Motivation, Self-Regulation, and Learning in Preschool

by

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To my parents, grandparents, and siblings, who have always supported me in everything I do.

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Abstract

Efforts to understand and improve the academic outcomes of children have increasingly focused on both achievement motivation and self-regulation skills as they foster children's interest, confidence, persistence, attention, memory, self-control, and learning (Pintrich & Schunk, 2002; Blair & Razza, 2007). Recent research has shown that self-regulation and motivation overlap to a significant degree, and both predict academic achievement (Berhenke, Lan, & Morrison, 2009). The present studies focus on how motivation and self-regulation are related, how they predict learning in preschool, and teachers' attributions about students' behavior when children are struggling academically. When children fail to complete learning activities it can be hard to determine the relative influence of motivation and self-regulation, because children can be uninterested, frustrated, distracted, or have simply forgotten or lack the necessary skills. Helping teachers understand the numerous contributions of and the dynamic interplay between motivation and self-regulatory skills would be especially important for teachers' ability to aid struggling preschool students. Accordingly, the present study addressed the following questions:

- What is the relation between self-regulation and motivation in preschool children?
- When children fail to persist at challenging tasks, can we tell whether they lack motivation and/or self-regulation?
- Which components of self-regulation and motivation best predict student learning over the course of the preschool year?

- How do teachers identify student struggles with self-regulation and motivation?
- How do they differentiate between these concepts?
- How do teachers choose courses of intervention for issues identified as motivational problems versus self-regulatory problems?

One hundred forty children ages 3-5 were assessed using teacher reports, group challenge tasks, and individual assessments of motivation, self-regulation, and achievement. Results revealed that motivation and self-regulation are distinct and related constructs. Persistence is likely the product of motivational beliefs and self-regulatory skills. Motivation was shown to significantly predict growth in children's reading skills during preschool, whereas both motivation and self-regulation predicted growth in math skills. Teacher reports of children's motivation and self-regulation did not predict growth in children's academic skills. Finally, teachers reported using atheoretical, largely intrinsic conceptions of children's motivation and ideas about self-regulation that included both cognitive skills and emotion regulation. Teaching practices used to promote motivation and self-regulation were aligned with teachers' conceptions of motivation and self-regulation. Implications for future work are discussed.

Chapter One

Introduction and Literature Review

The early childhood years are a critical period for the development of important cognitive skills and approaches to learning necessary for successful school transitions and later academic functioning (NICHD ECCRN, 2004). Substantial individual differences in these skills appear well before children begin formal schooling (Bronson, 2000; Shonkoff & Phillips, 2000; Smiley & Dweck, 1994), and these differences are linked to variability in early child care and preschool environments (NICHD ECCRN, 2004; Stipek, Feiler, Daniels, & Milburn, 1995). Given the importance of early academic experiences for shaping children's academic trajectories, and that interventions during preschool have been shown to be substantially more effective than those during kindergarten and later (Heckman & Masterov, 2007), several questions emerge. First, what is the relative importance of different approaches to learning such as motivation and self-regulation for academic growth in preschool? Second, how can we assess these approaches to learning in the classroom so that we may construct appropriate interventions for children who are struggling? Third, how can teachers intervene when students are struggling with issues of poor self-regulation or low motivation?

Approaches to Learning

Efforts to understand and improve the academic outcomes of children have increasingly focused on both motivation and self-regulation skills as they foster children's interest, confidence, persistence, attention, memory, self-control, and learning (Pintrich, Schunk, & Meece, 2008; Blair & Razza, 2007). Self-regulation and motivation overlap significantly and both predict concurrent academic achievement (Berhenke, Lan, & Morrison, 2009).

Unfortunately, teachers report that at least 50% of children entering kindergarten lack basic self-regulatory skills such as following directions and working independently (Rimm-Kaufman, Pianta, & Cox, 2000). Another study showed that 26% of preschoolers responded helplessly and failed to persist in the face of challenge (Smiley & Dweck, 1994). These early differences have the power to shape children's academic trajectories. Our own research demonstrates the importance of motivation to concurrent achievement (Berhenke, Miller, Brown, Seifer, & Dickstein, 2011). Still, no extant research has demonstrated the importance of motivation to students' learning over the course of preschool, leaving open the question of whether more competent students simply appear more motivated or whether their increased motivation helps them become more successful. It also remains unclear to what extent motivation and self-regulation interact to promote learning at this age. Finally, no known research has examined teachers' beliefs about young children's motivation and self-regulation, which bears significance for the development of classroom-based interventions to develop these skills. The present study addresses these gaps.

