotion regulation can influence" SPS, but

acknowledge that research in these areas has been particularly sparse, calling for more "systematic attempts to integrate affect and cognition," There is still substantial work to be done to support their theory and/or better understand the nuances and interrelations between contextual, emotional, and regulatory factors and the complex process of SPS.

Similarly, it is evident that social problem solving depends on contextual influences, such as social climate. Models of SIP and SPS have emphasized individual-environment interactions at all steps of the process (Crick & Dodge, 1994). In the next section, notable empirical work in the domains examined in this study (cognitive, affective, regulatory, contextual) will be reviewed.

Individual Skills Associated with Social Problem Solving

Current understanding of social problem solving (SPS) has predominantly arisen from the examination of cognitive-behavioral processes – the way an individual's thinking and behavior are reciprocally connected to inform their approach in a social scenario. Examinations of social functioning across many areas of study (e.g., social competence, social information process, aggression and social conflict) have highlighted the influence of emotional, self-regulatory, and contextual factors on social processes, suggesting that an individual's affect, activation, and environment also play a role in their evaluation of and decision-making in social situations (Lemerise & Arsenio, 2000). This section examines preliminary evidence of the influence of empathic concern, perspective-taking, self-control, and peer relationship climate on the development of SPS.

Emotional Influence on SPS: Empathic Concern.

Affective influences likely play numerous roles in Social Problem Solving (SPS). When faced with social conflicts, individuals must encode and interpret others' affective cues and their

own, modulate the intensity of these responses, and understand and empathize with how another may be feeling (Lemerise & Arsenio, 2000). Considering affect in SPS is of utmost importance as it can influence the effectiveness of social cognition (Damasio, 1994). Affective responses may function adaptively to facilitate faster problem-solving by activating emotional links to schemas and solutions (Schwarz, 2001). They may also promote connectedness to others, thereby reducing reactivity (Damasio, 1994). Alternatively, affective responses can maladaptively skew SPS through emotional bias or impairing levels of emotional distress (Damasio, 1994).

Given its relational focus and adaptive influence, empathic concern is of particular interest in the affective domain. Empathic concern represents an individual's felt sense of empathy toward others and encompasses an individual's "tendency to experience feelings of warmth, compassion, and concern for other people" (Davis, 1983, p. 169). Researchers posit empathic concern emerges beginning in early childhood (Batson, 2009), and originates from parenting, family, and other social learning opportunities (Koestner & Weinberger, 1990). When thinking about how an individual solves an interpersonal problem, it is important to understand if and how their empathic concern might relate to their approach to SPS or change in SPS ability over time. For example, individuals who respond to challenging social scenarios with greater empathic concern for others are more likely to engage in helping behaviors than those who respond within high levels of internal distress and reactivity (Davis, 1983; Stocks et al., 2009).

Across childhood, research illustrates that empathic concern is linked to multiple dimensions of social competence, including social understanding and social responding. A study of 136 kindergarten and first grade students revealed that in comparison to their lower empathy counterparts, empathic children exhibited a better understanding of peers' intentionality in social

scenarios, including better understanding of their peers' shyness and aggression (Findlay et al., 2006). Additionally, more empathic children also exhibited greater prosocial behavior, lower aggression, and a lower tendency toward social withdrawal (Findlay et al., 2006). Another study of 478 2nd, 4th, and 6th graders identified empathic concern as a significant predictor of teacher-rated prosocial behaviors in the classroom (e.g., helping, sharing, cooperating, comforting behavior) and community-oriented prosocial behavior (e.g., donating time or money to a cause) (Litvack-Miller et al., 1997). Children's empathic concern has also been linked to specific behaviors occurring in the context of peer social problems, including bullying and defending behavior (Barchia & Bussey, 2011; Warden & MacKinnon, 2003).

Despite the prominent relations of empathic concern to social understanding and social responding, limited work has investigated the relation of empathic concern to SPS and conflict resolution. However, results of a study of 131 nine- and ten-year-old students revealed that when faced with ambiguous social situations, children with greater empathic awareness may be more likely to respond in constructive and prosocial ways (Warden and MacKinnon, 2003). Further, a study of 307 adolescents identified positive associations between higher levels of empathic concern and an increased ability to constructively discuss and effectively solve conflicts with peers (de Wied et al., 2006). Further, this study also found negative relations between empathic concern and maladaptive or passive problem-solving approaches, such as withdrawal and compliance (de Wied et al., 2006). One known study has explored the influence of empathic concern on distinct parts of SPS (Van der Stouwe et al., 2018). In the context of a social skills intervention aimed to increase Social Information Processing (SIP) skills among juvenile justice-involved adolescents, Van der Stouwe and colleagues (2019) found that participants with greater empathic concern exhibited fewer instances of maladaptive cognitive distortion (e.g.,

maladaptive cognition impairing cue interpretation during SIP). Further, results indicated that empathic concern moderated treatment effects on hostile intent attribution (Van der Stouwe et al., 2019). Youth who exhibited moderate or high empathic concern showed significant improvements in the accuracy of their intent attributions (effectively reducing instances of maladaptive cognition that occur during the problem identification and interpretation steps of SPS), while no treatment effects were found in the low empathy group (Van der Stouwe et al., 2018). This suggests that empathic concern is particularly important for improving the SIP components of SPS. That is, empathic concern may be an important skill supporting the development of children's ability to engage prosocially in SPS.

Cognitive Influences on SPS: Perspective-taking

Social Problem Solving involves much consideration of others' intents and actions as children make sense of a social scenario, particularly in early encoding and interpreting steps and subsequently when evaluating and implementing solutions (Crick & Dodge, 1994). Of importance in this process is if and how children understand the thoughts and mental/emotional states of others. Perspective-taking is the ability to consider another's point of view and understand that others have thoughts, feelings, and intentions that are separate from one's own (Bailey & Im-Bolter, 2020). Engagement in perspective taking, or the discernment of another's thoughts, feelings, and motivations in a social scenario is highly facilitative of and related to successful interpersonal interactions (Nijhof et al., 2021). While implicated in many social processes, connected to many relational outcomes, and associated with SPS, work examining the relation of perspective-taking skills to SPS development is lacking and merits further exploration.

Perspective-taking has been associated with greater social competence (Im-Bolter et al., 2013) and higher self-esteem (Davis, 1983). In childhood specifically, perspective-taking has been supported as strongly related to prosocial behavior and empathy (Bengtsson & Johnson, 1992; Spinrad et al., 2006; Mestre et al., 2019), emotion regulation (Bengtsson & Arvidsson, 2011) and reductions in both internalizing problems and externalizing behaviors (Zadeh et al., 2007). Interestingly, in some cases perspective-taking has been implicated as associated with bullying and relational aggression, suggesting that better developed perspective-taking can also result in antisocial behavior, often in the context of low empathy (Repacholi & Slaughter, 2003).

Work examining the relation of perspective-taking to SPS shows that this is a promising area for study. Early investigations (Marsh et al., 1981) of this construct significantly link perspective-taking to all steps of interpersonal problem solving (defined in this case from Chang & D'Zurilla's Social Problem-Solving Model; problem identification, action generation, considering consequences, selecting solutions.) More recent work by Bailey and Im-Bolter (2020) offers a high-quality applied examination of perspective-taking within the complex process of social problem-solving in school-aged children. Bailey and Im-Bolter do so through a vignette assessment based on a socio-cognitive model developed by Schultz and colleagues (1989) examining problem identification, strategy generation, strategy evaluation, and solution evaluation. Results suggest students were better able to apply perspective-taking during problem identification and strategy generation. They found that students struggled most to incorporate perspective-taking into solution evaluation (Bailey & Im-Bolter, 2020). Bailey and Im-Bolter's findings parallel work by Cohen and colleagues (1998) that suggests perspective-taking is greatest during strategy generation and lowest during solution evaluation. Bailey and Im-Bolter posit that some of the difficulties in applying perspective-taking to solution evaluation may lie

within the executive functioning demands that this forward thinking requires, which also supports the inclusion of measures of self-regulatory factors in this investigation.

Additionally, research suggests substantial development in children's perspective-taking capabilities may occur during elementary school. Studies report that simpler forms of perspective-taking are present as early as age four and continue to develop into a higher order and more complex understanding of mental states during and beyond middle childhood (Im-Bolter et al., 2016; Selman, 1981). There is evidence to suggest that both semantic and syntactic language are essential for perspective-taking skills to develop, especially for perspective-taking during social problem solving (Zadeh et al., 2007), suggesting the likelihood of developmental influences as language development progresses with age. Further, studies identify differences in the relation of perspective-taking to SPS at different ages. Results of the aforementioned study by Bailey and Im-Bolter (2020) also showed differences in if and how children at different developmental stages apply perspective-taking, with older children demonstrating stronger perspective-taking on the strategy evaluation and solution evaluation aspects than younger children (Bailey & Im-Bolter, 2020). Generally, there is some understanding of how perspective-taking itself develops and some age-related differences, but clear prior examination of developmental differences in its relation to SPS is sparse.

Interrelation Between Empathic Concern and Perspective-taking

While currently inconclusive, theoretical and preliminary empirical work suggests that empathic concern and perspective-taking may be closely related. Specifically, perspective-taking and empathic concern have been identified by some researchers as the cognitive and affective components of empathy respectively (Kokkinos & Kipritsi, 2012; Davis, 1983). Further, there is some evidence to suggest that perspective-taking is a requisite precedent of empathic concern

(Mestre et al., 2019). In one study, of 82 children between the ages of three and five, authors identified a developmental progression from perspective-taking to affective empathy, proposing perspective-taking as a precursor to the development of a child's ability to experience feelings of compassion and concern for others (Brown et al., 2017). In another study of 417 adolescents, empathic concern was found to mediate the relation between perspective-taking and later altruistic and helping behaviors (Mestre et al., 2019). While correlated in many samples, a more precise understanding is still needed of how empathic concern and perspective-taking are related. Due to consistent differential relations to other measures of emotional reactivity, these merit consideration as distinct social emotional skills (Davis, 1983). Attention to the likely interrelation and potential overlap of these two subcomponent skills within the broader umbrella of empathy is needed.