Conceptualization of Motivation

Children's achievement motivation has been an important topic of research for years to the educators, researchers, and parents who strive to help all children reach their full potential in school. Motivation is related to greater learning in school, controlling for IQ (Skinner, Zimmer-Gembeck, & Connell, 1998) and with greater interest, engagement, performance, and well-being (Bandura, 1997; Deci & Ryan, 1985, 2000). Motivation and emotional experiences are intertwined and mutually reinforcing (Pintrich & Schunk, 2002). In this study, achievement motivation is defined as "the process whereby goal-directed activity is instigated and sustained" (Schunk, Pintrich, & Meece, 2008, p.4) and indicated by such variables as persistence, pride,

self-efficacy beliefs, intrinsic interest/liking, and goal orientation. Each of these constructs will be briefly reviewed in the context of research on younger learners.

Persistence. Persistence is a commonly used index of motivation and is defined as time spent on a task before quitting (Schunk et al., 2008), although some researchers seek to modify this definition into time spent on a task that is at least moderately challenging (e.g., mastery motivation researchers; see MacTurk & Morgan, 1995). Persistence represents behavior sustained by motivation, as in the above definition, and is related to greater learning and achievement (Schunk et al., 2008). Barrett and Morgan (1995) have argued that it is important to distinguish persistence from competence, although they may look similar when children are working on behavioral tasks such as puzzles. Persistence at one time point should be correlated with competence at future time points, however, as persistence often leads to greater success and learning. According to expectancy-value theory (Eccles, 2005), persistence is an achievement behavior that is a consequence of motivational beliefs such as expectancies for success (Eccles, Wigfield, & Schiefele, 1998). In mastery motivation research, persistence is typically coded as the number of intervals of task-directed behavior. For example, children are videotaped working on a task for several minutes. Coders rate children's behavior every 15 seconds, and the number of task-directed intervals is the child's persistence score (see Morgan, Busch-Rossnagel, Maslin-Cole, & Harmon, 1992).

Pride. Pride has been conceptualized in a variety of ways by motivation researchers. Stipek, Recchia and McClintic (1992) explain that pride is "potentially elicited in any situation in which an individual's performance can be compared to some standard and judged to exceed the standard" (p. 2). They note that this standard can be generated by the self or others. This is somewhat similar to Barrett and Morgan's (1995) conceptualization of expressive mastery,

which includes showing positive affect or pride during challenging tasks, or Morgan et al.'s (1992) definition of mastery pleasure (positive affect during or immediately after successful task-directed behavior), although the latter two concepts confound enjoyment and pride. Self-evaluative emotions such as pride are believed to affect behavior in achievement contexts (Stipek et al., 1992). Barrett & Morgan (1995) found expressive mastery was related to effortful control, the continuation or termination of engagement and interest, the approach motivation of young children, and the solicitation of high stimulus intensity. That is, measures of affect predicted persistence and interests in these children, which are reliable, stable, and predict choices of activities and learning over time in children as young as 3 years (Renninger, 1992). Tracy and Robins (2007) show that pride is associated with a distinct, universally recognized, nonverbal expression, which is spontaneously displayed during pride experiences. Heckhausen (1987) showed that infants expressed joy following successful mastery attempts by age 30 months and sadness following failure at 36 months. Stipek et al. (1992) found that by age 3, children evaluated their own successes and failures and reacted quite strongly to them.

Self-efficacy beliefs. According to Bandura's social cognitive theory (Bandura, 1997), motivation is "goal-directed behavior instigated and sustained by expectations concerning the anticipated outcomes of actions and self-efficacy for performing those actions" (Pintrich & Schunk, 2002, p. 161). In other words, people engage in motivated behavior when they expect to succeed at a task and when they believe that the outcome of that success will be useful. People have an innate desire to feel efficacious, according to this view, so they choose more difficult challenges, persist longer in the face of difficulty, put forth more effort (working at a greater rate and expending more energy), and display more positive emotions while working when compared with those who do not feel efficacious or expect valuable outcomes for success. As a result of

these behaviors, motivation leads to increased levels of performance. Mantzicopoulos, Patrick, and Samarapungavan (2008) have developed a Puppet Interview Scale of Competence and Enjoyment of Science for use with kindergartners, and pilot results (see Chapter 2, below) suggest that this scale can be modified for use assessing preschoolers' self-efficacy for puzzle solving. The scale uses a dichotomous forced-choice response format that does not require expressive language, which reduces the cognitive load of the task and allows the child to focus on the self-evaluative component of the task.