Self-Regulatory Influences on SPS: Self-control

Evidence suggests that children with better executive functioning/self-regulation are better able to make socially competent decisions in interpersonal interactions (Buckner et al., 2009), likely because their ability to inhibit emotional and behavioral impulses allows them to more calmly and thoughtfully engage in the problem-solving process (Dennis et al., 2007; Lemerise & Arsenio, 2000).

Self-control refers to one's capacity to override strong automatic responses for weaker but more intentional actions (Diamond, 2013). It has been conceptualized as one's ability to delay gratification, resist impulses, or inhibit automatic or dominant responses (Nigg, 2017). Self-control in the form of response inhibition emerges as early as 6-9 months of age and solidifies into full maturation in adolescence (Nigg, 2017). There is evidence that self-control increases with age and studies have demonstrated the relative stability of individual differences

in effortful control (the trait capturing consistent demonstration of self-control) across early childhood and school-aged years (Coyne & Wright, 2014; Dennis et al., 2007). Thus, developmental considerations when investigating and measuring self-control are key during this stage.

Self-control has been operationalized in many different ways with an extraordinary amount of diversity in assessment measures and methods. Assessments include executive function tasks, delay of gratification tasks, self-report questionnaires, and informant-report questionnaires (Duckworth & Kern, 2011). Central to these measurements is the presentation of multiple mutually exclusive responses that capture options with better long-term outcomes or correctness (as defined by task rules) but some form of delay, compared to others offering more immediately gratifying but incorrect or lesser outcomes (Duckworth & Kern, 2011). These assessments are based on the idea that individuals with greater self-control will opt for the more rewarding scenario despite the delay (Duckworth & Kern, 2011). This also plays out in more immediate fashion in self-control tasks designed for more instantaneous response inhibition (e.g., inhibiting the impulse to respond to a non-target item on a computer screen or managing distractions and frustrations to prioritize achieving a specific goal ignoring). Although self-control has been operationalized through many different interrelated behaviors and skills, results of a meta-analysis suggest that there is moderate convergent validity across these diverse measures of self-control (Duckworth & Kent, 2011).

Research has connected self-control to a variety of outcomes in the intrapersonal, interpersonal, and academic domains. While poor self-control has been implicated as a risk factor for impulsivity, aggression, and disruptive behavior (Eisenberg et al., 2009), greater self-control has been associated with a number of positive outcomes across the lifespan. For example,

research suggests that effortful control, or the consistent demonstration of self-control, is linked to better social and emotional competence, fewer internalizing symptoms, fewer externalizing behaviors (Eisenberg et al., 2003), and better academic achievement (Zorza et al., 2015). Early childhood studies have indicated that preschoolers with better self-control have fewer conflicts and more positive relationships with teachers (Valiente et al., 2012). There is also evidence to suggest that childhood self-control can predict positive later-life outcomes including higher SAT scores (Shoda et al., 1990) as well as patterns of physical health, substance use, financial status, and criminal activity in adulthood (Moffitt et al., 2011). Since self-control in childhood has been identified as such a critical skill for short- and long-term outcomes, including aspects of social functioning, better understanding its link to SPS could identify a key pathway for understanding and promoting positive outcomes.

There is a growing literature related to the impact of self-control on children's ability to access, demonstrate, or apply social-emotional skills successfully in social problem-solving scenarios (Dennis et al., 2007; Lemerise & Arsenio, 2000). Miller and colleagues (2020) offer a strong investigation of the influence of self-control on children's interpretations, goal generations, and strategy evaluations (social problem-solving) during social transgressions. In a sample of 81 seven- to ten-year-olds, they found that inhibitory abilities were related to fewer revenge goals during social problem-solving (Miller et al., 2020). In other words, children with stronger self-control may have been better able to inhibit impulses to exact revenge, and instead, took the time to further consider contextual factors and response options – ultimately arriving at more prosocial solutions. There is also evidence to suggest the role of self-control in helping children make healthy social decisions by delaying impulsive responses in the context of strong emotional reactions. Specifically, work by Eisenberg and colleagues (1995) found a significant

relation between emotionality and self-regulation, such that a combination of both low emotional reactivity and high self-regulation best predicts positive social competence across short- and long-term assessments. While emotional reactivity differs from empathic concern, one might posit that self-regulation abilities may also be beneficial for children with high empathic concern to access social problem-solving abilities when affectively activated. Another study by Buckner and colleagues (2009) of eight- to eighteen-year-olds showed that, in comparison to their low self-regulation counterparts, youth with high regulation abilities showed more adaptive coping responses to stressful events, better social competence overall, and healthier social responding in hypothetical scenarios, as well as numerous other positive outcomes in the domains of mental health, academic achievement, and behavior (Bucker et al., 2009).

Self-control itself may be associated with distinct aspects of the SPS process and may also play a key role in how students access other social and emotional skills to apply them to social problem-solving. Overall, the extant empirical work suggests self-control may be an essential factor supporting children's' ability to engage in the process of social problem solving by delaying impulses and allowing time to access other important skills. Therefore, it is likely that self-control may covary with other social and emotional skills in addition to its likely direct relation to SPS.

Contextual Influences on SPS: Classroom Peer Relationship Climate

Models and investigations of SPS have highlighted these processes as functioning at the intersection of individual and context (Adrian et al., 2010; Crick & Dodge, 1994; Lemerise & Arsenio, 2000). Given the key position of schools as a locale for SPS application, development, and promotion, understanding potential school-related contextual influences on SPS is of utmost importance. Within the school context, classroom climate has emerged as one proximal and

potentially main influence of school as a setting effect for SPS, social skill development, and on developmental course (Weissberg et al., 2015). Classroom climate generally refers to the sense of community, social dynamics, emotional atmosphere, and shared values and norms within the classroom (Battistich et al., 1997). Positive classroom climate has been associated with better overall academic, social-emotional, and behavioral functioning among students (Battistich et al., 1997; La Paro et al., 2004). Interventionists and researchers posit that classroom climate may be bidirectionally related to if and how children are able to develop key social, emotional, and academic skills (e.g., increases in positive climate improve skill development which then further improves climate) (Rimm-Kaufman & Hulleman, 2015; Weissberg et al., 2015). Given the importance of SPS to the formation and maintenance of peer relationships, peer relationship climate – a more nuanced and relationally-focused element of classroom climate – is of particular interest (Madill et al., 2014). Generally, much of the classroom climate research has centered around teacher-student relationship quality as opposed to peer relationship climate, a gap to which the present study responds (see also Scanlon, Del Toto, & Wang, 2020).

The peer relationship climate in a classroom is seen as representing the extent of opportunities for positive social interactions and instances of positive reinforcement for using SPS skills (Farmer & Xie, 2007). Within a classroom with better quality peer relations, students will have increased exposure to and opportunity to practice social and emotional skills (Rimm-Kaufman & Hulleman, 2015). Research suggests that positive social interactions offer key opportunities to learn lessons about getting along with others, the relation of one's own feelings and the feelings of others, and improve social problem-solving skills (Rubin et al., 2015). Further, student perceptions of their peer climate likely influence their comfort approaching and engaging with others, impact the social schemas activated in instances of relational success or

conflict, and have the potential to prime them for certain interpretations or problem-solving approaches based on perceived sense of social/emotional safety (Crick & Dodge, 1994). With no known extant literature, better understanding of how student perceptions of peer relationship climate in their classroom may impact their internal SPS process and development will provide much needed understanding of the key individual-environment interactional effects on SPS in the school context.

Evidence from adjacent areas of study suggests peer relationship climate is related to children's developing social competence and social problem-solving. For example, in a longitudinal study of 307 early elementary aged children, second grade social competence was predicted by preschool classroom social-emotional climate, indicating likely relations to SPS growth and development (Howes, 2000). Further, a meta-analytic review of 61 studies of classroom climate by Wang and colleagues (2020) highlights that positive classroom socioemotional climate is well supported as a predictor of healthy socioemotional development and shows small but consistently significant effect sizes across investigations. Similarly, work in the field of childhood aggression, which has a negative relation to SPS, offers insight into these processes. For example, Elsaesser and colleagues (2013) found that positive student perceptions of interpersonal climate within schools (specifically described as degree of support and helping behaviors among students) contributed to a decrease in relational aggression.

There is also extant evidence of the likely moderating relation of classroom peer climate on relations of individual skills and characteristics to social relatedness and competence outcomes. For example, in a study of 432 first-grade students by Hoglund and Leadbeater found interaction effects between classroom social climate (as represented by concentration of peer prosocial behaviors) and school disadvantage as it predicted growth in social competence

(controlling for behavior at the beginning of the school year, gender, classroom level of victimization). Further, in a longitudinal study of 1,364 children, caregivers, and teachers, first grade socioemotional climate was found to moderate the relation between early childhood anxious solitude and peer rejection for boys and girls, as well as peer acceptance for boys and peer victimization and depressive symptoms for girls (Gazelle, 2006). Overall, results suggest that classroom peer climate can significantly influence (moderate) relations between individual skills and outcomes pertaining to peer relations and emotional adjustment.

Finally, there is some limited extant empirical evidence to support the likely moderating effect of perceptions of peer relationship climate specifically on predictors of SPS development, although findings about the likely direction of moderation influences are mixed. Given the lack of studies examining perceptions of peer relationship climate as they relate to social problem-solving, studies of aggression and bullying are helpful in positioning positive perceptions of peer relationship climate as a likely promoter of healthier SPS and a relevant potential moderator of other skill relation pathways. Most notably, a major study of 23,532 students in grades 4-12 by Yang and colleagues (2020) offers support for the likely moderating effect of perceptions of classroom peer relationship climate on the relations of social and emotional skills to important peer relational processes like SPS. While this study examined perceptions of overall school climate, it found significant moderating effects at the individual perception level only, suggesting student perceptions of the social climate in their school context as important for influencing their skill relations and development (Yang et al., 2020). Specifically, this study found significant moderating effects for student-level perceptions of school climate on the association between key social and emotional competencies (social awareness, self-management) and bullying victimization, an interpersonal outcome with strong ties to SPS (Kokkinos & Kipritsi, 2012;

Rubin et al., 2006). Results suggest that perceiving one's school climate to be more supportive and emotionally attuned mitigated the positive relation between social awareness and bullying victimization such that there was lower risk for victimization for kids with greater social awareness when they perceived a more positive school climate (Yang et al., 2020). Additionally, results indicated that perceptions of positive school climate strengthened the protective effect of self-management (self-control, emotion regulation) on bullying victimization suggesting individual's self-management abilities are more protective against negative interpersonal challenges when students perceive themselves to be in unsupportive or negative school climates (Yang et al., 2020). Results are particularly applicable to the present study as they examine social, emotional, and regulatory competencies that capture all major predictors of interest, with empathy and perspective-taking captured by social awareness and self-control captured within self-management. Overall, this work by Yang and colleagues suggests that students' individual perceptions of social climate have the potential to enhance or mitigate the relations between social emotional skills and SPS/social functioning, potentially strengthening ties between skills and SPS or conversely buffering the need for individual competencies for SPS development. However, given notable deficiencies in the literature examining perceptions of peer relationship climate specifically or its relation to the interplay between social and emotional skills and SPS, much more research is needed.

Developmental Considerations

To gain a useful and sufficiently sensitive understanding of contributors to SPS, age must be considered. Extant empirical work supports that some social and emotional skills vary in importance and/or impact on social functioning by age (Malik & Marwaha, 2018). Generally, work in neuroscience and cognition suggest that a child's capacity for complex thinking and the

integration of multiple sources of evidence to arrive at a conclusion increases with age (Crick & Dodge, 1994; Fischer & Bullock, 1984). From this understanding, Crick and Dodge (1994) posit that SPS improves across development due to the acquisition of cognitive skills, development of broader social knowledge with greater experience, and increases in the capacity and speed of processing. Results from Dodge and Price's (1994) investigation of social information processing in a sample of 259 first, second, and third graders suggest significant linear effects for age on social information processing ability. Further, results demonstrate that as social information processing ability increases with age, it also becomes more significantly related to subsequent behavior and social competence (Dodge & Price, 1994). Work has also suggested a reciprocal causal influence that an increased need for behavioral performance as age increases may increase SPS skill by means of increased opportunity for practice and social demands (Devine et al., 2016; Dodge & Feldman, 1990). Thus, it is highly likely that overall SPS ability will increase across childhood.

However, skills may vary in their predictive importance to SPS depending on developmental stage. Current evidence suggests that perspective-taking, overall SPS, empathy, and self-control all develop across childhood, however there are no extant comparisons of these trajectories (whether developmental slopes are steeper, more consistently linear, or faster for certain skills) (Su et al., 2019; Zajdel et al., 2013). Thus, it may be that due to differences in skill development across age, children at different stages of development access different social and emotional skills when facing complex social situations.

Further, evidence of developmental consistencies/inconsistencies is varied based on the individual skill relations to SPS. For example, recent studies of perspective-taking suggest that the development of some essential cognitive SPS skills are not formed as a process until around

age 7 (Osterhaus & Koerber, 2021). Similarly, a 5-year longitudinal study of 161 5- to 10-year-olds identified significant developmental progressions in social reasoning and reasoning about social situations in late middle childhood (ages 9 and over) and noted significant differences particularly between grades 3 and 4 (Osterhaus & Koerber, 2021). However, in a longitudinal study of 77 children from early childhood through middle school, researchers identified consistent contemporaneous correlations of emotionality (affective responding) and self-regulation to social functioning at ages 6-8 and 8-10 (Eisenberg et al., 1997). These findings suggest an inconclusive understanding of the relation of various social and emotional skills to SPS at different developmental timepoints. Additionally, results of Wang and colleagues 2020 meta-analytic review of 61 studies of classroom climate identified a consistent positive influence of supportive classroom climate on psychosocial development across both primary and secondary school, suggesting that there are likely to be positive effects of positive peer relationship climate in both our early and later elementary populations. The present study is able to incorporate these considerations by differentiating our sample into a younger subsample (grades 2,3) and older subsample (grades 4,5). While measurement differences between these two subsamples precludes empirical evaluation of these differences, results will offer preliminary qualitative insights into developmental variations in relations to and predictive influence of cognitive, affective, and regulatory skills on SPS.

Measurement of SPS

Studies of SPS and related social and emotional skills have utilized varying forms of measurement that can be differentiated into measures of process and measures of effect. Process measures have typically examined the internal cognitive, attitudinal, and skill components of SPS that facilitate the identification of effective solutions to a problem. Effect measures have

focused on the quality of the solution, and often the actual behavioral enactment of the (typically prosocial) solution that in theory represents successful SPS. Process measures reflect the understanding of the internal components of problem-solving and effect measures represent an ability to demonstrate or outwardly apply skills effectively. Effect measures however, frequently rely on observer report of behaviors (e.g., teacher, parent, researcher) and by this nature are unable to capture the essential internal processes that contribute to active SPS (McKown et al., 2016). The present study aims to understand how additional internal factors (cognitive, affective, regulatory skills) influence the process of SPS and how these relations are impacted by context, and thus relies on a process measure.

Process measures can exist as both inventory assessments and performance measures. Inventories, which take a broad estimate of abilities, often occur in self-report via questionnaire or interview. Performance tests, which directly assess an individual's ability to apply social problem-solving skills in real-time to a specific task, involve more immediate assessments of active problem-solving. While broad in their range, inventories do not test the individual's abilities in real-time and are more subject to social desirability bias (Crowne & Marlowe, 1960). Performance tests offer the most natural assessment of skills in real-time. Social problem-solving and the process components of social information-processing are most often assessed using hypothetical ambiguous social situations, including vignette-based interviews (Dodge et al., 2002). To assess the various aspects of cognition that are present during SPS, interviewers propose an ambiguous social scenario and then ask questions to gauge the child's interpretation or thinking. Recent developments in SPS assessment have extended into computer-based programs for virtual engagement that present virtual scenarios for children to children navigate with an avatar as if it were happening in real-time. The program includes automated questions to

assess cognition in real-time as the child actively engages with the program (Russo-Ponsaran et al., 2018).

The present study examines SPS via two of these virtual direct performance assessments; SELWeb (McKown, 2019) and the Virtual Environment for Social Information Processing (VESIP; Russo-Ponsaran et al., 2018). These innovative measures are developmentally tailored for their target age-group in terms of visual presentation, complexity, and language (see Measures section for more details). The use of these novel direct assessments is a particular strength of this study, as it is one of very few to take such a comprehensive look at the relation of cognitive, emotional, and regulatory skills to real-time SPS.

Contributions to Growth in SPS

To best contribute to effective prevention and intervention efforts, there is a need for understanding how individual skills might promote SPS development, or growth in SPS over time. Presently, much of the work examining the relations of cognitive, affective, and regulatory skills to SPS has been conducted cross-sectionally, with limited longitudinal investigation of growth (Adrian et al., 2010; Walker et al., 2012). However, while the examination of predictors of SPS growth is a much-needed area for future study there is some preliminary evidence to suggest that our skills of interest will also be significantly related to SPS development over time. For example, Eisenberg and colleagues (1997) followed 77 children from early childhood (4) through middle school (10) and examined relations of self-regulation and emotionality to social functioning (as measured by hypothetical peer conflict scenarios involving key indicators of SPS). Results indicated that emotionality and self-regulation consistently predicted subsequent social functioning in all three age groups (4-6, 6-8, 8-10) suggesting strong evidence for the likely predictive influence of our measures of empathic concern and self-control to growth in

SPS (Eisenberg et al., 1997). Further, in a general, diverse sample of 101 students evaluated in preschool (age 3-4) and Kindergarten, Denham and colleagues (2014) found that executive control significantly predicted aspects of social cognition including social problem solving after one year. Other studies have begun to examine SPS in this longitudinal/developmental way, but have focused on predictors that are not of interest in this study. For example, in a study of 576 children and families beginning in preschool and ending in third grade researchers applied multilevel growth models to examine the predictive relation of positive parenting and sociodemographic factors (e.g., gender, race, SES) to growth in SPS (Su et al., 2019). Results indicated modest predictive influence of early positive parenting and ethnic/sociocultural background (Su et al., 2019). Overall, there is promising evidence for the likely positive predictive influence of our skills of interest and the feasibility/analytic structure for longitudinal studies of SPS development, although much more work needs to be done in this area.

Of the longitudinal studies conducted involving SPS, most have been intervention studies that test overall program effects on SPS but not the effect of specific growing skills or program components that result in this positive growth. However, as a whole, SPS interventions do suggest SPS is a malleable and buildable competence given the consistently significant outcome of growth in SPS in studies in which it was targeted and assessed (Merrill et al., 2017). Further, interventions and SPS curricula regularly include instruction in elements of perspective-taking, emotion-regulation, and executive/self-control (Merrill et al., 2017). Thus, while there is a notable gap in understanding and measuring the underlying mechanisms by which these interventions promote growth in SPS (e.g., if and how these skills really promote SPS development), they offer some evidence of the likelihood of the predictive influence of our skills of interest.

Overall, while there is enough evidence to support a likely positive relation of cognitive, affective, and regulatory skills to growth SPS, the paucity of research comparing the predictive influence of these skills leaves major questions about the respective strength of their impact over time. Thus, we will not only examine the contemporaneous relations of cognitive, affective, and regulatory skill contributions to SPS, but also their longitudinal predictive influence.