Intrinsic task value (interest/enjoyment). According to Wigfield and Eccles' (2000) expectancy-value theory, the intrinsic value of a task is the enjoyment one gains from doing it. Deci and Ryan (1985, 2000) have demonstrated that participating in intrinsically motivated activities leads to greater learning, performance, persistence, creativity, self-esteem, vitality, and general well-being. This construct includes both positive affect during a task and situational and personal interest in the task. Earlier efforts (e.g., Berhenke, Lan, & Morrison, 2009) to use emotion expression and task behavior to code interest have been time consuming and sometimes fruitless endeavors, with coders reporting that they are coding something much akin to persistence. In this project, I use a modified version of the PISCES (Mantzicopoulos et al., 2008) to assess children's intrinsic value for puzzles, math, and reading.

Goal orientation. Goal orientation theories as conceived by Dweck (Dweck & Leggett, 1988; Dweck & Elliott, 1983) and Nicholls (1978) have linked attributions people make for success and failure to the goals that they adopt toward tasks and their responses to challenge and failure. In Dweck's goal-confidence model (see Dweck, 2002, for a complete review), students are said to be *learning oriented* if they tend to engage in tasks to master or learn skills. This is similar to the mastery orientation proposed by Ames (1992) and the task-involved orientation

proposed by Nicholls (1984b). Dweck also describes *performance-oriented* students who place emphasis on getting good grades or rewards, beating other students and demonstrating high ability, a concept echoed by Ames (1992) and designated as ego-involved by Nicholls (1984b). Research by Nicholls (1978) and Dweck (Dweck & Leggett, 1988) has convincingly linked these orientations to students' conceptions of ability and attributions for success and failure. Students who adopt learning orientations tend to hold incremental views of intelligence, believing that intelligence can be increased through further effort. When faced with failure, these students make attributions to low effort and redouble their efforts. When they succeed, students see it as a result of their efforts. These students show more positive affect, more interest, higher cognitive engagement, greater effort, more persistence, more adaptive help seeking, and more risk-taking behaviors than students with performance orientations (Pintrich & Schunk, 2002; Elliot, 2005).

Students who adopt performance orientations tend to endorse entity views of intelligence and attribute successes and failures to their fixed abilities. When these students succeed, their perceptions of their abilities are reinforced, and they develop strong self-efficacy beliefs. When these students fail, however, they attribute their performance to a low level of ability that they cannot change, and they give up helplessly. Dweck and her colleagues (e.g., Mueller & Dweck, 1998; Smiley & Dweck, 1994) express concern about students with low confidence and performance orientations, because these students believe that poor outcomes are imminent and will serve as evidence of low ability. They are therefore more likely to procrastinate and withdraw effort prematurely so that task outcomes cannot be attributed to ability.

Smiley and Dweck (1994) established a well-used protocol for assessing learning and performance orientations in young children. They had children work on a series of four jigsaw puzzles, the first three of which had mixed-up pieces so that they were impossible for children to

solve. Children worked on the first three puzzles for just a few minutes, and then worked on the fourth puzzle until they finished it. Afterwards, children were asked which puzzle they would like to try again, and why. Children who selected an unfinished puzzle were designated as learning-oriented, because they were making a choice oriented toward mastering a task. Children who selected the finished puzzle were designated as performance-oriented because they were arguably opting to demonstrate their ability. This classification system is broadly used with young children. Ziegert, Kistner, Castro and Robertson (2001) demonstrated the utility of this classification system with kindergartners and first graders, and Blair (2010, personal communication) has successfully used this manipulation in a study of kindergartners' self-regulation.

Interim summary. There are measurable differences in young children's achievement motivation that have been related to the structure of preschool programs, suggesting that studying achievement motivation and the effect of the environment on early motivation in this age group is both a fruitful and critical endeavor. Stipek and her colleagues (Stipek, Feiler, Daniels, & Millburn, 1995) have shown that children in child-centered preschool and kindergarten programs rate their abilities higher, have a higher preference for challenge, take more pride in their successes, are less dependent on adults, and have lower anxiety than students in didactic, academically focused programs. Longitudinal research, along with experimental work, is essential for determining whether the schooling environment is causing these differences, however. Furthermore, young children show individual differences in interest (Krapp, Hidi, & Renninger, 1992), mastery motivation (Kelley, Brownell, & Campbell, 2000), and helpless responses to failure (Smiley & Dweck, 1994) before even beginning formal schooling, suggesting strong influences of the early home environment on motivation. This

suggests that preschool children will show measurable differences on assessments of achievement motivation that may predict early achievement. The present study uses multiple theoretical approaches to the assessment of young children's achievement motivation, as there are no standard procedures for assessing motivation in preschoolers.