The Present Study

In sum, there is extensive research across the social, cognitive, developmental, and educational literature highlighting SPS as a key process for promoting positive social, emotional, and academic outcomes. While there is very solid preliminary research examining predictors of SPS, much of the current work has focused on cognitive and behavioral examinations of this process. While essential and well supported, more and more investigations are calling for the need to include affective and regulatory factors into models of SPS, given their identification as essential skills for child development. Finally, social ecological systems perspective highlights the need for considering a child's context and developmental stage to understand their experience and development. As schools are primary developmental contexts for children and promising systems for reaching youth through universal and targeted prevention and intervention efforts, more work is needed to understand the nuanced ways in which elements of school climate and context impact the development of SPS.

The present study investigates how cognitive (perspective-taking), affective (empathic concern), and regulatory (self-control) skills relate to SPS contemporaneously and longitudinally and explores the consistency of these relations at two different stages in elementary school. The moderating influence of peer relationship climate within the classroom will also be evaluated to provide essential context for the aforementioned processes.

Aims and Hypotheses

Aim 1: Establish the contemporaneous and longitudinal relations of cognitive, (perspective-taking), affective (empathic concerns), and regulatory (self-control) skills to social problem solving.

Hypothesis 1: At baseline, empathic concern, perspective-taking, and self-control will be positively related to social problem solving.

Hypothesis 2: Baseline empathic concern, perspective-taking, and self-control will positively predict changes in social problem solving across one year, controlling for baseline social problem solving.

Aim 2: Establish the influence of classroom peer relationship climate on the relation of cognitive, affective, and regulatory skills to the development of social problem solving.

Hypothesis 3: Classroom peer climate will moderate the predictive relationship between cognitive, affective, and regulatory skills to growth in social problem solving, although investigations remain exploratory given mixed literature about the likely direction of this influence.

Aim 3: Explore the consistency and variation of the relations between of cognitive, (perspective-taking), affective (empathic concerns), and regulatory (self-control) skills and the development of social problem solving for two grade-based subsamples.

Chapter 3 – Methods

Recruitment

Data for this study is from the Compassionate Schools Project (CSP), a seven-year group randomized control trial of a mindfulness-based social-emotional learning and wellness education curriculum for elementary grades. The CSP project overall aims to evaluate the expected effects of improving physical awareness and fitness, health-related attitudes, mindfulness stress management strategies, and social emotional learning to increase student mental and physical health, engagement in learning, and academic outcomes. However, intervention effects are not the focus of the current study.

Student participants in CSP were sampled from within twenty-one of forty-five participating schools in a large School District in Louisville, KY. These schools were blocked based on racial composition and rate of free and reduced lunch recipients. They subsequently participated in a lottery for random assignment to intervention (*N = 24)* or control conditions (*N = 21*). The CSP study also included two cohorts of schools; Cohort 1 which initiated the study in the 2016 – 2017 academic year and Cohort 2 which began participating in the 2017 – 2018 academic year. Within each cohort, two classrooms per grade in each intervention and control school were selected to be evaluated as representative of the sample. Within each classroom, the teacher and 10 randomly selected students (equally distributed male and female) were assessed.

The present study utilized student-report data from active students in control schools only (N = 21) during their second years of involvement in CSP (for Cohort 1 this was the 2017 – 2018 academic year, for Cohort 2 this was the 2018 – 2019 academic year). Control schools only were used to prevent any variation in relations that might have been due to intervention. Analyses investigated relations between variables across one year, with Fall representing baseline and

Spring scores representing outcomes for each cohort. These baseline and outcome scores are captured together as “wave 3” for both cohorts, as this is their third semester of enrollment in the study, and “wave 4” at outcome. Participants included all 2nd through 5th grade students involved in the study in control schools during waves 3 and 4 of their study enrollment. Students are categorized into early elementary (2,3) and late elementary (4,5) for qualitative comparison across different developmental stages. Demographics are reported separately as analyses will be run by distinct developmental stage.

Sample

The present sample included 602 students in grades 2,3 and 599 students in grades 4,5. Each of the subsamples was relatively evenly split between grade and gender. Both samples were predominantly White (18.6% and 20.2% respectively), closely followed by African American students (14% and 18.4% respectively). Within the sample, the average number of students per classroom was 4.3 for grades 2,3 and 4.9 for grades 4,5.

Table 1
Demographics

		Grades 2,3		Grades 4,5	
		n	%	*n*	%
Gender	Female	288	47.8	299	49.9
	Male	279	46.3	254	42.2
	Missing	18	3.0	46	7.7
Ethnicity	White	112	18.6	121	20.2
	African American	84	14.0	110	18.4
	Hispanic	49	8.1	53	8.8
	Asian	20	3.3	16	2.7
	Two or more ethnicities	27	4.5	19	3.2
	American Indian	4	.7	0	0
	Missing	306	50.8	280	46.7
Grade	2 or 4 respectively	306	50.8	291	48.6
	3 or 5 respectively	295	49.0	308	51.4
Cohort	1	426	70.8	392	65.4
	2	175	29.1	207	34.6

Procedure

Data included in this study are comprised of student self-report and direct assessment measures. Randomly selected students from the identified participating classrooms were assessed by trained data collectors at school. Students in 2nd and 3rd grade completed surveys through SELweb, a web-based tool used to assess social and emotional skills. Additional measures were loaded in to the SELweb platform in addition to McKown and colleagues' (2016) formal SELweb assessment. Students in 4th and 5th grade completed surveys through Qualtrics, a web-based assessment platform (Qualtrics, 2020), and VESIP (Russo-Ponsaran, et al., 2018), a computer-based social-information processing assessment (described in detail in the following section). Student baseline data was collected between August – December of 2017, 2018 respectively and outcome data between February – May of 2018, 2019 respectively.

Measures

Social Problem-Solving

Social problem-solving was represented by two developmentally-tailored virtual scenario measures. Students in early elementary (2-3) were evaluated for social problem-solving using the Social Reasoning subscales for SELweb (Mckown et al., 2016) while students in grades 4 and 5 were assessed using the Virtual Environment for Social Information Processing (VESIP; Russo-Ponsaran et al., 2018).

SELweb. The SELweb measure is a web-based set of assessment modules examining social-emotional comprehension. The Social Reasoning module involves ten illustrated and narrated vignettes that expose participants to five ambiguous social situations and five peer entry situations. Following exposure to the vignette, participants are asked to choose from a sets of multiple response choices to select a description of the problem, a social goal, and their preference for how to solve the problem. Scores for each component of the process (problem identification, goal selection, solution preference) are scored separately for each vignette and then summed and standardized to create scores. The Social Reasoning subscale for SELweb has demonstrated strong internal consistency ($\alpha = .82$) overall and adequate internal consistency by domain with subscales ranging from (.69 to .83) (McKown et al., 2016). The present study utilized a composite score to represent overall SPS. This composite averaged standardized Z-scores for the solution preference, problem identification, and goal preference subscales. Measurement validation work has suggested strong internal consistency for this composite as reported in white papers by the measure developers (e.g., McKown, 2019). In the present sample, this composite also demonstrated strong internal consistency at baseline and outcome (both at $\alpha = .88$).

Virtual Environment for Social Information Processing (VESIP). The VESIP measure assesses student's social problem-solving by evaluating how they interpret and respond to social problems through self-report responses in computer-based scenario activities (Russo-Ponsaran et al., 2018). The VESIP allows students to create a personalized avatar who moves through social situations in two simulated school days. Scenarios include student exposure to ambiguous provocation, bullying, compromise, peer entry, and friendship initiation with one peer, with students exposed to a total of 5 scenarios overall (one per category). During each scenario, students are asked to respond to a variety of multiple-choice response options to measure problem identification, intent attribution, goal preference and solution preference. Scores for each domain are calculated by averaging scores across scenarios with higher scores indicating better abilities in that domain. VESIP has demonstrated adequate internal consistency across domains in a sample of 50 typically developing and autistic students (Cronbach's alpha ranging from .72 to .82) (Russo-Ponsaran et al., 2018). The present study utilized a composite score that standardized and then averaged scores for the problem identification, goal preference and solution preference sub-domains. Intent attribution was omitted to parallel our measure of SPS in the early elementary sample. This composite demonstrated good internal consistency at baseline ($\alpha = .77$) and outcome ($\alpha = .81$).

Empathic Concern & Perspective-taking

Measurement of empathic concern and perspective-taking was differentiated for grades 2-3 and 4-5 due to findings that means of assessment appropriate for testing abilities at the lower grades/ages will not differentiate among older participants (ceiling effect). Further, for measures with appropriate sensitivity in both age groups, item format was slightly differentiated to be more developmentally engaging.

Grades 4 & 5: Empathic concern and perspective-taking in the older elementary sample were assessed using respective subscales from the Interpersonal Reactivity Index (Davis, 1983). This measure generally examines student self-reported ability to recognize and understand others' emotions with perspective-taking representing the ability to understand another person's point of view and empathic concern examining feelings of compassion, concern, and care toward others. The Empathic Concern and Perspective-taking subscales are each comprised of seven items. Empathic Concern includes items such as "I often have strong feelings about things that happen around me" and "I often feel sorry for other children who are sad or in trouble." Subscale scores were calculated using the average of all non-missing items per scale. The Perspective-taking subscale includes items such as "Even when I'm mad at someone, I try to understand how they feel" and "There are different ways to think about a problem and I try to look at all of them." Students in 4th and 5th grade completed the assessment through the Qualtrics virtual platform (Qualtrics, 2020). Items were presented on a 5-point Likert scale from *Not at all like me* (1) to *Always like me* (5).

There is evidence for the strong test-retest reliability and internal consistency of the IRI. For example, when evaluated with a sample of 677 male and 677 female undergraduate students, test-retest reliabilities for the IRI ranged from .61 to .81 in a 60-75-day time frame (Davis, 1980). In the same sample, this measure also showed adequate internal consistency with Cronbach's alpha for empathic concern ranging from .80 -.96 and perspective-taking from .74-.80 (Davis, 1980). Within our 4th and 5th grade sample, empathic concern ($\alpha = .83$) and perspective-taking ($\alpha = .79$) also demonstrated strong internal consistency.

Grades 2 & 3: Measures for empathic concern and perspective-taking were differentiated in the two age groups with differences in measure selection and item formatting to be more

developmentally appropriate for our younger participants. Empathic concern, which was still assessed using the Empathic Concern subscale of the Interpersonal Reactivity Index (IRI, Davis, 1983) involved changes to item format and response options. Students in 2nd and 3rd grade completed this measure through the SELWeb virtual platform (versus Qualtrics for 4,5). Items in SELWeb were administered in the Harter format which has participants rate themselves along a continuum between two extremes (Harter, 1982). Students are presented with two cartoon dogs (Comet and Bear) presenting opposite response options (e.g., "Some kids feel sorry for people who don't have the things they have" versus "Some kids do not feel sorry for people who don't have the things they have.") Students are first asked to select which one is more like them (Comet or Bear), and then asked to rate if this was "really" like them or "sort of" like them. Thus, items identify positive or negative affinity toward the construct and then elicit more nuance around the intensity of the association. Internal consistency was adequate in the early elementary sample ($\alpha = .77$).

Perspective-taking in 2nd and 3rd grade students was assessed using a different measure of the construct that reduces demands on metacognition to maximize developmental match. This measure, also administered as part of SELWeb, presents items in a story format and was specifically designed for this early elementary age group (McKown et al., 2019). Further, the measure selected demonstrated better internal consistency in this sample than the comparable perspective-taking subscale of the IRI ($\alpha = .35$) applied with 4th and 5th graders and has shown strong internal consistency in similarly-aged samples ($\alpha = .79$; McKown, 2019). This Social Perspective-taking measure requires students to listen to illustrated and narrated vignettes presenting characters in various scenarios. Then, students are asked to make inferences about the character's mental state and intentions in the scenario (e.g., "Why did the boy look in the

basket?") and select from four pre-determined possible responses. Items are scored 0 (incorrect answer), 1 (factually accurate with no mental state inference), or 2 (correct mental state inference). This assessment demonstrates adequate internal consistency in the early elementary sample ($\alpha = .65$).

Self-Control

Self-Control Composite from SELWeb. Self-control for all grades was measured using a composite self-control score comprised of the SELWeb Delay of Gratification and Frustration Tolerance tasks. Scores for these tasks were standardized and averaged. In the Delay of Gratification tasks, students are instructed to send rocket ships to space using a fast, medium, or very slow ship. They are told to get as many points as possible in 10 trials with the slower rocket valued at the highest amount. Thus, if children can delay gratification and wait for the slowest rocket ships, they will obtain the highest score. The Frustration Tolerance task has students discriminate between matched or unmatched pairs of shapes by clicking with their computer mouse when items are matched. They are asked to complete as many trials as possible in 90 seconds, with a few items programmed to "get stuck" and delay the task. Items are scored as correct (1) or incorrect (0) with a maximum score of 21. Data for Frustration Tolerance showed some distortion of distribution due to a few outliers among scores of 2nd and 3rd grade participants. To address this non-normal distribution, the few who scored under 13 total completed items were recoded to receive a score 13 which thus represents baseline meaningful engagement with the task. This also parallels developmental expectations for the Frustration Tolerance task suggesting that for some children at this young age, these skills are not developed enough to be captured in the current sensitivity of the task. For consistency, the same cutoff score was applied in our older elementary sample (4th and 5th grade).

The scales used to create the self-control composite have preexisting evidence of adequate reliability in similarly-aged populations. For example, in a sample of 4,419 students from urban and suburban elementary schools, both measures demonstrated adequate internal consistency with Delay of Gratification evidencing an alpha of .74 and Frustration Tolerance and alpha of .85 (McKown, 2019). In the current sample, pre-standardization, Delay of Gratification demonstrated strong internal consistency in grades 2,3 ($\alpha = .81$) and grades 4,5 ($\alpha = .83$) and Frustration Tolerance exhibited slightly lower, but adequate internal consistency in both grades 2,3 ($\alpha = .72$) and grades 4,5 ($\alpha = .61$). Additionally, pre-standardization, Delay of Gratification and Frustration Tolerance were positively and significantly correlated in both the grade 2,3 ($r = .09$, $p < .05$) and grade 4,5 ($r = .18$, $p < .01$) samples.

Classroom Peer Climate

Adapted Classroom Community Scale. Student self-reported feelings of caring, autonomy, and influence from peers in their classroom for all grades were measured using an adapted version of the Sense of Community Scale (Battistich et al., 1997). This measure was originally adapted by Madill and colleagues (2014) and utilizes select re-worded items to center assessment specifically on classroom perception of peer relationships rather than overall school climate. This measure consists of six items rated on a five-point Likert scale from *Never* (0) to *Always* (4). Items include statements such as "Kids care about each other in my classroom." Items are averaged to create an overall score for peer climate. In a sample of teacher-child interactions in 749 first, third, and fifth graders, this measure demonstrated adequate internal consistency ($\alpha 1 = .83$, $\alpha 2 = .82$) (Madill et al., 2014). The present study will examine this variable at the individual level, representing each student's distinct perspective of the peer

relationship climate within their own classroom. In our sample, this measure demonstrated good internal consistency in grades 2,3 (α = .77) and grades 4,5 (α = .85).

Covariates

Student gender and race/ethnicity were included in all models as categorical controls. Values for these variables were collected from available data provided by the Public School District involved in the study. Specifically, the school district provided one variable for race and ethnicity that places students into mutually exclusive categories Hispanic, American Indian, Asian, African American, White, or Two or more races. For the present study, this variable was dummy coded for inclusion in each of these identity groups with White students as the reference group given the predominance of White students in both samples. Gender was valued at male = 0, female = 1. Intervention condition was controlled for through the use of only control condition schools.

Analytic Design

This study applied a multilevel modeling approach (Raudenbush & Bryk, 2002) to investigate the relationship between predictors of interest and social problem-solving using MPLUS Version 8.7 (Muthén & Muthén, 2021). Multilevel modeling was applied to protect against the possible inflated levels of statistical significance that could occur due to the biased estimates of parameters and standard errors that is possible in nested data and would violate the assumption of independence (Maas & Hox, 2005). In the present study, students (level 1) are nested within classrooms (level 2), with teacher assignment as the clustering variable in the multilevel models applied. Empathic concern, perspective-taking, self-control, peer relationship climate, and baseline/outcome SPS were all measured at level 1. Additional level 1 covariates

included gender and ethnicity. Level 2 accounted for variance in the outcome that was nested at the teacher/classroom level. Continuous variables of interest were grand mean centered within each respective grade group sample as a means of facilitating interpretability while retaining natural metrics (Heck & Thomas, 2015). A robust estimator was used to manage slight skew and kurtosis identified in some variables (non-normal distribution) (Field & Wilcox, 2017).

Three mixed effects models were tested for each age group respectively (2,3 and 4,5). The first model examined cross-sectional (concurrent) direct effects of empathic concern, perspective-taking, and self-control to baseline SPS, controlling for gender, ethnicity, and classroom assignment. The second model examined the longitudinal direct effects of empathic concern, perspective-taking, self-control, to SPS at the end of the academic year while controlling for baseline SPS, thus isolating the relation of predictors to growth in SPS across one year. The second model also controlled for gender, ethnicity, and classroom assignment. The third model added examination of the potential moderating influence of classroom peer relationship climate on the predictive influence of each individual variable to growth in SPS development (interaction).

Missing data. Data were analyzed to identify patterns of missingness. There was substantial missing data for ethnicity in both the early elementary (n = 305, 51%) and older elementary (n = 280, 47%), followed by SPS at outcome in both the early elementary (18%) and older elementary (9%) samples. Otherwise, for all other variables in both samples missingness varied between 4 – 10%. Missing data were accounted for using Full Information Maximum Likelihood (FIML; Enders & Bandalos, 2001).

Chapter 4 – Results

Descriptive and Bivariate Analysis

Descriptive statistics for relevant study variables are included in Table 2. Among students in grades 2 and 3, Empathic Concern (-1.82, *SD* = 0.59), SPS at baseline (-1.82, *SD* = 1.27), and SPS at outcome (-1.65, *SD* = 0.32) were negatively skewed. Among students in grades 4 and 5, Self-control (-1.05, *SD* = 0.78) was also negatively skewed. Maximum Likelihood Rotation estimates were used in all analyses to account for these non-normal distributions.

Bivariate correlations for grade 2,3 variables are presented in Table 3 and in Table 4 for grades 4,5. For grades 2,3 and grades 4,5, baseline empathic concern, social perspective-taking, and self-control were all significantly and positively correlated to baseline social problem solving as expected ($p < .01$). For both age groups, comparisons of baseline levels of empathic concern, perspective-taking, and self-control to social problem solving at outcome were positively and significantly correlated ($p < .01$). As expected, baseline and outcome SPS were positively and significantly correlated for both age groups as well – grades 2,3 ($r = .61$, $p < .01$), grades 4,5 ($r = .62$, $p < .01$).

With regard to the potential moderating role of classroom peer relationship climate, differences were identified between grades 2,3 and grades 4,5. In grades 2,3 peer relationship climate was significantly correlated with social problem solving at baseline ($r = .19$, $p < .01$) and outcome ($r = .17$, $p < .01$), as well as empathic concern ($r = .28$, $p < .01$). Classroom peer relationship climate in grades 2,3 was not significantly correlated with perspective-taking, or self-control. In grades 4,5 classroom peer relationship climate was significantly and positively correlated with all variables. It showed significance at the $p < .01$ level for all variables except for social problem solving at outcome ($p < .05$).