Conceptualizing Self-Regulation

Zimmerman and Schunk (2008) provide a lexical definition for self-regulation: "the control of one's present conduct based on motives related to a subsequent goal or ideal that an individual has set for him- or herself" (p. 1). In other words, self-regulation involves controlling one's behavior in order to achieve a goal. One important domain where children use self-regulation is school, where they are required to pay attention, follow instructions, and inhibit inappropriate reactions in order to achieve the goals of the classroom. These skills, known as *behavioral regulation* (McClelland et al., 2007), or simply self-regulation, are critical for early school success. Research has shown that children entering formal schooling with low levels of behavioral self-regulation are at risk for peer rejection and lower academic achievement (Cooper & Farran, 1998; Ladd, Birch, & Buhs, 1999; McClelland, Morrison, & Holmes, 2000). Furthermore, behavioral regulation predicts academic growth over the preschool year, suggesting that it plays an important role in preschool achievement as well (McClelland et al., 2007).

Behavioral self-regulation, also known as executive functioning, has three central components: working memory, attention control, and response inhibition (Cameron et al., 2008; McClelland et al., 2007). Attention control is a central component of several researchers' definitions of self-regulation (e.g., Rothbart & Hwang, 2005; Zelazo & Muller, 2002) because it allows children to carry out behaviors, focus on a task or problem, access working memory, and

complete tasks. It is also important for learning correct behavior from models. Working memory allows children to remember and follow directions and helps them plan solutions to problems (McClelland et al., 2007), and it may be involved as the child compares the behavior he produced with that modeled earlier. Inhibitory control develops rapidly during early childhood (Diamond, 2002) and helps children control behavior by stopping incorrect solutions to a problem or incorrect behaviors and carrying out more adaptive responses or behaviors (McClelland et al., 2007).

Another, similar definition of self-regulation is effortful control, defined as "the ability to suppress a dominant response to perform a subdominant response" (Kochanska, Murray, & Harlan, 2000, p. 220). Blair and Razza (2007) found preschool measures of effortful control to be moderately correlated with preschool and kindergarten measures of executive functioning, including inhibitory control and attention shifting. Effortful control in preschool also predicted kindergarten math and letter knowledge.

The development of self-regulation. According to Bandura's social-cognitive theory (1997; see also Bronson, 2000), self-evaluation plays a central role in the development of self-regulation. Children learn about which behaviors are rewarded and punished in the environment through action and observing the actions of others and evaluating the effects of these actions. These evaluations lead to the development of expectations for the outcomes of future behaviors and the establishment of internal criteria for judging the adequacy of the behaviors. Children then use these criteria to evaluate and regulate their own behavior and evaluate their effectiveness. Schunk and Zimmerman (1997; Zimmerman, 2000) have integrated this model into a socialization framework whereupon regulation shifts from social to self-sources as a result of the students' learning and motivation (in contrast with a Vygotskian model where this shift in

regulation occurs as a result of learning). First, they argue, learners must discriminate a skill from a proficient model's performance over multiple observations (*observational level*). At this point learners are often motivated by positive vicarious consequences to the model. Then, learners must duplicate the model's response on a corresponding task with social assistance (*emulation level*). Learners improve more when guidance, feedback, and reinforcement are provided. Next, learners practice the skill in structured settings without models (*self-control level*), using a mental recollection of the model. Learners' self-reinforcement is contingent upon their success in matching a standard during practice, which is highly motivating. Finally, learners practice the skill in unstructured settings involving varied contexts and dynamic interpersonal interactions (*self-regulated level*).

Self-regulation or self-regulated learning? A point of clarification: among older students, self-regulation has been applied to learning strategies, and has been studied as self-regulated learning (e.g., Pintrich & De Groot, 1990). This concept is slightly more specific than that being discussed here, as self-regulated learning applies to specific strategies being used, while the research on younger children focuses on the cognitive skills necessary to use self-regulatory strategies. For example, self-regulated learning focuses on specific strategies for self-observation, such as self-recording a behavior (Schunk et al., 2008), whereas the study of self-regulation focuses on attentional control, a skill that would be necessary for any form of self-observation. More broadly, until recently it seems that self-regulation in young children has been measured and discussed as a developing capacity of the child, while self-regulated learning has been discussed as a skill set that can be taught. A few notable exceptions to this tradition reveal that self-regulation in young children may be taught as well (e.g., Diamond, Barnett, Thomas, & Munro, 2007), although many fewer interventions have been conducted.