Table 2

Descriptive Statistics

	Grades 2,3					Grades 4,5				
	M	SD	Min	Max	Skewness	M	SD	Min	Max	Skewness
Empathic Concern	3.54	0.59	1	4	-1.82	2.66	.86	1	5	-.50
Perspective-Taking	1.56	0.33	0.5	2	-0.91	3.18	.84	1	5	-.10
Self-Control*	0.00	0.75	-2.66	1.6	-0.44	.000	.78	-2.88	1.53	-.91
Peer Relationship Climate	3.26	0.72	1	4	-1.00	2.35	.85	0	4	-.30
SPS Baseline	0.99	2.37	-10.19	3.35	-1.82	1.65	.42	.33	2.33	-.84
SPS Outcome	0.95	2.50	-9.71	3.35	-1.68	1.64	.46	.13	2.33	-.84

*Note: Subscales used to create the self-control measure were standardized into Z scores before averaging to create this composite. Descriptives presented here indicate distribution and descriptive values after this process.

Table 3

Grades 2,3 Bivariate Correlations

	Empathic Concern	Perspective-Taking	Self-Control	Peer Relationship Climate	SPS Baseline	SPS Outcome
Empathic Concern	1					
Perspective-Taking	.25*	1				
Self-Control	0.07	.26*	1			
Peer Relationship Climate	.28*	-0.03	-0.05	1		
SPS Baseline	.42*	.26*	.23*	.19*	1	
SPS Outcome	.26*	.21*	.23*	.17*	.61*	1

*. Correlation is significant at the 0.01 level (2-tailed).

Table 4
Grades 4,5 Bivariate Correlations

	Empathic Concern	Perspective-Taking	Self-Control	Peer Relationship climate	SPS Baseline	SPS Outcome
Empathic Concern	1					
Perspective-Taking	.69**	1				
Self-Control	.11**	0.07	1			
Peer Relationship Climate	.31**	.31**	.12**	1		
SPS Baseline	.21**	.22**	.23**	.19**	1	
SPS Outcome	.21**	.16**	.14**	.11*	.62**	1

**. Correlation is significant at the 0.01 level (2-tailed).
*. Correlation is significant at the 0.05 level (2-tailed).

Contemporaneous Direct Effects

Table 5 presents estimates (standardized beta coefficients) for the multilevel models examining the contemporaneous effects of empathic concern, perspective-taking, and self-control on baseline SPS (beginning of the school year) while controlling for gender, ethnicity, and classroom nesting. In grades 2,3, all three predictor skills had independent significant relations with SPS ($p < .001$) with the model overall explaining 31% of the total variance ($R^2 = .31$). In grades 4,5 perspective-taking and self-control were significantly related to SPS ($p < .001$) while the relation with empathic concern was not significant. Within our younger elementary sample (grades 2,3) empathic concern evidence the strongest relation to SPS at baseline ($\beta = 0.39$) with lesser but comparable effects for perspective-taking ($\beta = 0.14$) and self-control ($\beta =$

0.15). In the older elementary sample (grades 4,5) self-control was most strongly related to SPS at baseline (β = 0.20), followed by perspective-taking (β = 0.16). In the grade 4,5 sample, this direct effects model explained 13% of the total variance (R^2 = .13).

Table 5
Standardized Contemporaneous Relations to SPS at Baseline

	Grades 2,3				Grades 4,5			
	β	SE	*t*	*p*	β	SE	*t*	*p*
Empathic Concern	0.39	0.05	7.41	0.00	0.05	0.06	0.76	0.45
Perspective-Taking	0.14	0.05	2.67	0.01	0.16	0.06	2.52	0.01
Self-Control	0.15	0.05	3.10	0.00	0.20	0.04	4.54	0.00

Note: Student gender (female = 1) and ethnicity (dummy coded with mutually exclusive categories for Hispanic, American Indian, Asian, African American and two or more races, with White, non-Hispanic as reference group) included as covariates

Longitudinal Direct Effects

Table 6 outlines longitudinal relations (contribution to growth of SPS across one school year) for all three predictors on SPS at the end of the school year while controlling for ethnicity, gender, SPS at baseline, and accounting for classroom nesting. Standardized beta coefficients indicate significant effects of self-control (β = *0.08, p* = .04) on growth in SPS in grades 2,3. No other significant predictors of growth in SPS were identified, although for Grades 4,5 the relation of Empathic Concern was near significant (β = *0.08, p* =.08). R^2 values in the grade 2,3 sample indicate this model explained 50% of the variance. In the grade 4,5 sample, 40% of the total variance was accounted for by this model.

Table 6
Standardized Longitudinal Relations to SPS at Outcome

	Grades 2,3				Grades 4,5			
	β	SE	*t*	*p*	β	SE	*t*	*p*
Empathic Concern	-0.03	0.05	-0.64	0.53	0.08	0.05	1.76	0.08
Perspective-Taking	-0.01	0.05	-0.19	0.85	-0.03	0.05	-0.72	0.47
Self-Control	0.08	0.04	2.03	0.04	-0.02	0.04	-0.47	0.64

Note: Student gender (female = 1), ethnicity (dummy coded with mutually exclusive categories for Hispanic, American Indian, Asian, African American and two or more races, with White, non-Hispanic as reference group), and Baseline SPS included as covariates

Moderation Effects

Table 7 presents estimates (standardized beta coefficients) for the moderating effect of perceived classroom peer relationship climate on relations of empathic concern, perspective-taking, and self-control to SPS at the end of the school year. Moderation analyses were conducted while controlling for ethnicity, gender, and baseline SPS, and accounting for classroom nesting. There was no significant moderating effect of perceived classroom peer relationship climate on relations in grades 2,3. In grades 4,5, perceived classroom peer relationship climate significantly moderated the relation between self-control ($p = .035$) to growth in SPS. The moderating effect of classroom peer relationship climate on the relation between perspective-taking ($p = .06$) and growth in SPS approached, but did not meet, the threshold for significance. Main effects in the moderation model remained significant for Self-Control in grades 2,3 ($p < .05$) and approached significance for Empathic Concern in grades 4,5 ($p = .07$). SPS at baseline was also significant and demonstrated the strongest effects for both age groups ($p < .001$). R^2 values indicate 50% and 42% of the variance is accounted for by this moderation model in grades 2,3 and grades 4,5 respectively.

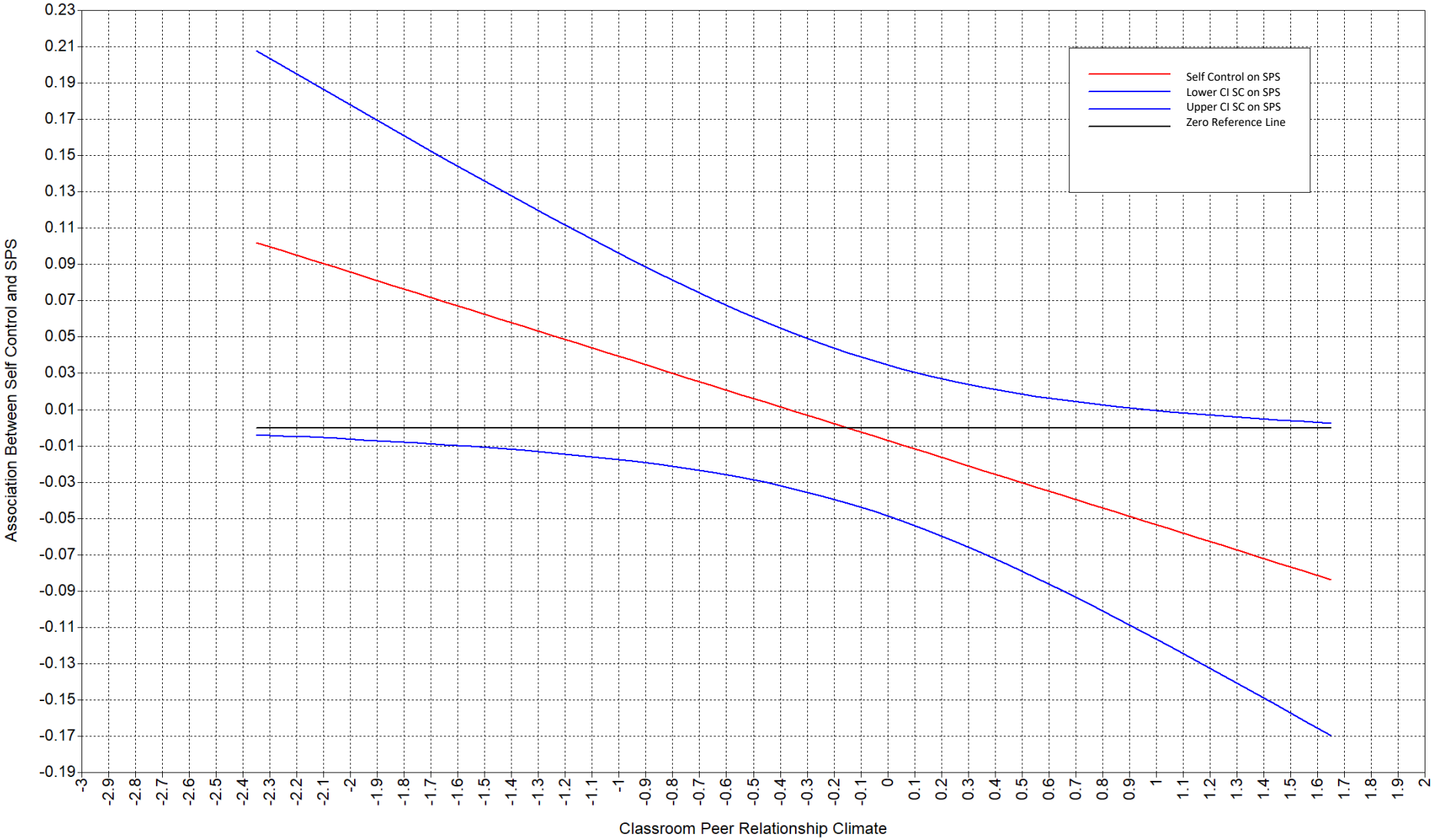
To better understand the nuance of the significant moderating effect on the relation between self-control and SPS, a Johnson-Neyman plot (Preacher et al., 2006) was generated. Figure 2 presents the conditional effect of the focal predictor, self-control, on the outcome SPS, across all possible values of the moderator, perceived classroom peer relationship climate. Evaluation of the Johnson-Neyman plot suggests that the association between self-control and SPS (i.e., red line in Figure 2) varied over levels of classroom peer relationship climate. When students perceived classroom peer relationship climate to be below average, there was a positive association between self-control and SPS, such that an increase in self-control was associated with an increase in SPS. When students reported more average perceptions of classroom peer relationship climate, the association between self-control and SPS was approximately zero. Lastly, when students reported above average perceptions of classroom peer relationship climate, there was a negative association between self-control and SPS, such that an increase in self-control was associated with a decrease in SPS. It should also be noted that the bounds representing the 95% confidence intervals (i.e., blue lines in Figure 2) for the association between self-control and SPS always encompassed zero, suggesting that there were no regions of significance where self-control was significantly associated with SPS across the valid range of perceived classroom peer relationship climate.

Table 7
Standardized Moderation Effects of Peer Relationship Climate (PRC) on SPS at Outcome, Controlling for SPS Baseline

	Grades 2,3				Grades 4,5			
	β	SE	*t*	*p*	β	SE	*t*	*p*
Empathic Concern	-0.02	0.05	-0.48	0.63	0.08	0.04	1.84	0.07
Perspective-Taking	-0.02	0.05	-0.30	0.76	-0.03	0.05	-0.50	0.61
Self-Control	0.08	0.04	2.10	0.04	-0.01	0.04	-0.33	0.74
PRC*	0.00	0.04	0.01	0.99	-0.04	0.04	-1.07	0.29
Empathic Concern x PRC	0.00	0.04	0.07	0.95	0.11	0.06	1.72	0.09
Perspective-Taking x PRC	0.03	0.05	0.48	0.63	-0.12	0.06	-1.92	0.06
Self-Control x PRC	0.04	0.04	0.87	0.38	-0.07	0.03	-2.11	0.04

*PRC = Peer Relationship Climate
Note: Student gender (female = 1), ethnicity (dummy coded with mutually exclusive categories for Hispanic, American Indian, Asian, African American and two or more races, with White, non-Hispanic as reference group), and Baseline SPS included as covariates

Figure 2. **Johnson-Neyman Plot of the Relationship between Self-Control and Social Problem Solving across Levels of Classroom Peer Relationship Climate (Grades 4,5)**



Chapter 5 – Discussion

The present study examined key cognitive, affective, and regulatory skills as they relate concurrently to SPS and longitudinally to SPS development, with additional attention to the moderating influence of student perceptions of classroom peer relationship climate and variation in findings by developmental stage. Hypotheses were mostly supported, with significant effects identified for contemporaneous and longitudinal relations as well as some variation by perceived classroom peer relationship climate and age group.

Contemporaneous Relations

Results were partially supportive of hypothesis one. Preliminary analyses, specifically bivariate correlations, indicated all predictors were positively and significantly correlated with SPS at both baseline and outcome in both age groups. Initial regression analyses revealed significant and positive contemporaneous direct relations between all predictors and SPS for both age groups, except for empathic concern in the grade 4,5 group. Overall, results indicate that in this sample, greater levels of empathic concern, perspective-taking, and self-control were related to better SPS in grades 2,3 and greater perspective-taking and self-control were related to better SPS in grades 4,5.

Support for the significant relation of these predictors to SPS is consistent with prior research evidencing these associations for empathic concern (Findlay et al., 2006), perspective-taking (Bailey & Im-Bolter, 2020; Marsh et al., 1981), and self-control (Miller et al., 2020). The consistent contemporaneous relation of perspective-taking to SPS across both age groups suggests that perspective-taking abilities remain closely linked to SPS across elementary school. This parallels the origin of SPS as originally focused on/represented by cognitive elements

through social-information processing (Crick & Dodge 1994) and supports assertions in the field that SPS involves many cognitive components. The consistent positive association of self-control to SPS in both age groups also support Lemerise and Arsenio's (2010) assertion that self-regulatory skills are essential in explaining SPS.

However, there were mixed findings for the role of empathic concern. The significant association identified for early elementary students does parallel theoretical (Lemerise & Arsenio, 2000) and empirical (Findlay et al., 2006; Warden & MacKinnon, 2003) assertions that there are relations between affect and SPS. The non-significant effect of empathic concern in our grades 4,5 sample however, is inconsistent with findings of prior investigations of this relation in similarly aged samples (e.g., Warden & MacKinnon, 2003). In the present study, this result suggests empathic concern may be less related to SPS in later elementary school. It is possible that by later elementary school there is more variation in empathic concern abilities among students that muddies this relationship (whereas for younger students, their overall levels of empathic concern may be consistently less developed, however those evidencing some ability show a clear link to SPS).

Relation to Change in SPS

Results were less consistent with hypothesis two. Longitudinal relations between key predictors and growth in SPS were found for self-control only, and only in the early elementary sample. The relation of empathic concern to change in SPS, approached significance for the older elementary sample. These results suggest that empathic concern and self-control skills may help explain change in SPS over time, perhaps varying by age of baseline measurement. The significance of self-control in the early elementary sample suggests that at earlier ages one's ability to inhibit and control impulses may significantly predict growth in SPS. This could

indicate that the more a young child can control reactive responses, the better able they are to pause and access skills for SPS. Further, the fact that their self-control better allows them to remain in challenging social situations may facilitate greater opportunities for practice, thus resulting in greater SPS development. In later elementary school, the findings may suggest that greater empathic concern could relate to positive growth in SPS over one year. This could reflect that a child's ability to empathize with their peers at this point in development may spur improvement in navigating challenging social problems. Overall, while there has been limited longitudinal investigation of the relation of social and emotional skills to SPS, results partially parallel the few studies that support aspects of self-regulation and emotionality as relating to growth in SPS (e.g., Eisenberg et al., 1997; Denham et al., 2014). However, results introduce some uncertainty about the developmental stability of these relations.

Overall, results of models exploring the relation of social and emotional skills to SPS growth across one year revealed less significance than anticipated. This could suggest there may not be as much effect of these distinct social and emotional skills on change as predicted. It may also be that there are very difference developmental trajectory of SPS ability for different students that impair identification of any overall trend in SPS change over the year in this sample. However, the few significant findings identified do suggest that there is some predictive relation between baseline skill levels and SPS growth. Such dynamism may be an important indicator of the continuous malleability of skills and the potential value of focusing on empathy or self-control when interested in affecting SPS ability over time.

Role of Classroom Peer Relationship Climate

Student perception of classroom peer relationship climate was partially supported as a moderator. Perception of classroom peer relationship climate significantly moderated the

relationship between self-control and SPS for participants in grades 4,5. This moderation was not significant for participants in grades 2,3. For participants in grades 4,5, the plotted association between self-control and SPS (red line in the Johnson-Neyman plot, Figure 2) indicates that when students perceive their classroom peer relationship climate to be less supportive, self-control is more positively associated with SPS. As perceptions of this climate improve (students feel their peers are more attuned and supportive), this association between self-control and SPS becomes more negative. This shift in the direction of the association between self-control and SPS across levels of perceived classroom peer relationship climate suggests that the relation of baseline regulatory skills to SPS may differ based on how welcoming and accepting older elementary students perceive their peers to be. This indicates that perception of a more supportive peer relationships within a classroom could help blunt the need for these individual social and emotional skills to achieve gains in social problem solving. In other words, results suggest that in a classroom in which a child perceives their peers to be more supportive and emotionally attuned, the child may be able to experience improvement in SPS abilities with lower levels of baseline regulatory skills. Conversely, it may be that if a student does not perceive their classroom to be safe or accepting (i.e., less supportive peer relationship climate), their ability to develop skills for SPS over the school year may depend more on having existing skills for managing/controlling their reactive impulses. Thus, results may indicate that the need for individual skill may be greater when children feel they are in a less supportive peer relationship climate.

Although classroom climate significantly moderated the relationship between self-control and SPS, the confidence intervals (i.e., blue boundary lines in Figure 2) within this plot indicate that self-control did not significantly predict SPS at any level of perceived classroom peer

relationship climate. It is important to consider these results in the context of additional factors that could have contributed to the level of significance of this association. While multilevel model results showed significant patterns of moderation as hypothesized, potential limitations related to power and sampling may have impacted the strength of analyses. Specifically, in the present sample we were not able to identify specific regions of climate where self-control had a statistically significant positive or negative effect on SPS (i.e., see J-N plot). This could be due to small effect sizes as well as limitations in measurement precision and sample size. It may be that in a bigger sample, the confidence interval for these relations would shrink to demonstrate regions of statistical significance. Further, the observed range of perceived classroom peer relationship climate is dependent upon this specific sample and the measures included in this study. If there were more individuals who perceived their environment to be on the extremes of safety and supportiveness, this could reveal different trends in direction and significance not observed within this sample. In different samples, there may also be a wider range of responses, extending examination of the association between self-control and SPS into zones of significance at wider ranges of classroom peer relationship climate. Moreover, the measure of classroom climate was a 5-point Likert-type scale. It could be that if respondents were given a wider-range of choices, more nuanced relationships could potentially emerge. Overall, results present promising initial work that requires continued study.

A significant moderating effect of perceived relationship climate was not found for any skill associations in the early elementary subsample (grades 2,3). This suggests the impact of social and emotional skills on SPS may be relatively independent from student perceptions of the supportiveness of their peers and classrooms for children who are in earlier developmental

stages. Further research is needed to examine if developmental differences in the significance of perceptions of classroom climate found within this study remains consistent in other samples.