It is likely that self-regulatory abilities play a role in the acquisition of self-regulated learning skills (see Figure 1). For example, establishing a productive learning environment for studying requires inhibiting responses to tempting stimuli and controlling one's attention, whereas monitoring and assessing one's progress toward a goal requires both working memory (necessary for comparing one's current performance to the standard) and attention control (necessary for monitoring progress). Persistence requires attention control and response inhibition, while comprehension monitoring requires attention control and working memory. For these reasons, it seems reasonable to draw inferences about the relation of self-regulation and motivation from research on the relation between self-regulated learning and motivation, which will be reviewed in subsequent sections.

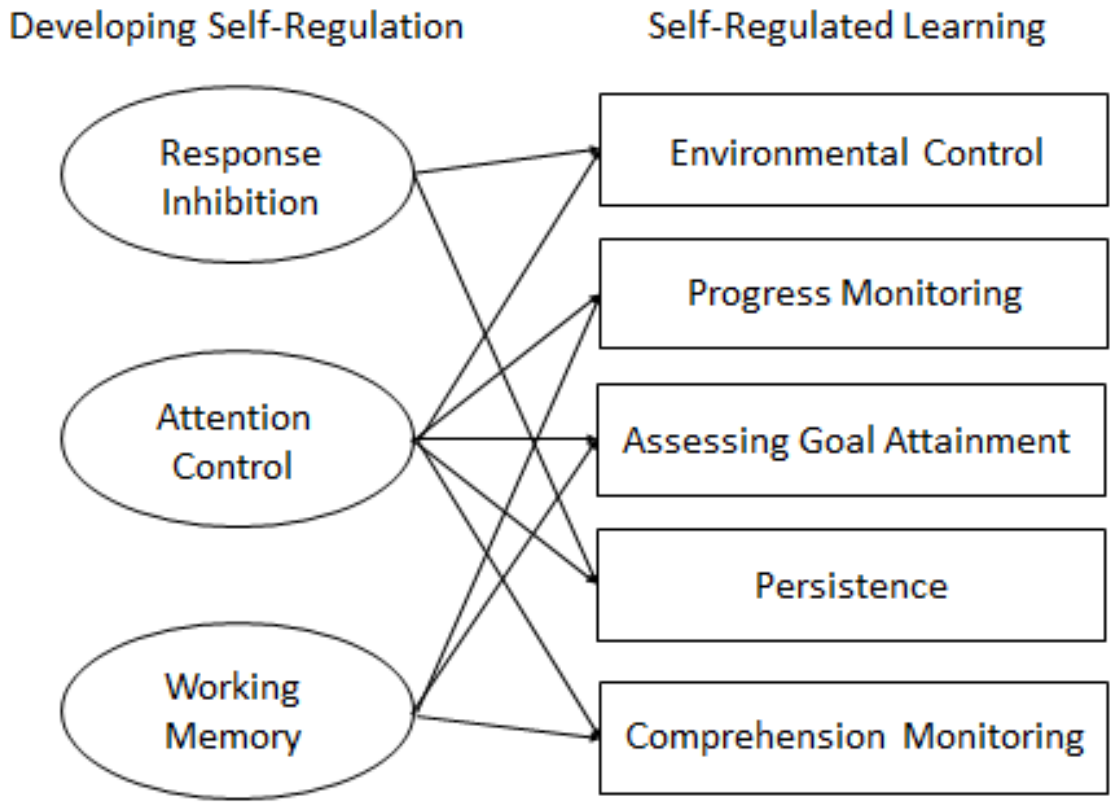


Figure 1. Proposed relations between developing self-regulation and self-regulated learning.

The Relation between Motivation and Self-Regulation

Whereas a number of theorists (e.g., Berger & Karabenick, 2011; Pintrich & De Groot, 1990; Zimmerman & Schunk, 2008;) have studied the relation between motivation and self-regulation in older students, the link between behavioral self-regulation in young children and achievement motivation remains unclear. For example, persistence at challenging tasks is important for learning and accomplishment, and persistence is commonly used by researchers as a measure of motivation (Schunk et al., 2008). Indeed, for mastery motivation theorists, persistence is the central index of a child's motivation (e.g., MacTurk, Morgan, & Jennings, 1995, Yarrow, Klein, Lomonaco, & Morgan, 1975). However, persisting at a classroom task also requires aspects of self-regulation, including inhibiting responses to distracting stimuli and controlling one's attention (McClelland et al., 2007); in fact, some theorists have argued that persistence is evidence of self-regulation (Rothbart & Hwang, 2005). Understanding the nature of persistence is important for educators who must decide how to intervene with non-persisters, whether by increasing interest or helping children improve attentional skills, or both. Discovering the underlying relation between self-regulation and motivation may elucidate this dilemma of persistence.