Overall, results indicate a need for further research to better understand the role of peer relationship climate in SPS development. As this is one of very few studies to examine these relations, there are many opportunities for extending this work. For example, there is more work needed to understand the role of perceptions of peer relationship climate as they may directly relate to SPS and as they may moderate associations between SPS and other skills. Additionally, future studies would benefit from larger sample sizes, samples with varying risk profiles, and samples with more climate variation to gain a broader understanding of how peer relationship climate functions across groups and at extremes. Future work may also consider expanding measures of peer relationship climate to include wider response options to gather more nuanced data. Finally, research in this domain would benefit from examination of peer relationship climate at both the individual- and classroom-levels. While student-level perceptions of peer relationship climate are relevant for understanding individual experiences and internal processes, individual perceptions may also be influenced by a number of factors, including student ability in some of the social and emotional skills of interest in this study. Work to understand how observed or more global peer relationship climate in the classroom influences SPS development would strongly inform future climate-related intervention and prevention work. While the present study was limited in ability to interpret climate at the classroom level because of the relatively small number of students sampled from within each classroom (approximately 5 students), the inclusion of more students from each classroom would improve the precision of future models examining classroom-level influences (Bell et al., 2010; Maas & Hox, 2004). In sum, results present promising initial work that requires continued study.

Developmental Influences

While limited in our ability to empirically compare these two age groups due to our use of distinct, developmentally-tailored measures, qualitative evaluation of patterns between age groups revealed some notable findings. Variations were identified between groups for contemporaneous associations, longitudinal relations to growth, and the role of classroom peer relationship climate. Results indicate that at different ages, skills differentially related to SPS and SPS development and vary in their sensitivity to contextual influences.

Across models, the role of empathic concern seems to vary between the two age groups. In the early elementary sample, empathic concern is significantly associated with baseline SPS contemporaneously, but does not predict SPS growth across one year. For the older elementary sample, empathic concern was not significantly associated with SPS at baseline but did significantly predict SPS development across one year. Thus, it appears for younger populations, empathic concern may be concurrently associated with SPS, but less implicated in SPS development. For older students, empathic concern may be more implicated in a student's ability to connect and engage with peers in opportunities to develop SPS.

Differences were also identified in the role of self-control for different age groups. While direct associations were identified between self-control and baseline SPS contemporaneously for both age groups, only the younger elementary sample showed a significant predictive relation of baseline self-control to growth in SPS. This variation may arise from differences in the timing of development of other key social and emotional skills. For example, research indicates that children develop higher order and more complex thinking skills during and beyond middle childhood (Im-Bolter et al., 2016; Selman, 1981). Thus, at younger stages in development (e.g., early elementary school) where metacognitive and theory of mind skills are less established,

simply inhibiting reactive impulses may be the strongest skill that differentiates a student's ability to successfully or unsuccessfully engage in a social situation. Base inhibitory competencies may substantially influence a young child's exposure to SPS by determining if a child can remain in a social scenario long enough to practice SPS. For example, in second grade, one's ability to inhibit an immediate impulse to run away, tell a teacher, or hit back in a peer conflict may take precedence in determining if a student can access and practice SPS skills before reactively responding.

Variations by age group were observed in the moderating influence of classroom peer relationship climate on the relation of affective, cognitive, and regulatory skills to growth in SPS. For younger elementary students, classroom peer relationship climate did not significantly influence these relations. For older elementary students, the relation of perspective-taking to SPS significantly differed across levels of classroom peer relationship climate, specifically for students who perceived themselves to be in very supportive classroom environments. The relation of perceptions of classroom peer relationship climate to SPS also differed across levels of perspective-taking and self-control in the older elementary sample, but only for students with very high levels of these skills at baseline. This variation by age group could be related to a number of factors. This difference could be indicative of the shifts in orientation away from supportive adults and more toward peers that is common in later childhood and early adolescence (Lam et al., 2014). It may be that at younger ages, interactions with peers are more monitored and managed by adults, reducing the influence of peer relationship climate on skill development. Older children have more opportunities for more independent engagement with peers across a variety of school contexts and may thus be more cognizant of or influenced by their perceived classroom peer relationship climate.

Finally, consistencies across development are also key for informing intervention efforts in the elementary population. Perspective-taking, for example, functioned more similarly in both age groups evidencing significant concurrent direct effects but no relation to growth in SPS in either subsample. This is somewhat consistent with prior developmental research that identified ages 7 as a critical point before which some essential cognitive skills requisite for perspective-taking are not solidified (Osterhaus & Koerber, 2021). Thus, extrapolations from prior work would suggest similarities in the relation of perspective-taking to SPS if skills were to be solidified around age 7. Overall, it may be that perspective-taking skills are relatively stable and function consistently between the ages of 7 – 11 that are captured within our overall sample. In sum, the developmental inconsistencies and consistencies identified within this study could be used to inform at which age and with which skills interventions may be most effective for targeting SPS development.

Limitations

While this study contributes to the literature by exploring SPS in relation to co-occurring social and emotional skills and contextual and developmental influences, it does present with some limitations. First, this study utilized secondary data analyses. While the construct measurement was set for similar interests, it is possible that more rigorous measures may exist for the assessment of our predictors of interest. Second, the present study is limited by some missing data. While accounted for by the application of FIML in analyses, all variables exhibited some missing data. Specifically, there was substantial missing data for ethnicity, which may have influenced our use of this variable as a control. All data was assumed to be missing at random. However, because this information was collected by the School District and from parent report and then provided to our research team, we are unable to verify potential biases in the collection

or reporting. Third, this study applied a multi-level modeling approach to account for student nesting within classrooms. While this sample is considered large by most standards, the second (classroom) level was comprised of 139 classrooms in the grade 2,3 sample and 122 classrooms in the grade 4,5 sample. Thus, the cell sizes for each classroom (4.3 for grades 2,3 and 4.9 for grades 4,5) could be considered small and may have limited sensitivity to detect effects of interest, particularly moderation effects. Further, this may affect the reliability of scores for stably and accurately representing the broader population. Fourth, even with the longitudinal strength of this study, all analyses are based on correlations, especially the contemporaneous relationships and cannot be interpreted as causal. Fifth, while developmental consistencies/inconsistencies in relations were of interest in this study and clearly needed to round out the literature and inform intervention efforts, we were unable to quantitatively evaluate differences between our younger and older elementary populations. While the application of developmentally-tailored assessments of our constructs represents a relative strength of this study, it did limit our ability to respond empirically to our third aim. Further, the age groups selected in this study to represent younger and older elementary stages do each include two grades. Thus, it is possible that there could be some developmental variation even within these identified developmental comparison groups. Finally, the present study responds to the call for longitudinal evaluations to inform understanding of SPS growth. However, given our current data set, we were only about to assess growth in SPS over one year, limiting the window for our predictors to enact influence on SPS development.

Future Directions

While the present study offers significant contribution to the literature, limitations inform needed next steps in future studies. First, future studies should identify measures that are

developmentally appropriate or empirically established as comparable across age groups assessed to facilitate the statistical examination of similarities and differences related to developmental stage. Second, future studies should examine skill relations to SPS and SPS growth across longer timeframes with more data points, as the present study captures only a brief window of school-aged childhood through baseline and outcome measures. Third, while included in this study as control covariates, given the significant differences by gender and ethnicity, future studies should explore these factors and their influence on SPS and SPS development. Finally, additional studies to track and compare the developmental trajectories of the included social and emotional skills would be greatly informative to future studies and SPS intervention design.

Implications for Prevention and Intervention

Overall, the present study offers key insights that may be used to inform prevention and intervention design. First, results highlighting the association between cognitive, affective, and regulatory skills to SPS in some capacity indicate the benefit of targeting all three skill domains to promote positive development and social functioning. Second, the significant and marginally significant effects of self-control in early elementary school and empathic concern in later elementary school on SPS growth suggests affective and regulatory competencies may be leveraged to promote growth in SPS ability. Third, results of moderation analyses related to classroom peer relationship climate suggest that intervention needs and effects may vary depending upon the perceived supportiveness of peer relationships in a given classroom. The consideration of this essential social context may inform the selection of different skill targets based upon the classroom climate perceptions or impact the strength with which growth in one social emotional skill set impacts growth in SPS. Further, it positions classroom peer relationship

climate as a possible target for intervention that, in some circumstances could supersede individual skill differences to promote growth in SPS. Finally, given the significance of this effect for the later elementary sample only, interventions may be able to be more universally applied in younger groups irrespective of classroom climate but should be more carefully tailored for older groups. In the same vein, developmental consistencies in the association of perspective-taking and self-control to SPS contemporaneously suggest some benefit to continuing to promote these competencies. Developmental differences in the skills related to growth in SPS highlight the need for shifting intervention emphasis to match critical skills for each respective age group, thus maximizing growth potential.

Conclusions

Overall, the findings from the present study contribute to the body of literature linking cognitive, affective, and regulatory skills to the process of SPS. The results demonstrate that there are significant associations between perspective-taking, empathic concern, and self-control to SPS contemporaneously for younger elementary students and perspective-taking and self-control to SPS for older students. Further, they highlight self-control as related to growth in SPS for younger elementary students and empathic concern as trending toward significance in relation to growth in SPS for older elementary students. The limited relations of the social and emotional skills of interest to growth in SPS suggest there may be other factors, not included in the present study that are more significantly implicated in SPS development. The study also highlighted the moderating effect of perceptions of classroom peer relationship climate on relations of regulatory skills to growth in SPS for older elementary students, but not cognitive or affective skills, and not in the younger elementary subsample. Finally, broad developmental differences were revealed that inform efforts to best tailor prevention and intervention efforts by

age. Results overall support the shift in the literature toward integrated models of SPS that include affective and regulatory skills in addition to cognitive and behavioral components (Lemerise & Arsenio, 2000). Knowledge from this study has the potential to inform more effective, developmentally-tailored, and comprehensive interventions to promote healthy SPS, thus bolstering youth capacity for forming and sustaining essential supportive relationships and experiencing their immediate and long-term positive effects.

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