They are inextricably intertwined. In a philosophical paper, Prawat (1998) maintains that motivation and self-regulation, or interest and effort or will, merge during the development of big ideas. That is, when voluntary self-regulation occurs in the natural environment, it is a motivated behavior (see Figure 2). Bronson (2000) argues that motivation and self-regulation are intertwined in two ways: first, people are innately rewarded by competence and control (e.g., White, 1959), and second, people need self-regulated control to reach other goals. Children take pleasure in controlling their own activities and producing effects in the environment, and this can

lead to feelings of competence (White, 1959). People are also motivated to reach specific goals and earn rewards such as social approval or material gain, and self-regulation is usually required to achieve these goals and rewards. Whether the activity is intrinsically or extrinsically motivated, it is self-regulation that enables goal attainment and motivation that facilitates self-regulation. Simply put, we are motivated to self-regulate.

Moreover, self-regulation can be an intrinsically motivated activity itself (Bronson, 2000). Intrinsic motivation for self-regulation is described as "a generalized tendency to be rewarded by, and then seek mastery or control of, the self, others, or the physical and conceptual environment" (Bronson, 2000, p. 35); this is seen in infants' delight in mastery as well as toddlers' desires to choose and direct their own activities.

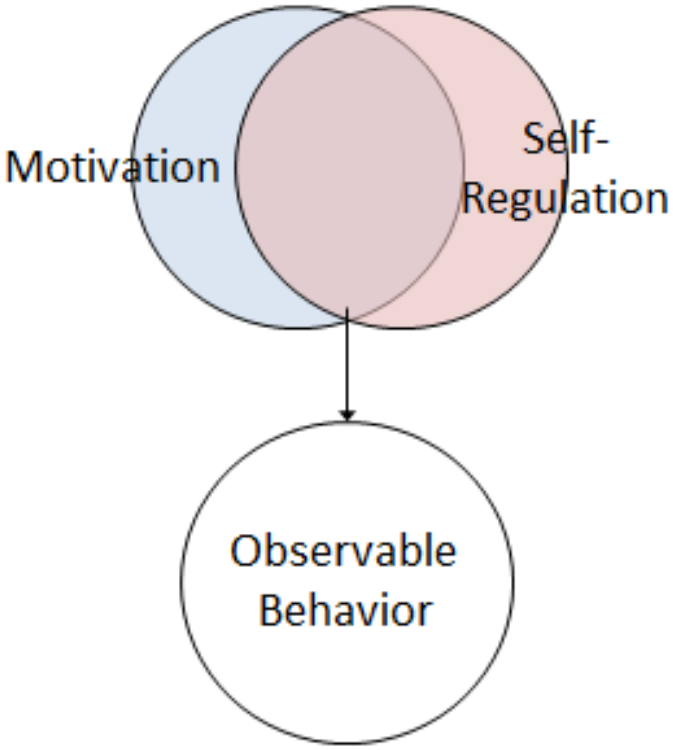


Figure 2. Motivation and self-regulation are inextricably intertwined.

Finally, self-regulation is inherent in theories of intrinsic motivation (e.g., Deci & Ryan, 1985, 2000). Motivation for competence requires a perception of control as a condition for satisfaction. If one does not feel responsible for the actions that demonstrate competence, one will not feel a sense of competence (Bronson, 2000). According to Organismic Integration Theory (OIT; Deci & Ryan, 1985), self-regulation and the internalization of motivation for an activity go hand in hand. Behavior is only truly self-regulated when it is intrinsically motivated; otherwise, the child is being controlled by rewards or punishments, or focusing on approval from others as the cause of the behavior. (Here, the term "self-regulated" equates more to "self-directed" than to a cognitive definition; still, it is possible that when behavior is self-directed, cognitive strategies such as attention control may be better employed.) Empirically, intrinsic motivation has been shown to be important for self-regulated learning. Students who were experimentally manipulated to hold intrinsic task orientation displayed deeper learning, better performance, and greater persistence than students oriented to an extrinsic goal (Vansteenkiste, Simons, Lens, Sheldon, & Deci, 2004).

One similarity between all of these theoretical conceptions of motivation and self-regulation is that all theories equate self-regulation to a sense of self-control or self-determination. This largely comes from the developmental perspective where developing self-regulation is interlaced with developing competence and the theory of self-determination, which shows that as behavior is more internally regulated, it also becomes more intrinsically motivated and more self-determined. This definition is different from more cognitive theories of self-regulation involving processes such as attention control and working memory, to such an extent that researchers seem to be describing entirely different phenomena with the same terminology. But, the idea of self-regulation as self-mastery or self-control overlaps with ideas of self-

regulation as response inhibition. Indeed, the tasks used to measure response inhibition often require the participant to follow his/her own directions instead of the directions of the experimenter (see, for example, Head-Toes-Knees-Shoulders; Ponitz et al., 2008). Response inhibition as measured looks similar in this way to self-determination; thus the definitions of self-regulation may not deviate entirely from cognitive definitions. Finally, the implication of Prawat, Bronson, and Deci and Ryan's theories is that it is impossible to measure self-regulation without measuring intrinsic motivation as well. *If all self-regulated behavior is intrinsically motivated, then it is impossible to develop a "pure" measure of self-regulation, and one's self-regulation would always be dependent on one's motivation for the task provided.* Thus it would be important to examine the relation between motivation and self-regulation.

They are separate but interrelated. The preponderance of literature suggests or is based on the assumption that, in fact, motivation and self-regulation are distinct constructs that are systematically interrelated (see Figure 3). This literature includes research conducted with young children (e.g., temperament research) as well as with older students (e.g., in social-cognitive theory) described below.

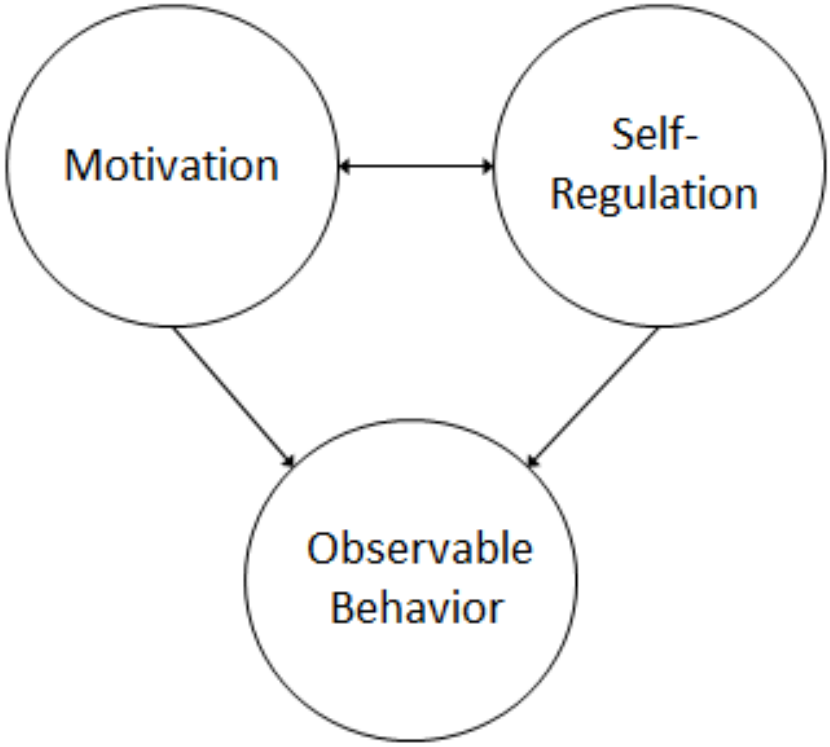


Figure 3. Motivation and self-regulation are separate but interrelated.

Temperament research. One major theory linking motivation and self-regulation in young children is Rothbart's work on temperament. In Rothbart's view, there are three main dimensions of temperament. These are "constitutionally based individual differences in reactivity and self-regulation displayed in the domains of emotion, activity, and attention" (Rothbart & Hwang, 2005, p. 168), surgency-extraversion, negative affectivity, and effortful control (Ahadi, Rothbart, & Ye, 1993). Surgency-extraversion, which is theoretically related to approach motivation, includes subscales assessing positive emotionality and approaching novel stimuli. The fear subscale of negative affectivity is thought to relate to avoidance motivation, as it measures fearful reactions to novel stimuli. Finally, effortful control, comprised of inhibitory control, attentional focusing, and low intensity pleasure subscales, is theoretically similar to self-

regulation because its components measure response inhibition, attention control, and emotion regulation. These dimensions—surgency-extraversion, negative affectivity, and effortful control—or, approach motivation, avoidance motivation, and self-regulation, empirically separate as three distinct characteristics of children's temperaments. Effortful control is inversely related to negative affectivity and not related to surgency-extraversion (Ahadi et al., 1993).

In the first two years of life, motivation is governed by surgency-extraversion and fear. Children approach activities when they perceive signals of reward and non-punishment or when triggered by imbalances such as hunger (Derryberry & Rothbart, 1997). When children perceive signals that predict punishment, predict non-reward, or are biologically fear-inducing or novel, the fear system inhibits motor behavior, increases arousal, directs attention to relevant information in the environment, and inhibits the approach system. Thus motivation organizes behavior and emotional components of personality and regulates attention and perceptual processing which in turn affect cognition and memory. Approach-related motivation and fear-motivated avoidance are both reactive, although sometimes we approach things we fear and avoid things that can be rewarding. Doing so requires effortful control, which is based on the developing system of executive attention, allows the developing child to flexibly coordinate mental representations and generate future-directed behaviors. Effortful control is related to the efficiency of executive attention, including the ability to inhibit a dominant response or activate a subdominant response, to plan, and to detect errors (Posner & Rothbart, 1998, in Rothbart & Hwang, 2005). Effortful control can inhibit immediate approach behavior to a stimulus, allowing for delayed gratification, and can activate behavior in the face of punishment, allowing people to act "on principle". Effortful control interacts with the systems of approach and avoidance to help children achieve motivationally appropriate ends.

The main implication of Rothbart's work on temperament is that self-regulation is both theoretically and empirically separable from motivation and so can be studied in this way. Effortful control has been conceptualized in a number of different ways in the research. Kochanska et al. (2000) review literature on effortful control including definitions and operationalizations of self-regulation and related constructs and conclude that effortful control sits at the intersection of the temperament and behavioral regulation literatures and encompasses the primary features of the other definitions—inhibiting a dominant response and activating a subdominant response.

Summarizing the social-cognitive perspective. There is a considerable body of research conducted with older children and college students on motivation and self-regulation. Social cognitive theorists define self-regulation as "the process whereby students activate and sustain cognitions, behaviors, and affects that are systematically oriented toward attainment of their goals" (Schunk et al., 2008, p. 154). Students who are *motivated* to attain a goal engage in self-regulation to help them. Self-regulation promotes learning, and the resulting perception of greater competence sustains motivation (Pintrich, 2004; Zimmerman & Schunk, 2004). Thus, motivation and self-regulation are distinct processes that are cyclically related. *Furthermore, self-regulation does not exist without motivation, because without motivation, there are no goals toward which to self-regulate.* Self-regulation also does not exist where there is no choice, because in that case students are considered *other-regulated*. In an extensive review, Zimmerman and Schunk (2008) elaborate on the connections between motivational beliefs and self-regulated learning. I will review these connections as they relate to my central motivational constructs.

Persistence. Zimmerman and Schunk (2008) refer to persistence as a self-regulated learned behavior, explaining that good self-regulators expend more effort and persist longer than

poor self-regulators (although Zimmerman and Cleary (2009) also refer to persistence as a motivational outcome). In this theoretical vein, motivation consists of unobservable beliefs (e.g., self-efficacy beliefs, achievement goals, task value), and observable behaviors are all identified as self-regulated learning behaviors. Thus the researchers who claim to have been measuring motivation by observing persistent behavior are not measuring motivation but rather its consequences. Thus motivation and self-regulation are separate but can simultaneously predict behavioral outcomes (e.g., Figure 2). That is, these researchers have been measuring self-regulation, but because it overlaps to such an extent with motivation, self-regulation predicts many of the same outcomes as does motivation. Whether persistence indicates motivation or self-regulation, or both, remains an open question that will be addressed in the present dissertation.

Pride. Zimmerman and Cleary (2009) discuss Bandura's (1986) theory that self-regulatory feedback loops are based on three closely-linked iterative processes: self-observation, judgment, and self-reactions. According to this view, each of these processes is influenced by self-reactions to personal feedback. One example of self-reaction could be pride, which is a positive personal feeling that may support continued efforts to learn. While Zimmerman and Cleary do not specifically mention pride, they cite evidence that learners' perceptions of satisfaction regarding their performance and their corresponding positive affect motivate them to continue efforts to learn (Zimmerman & Kitsantas, 1999). Furthermore, students who are highly self-satisfied are more likely to make adaptive inferences for errors, concluding that they need to choose different and more effective strategies next time when they encounter negative consequences (Zimmerman & Bandura, 1994). Finally, learners who are more self-satisfied show increased self-efficacy and task value beliefs (Zimmerman & Kitsantas, 1999), which lead to

greater self-regulated learning behaviors in future iterations of the task cycle. Thus, although this research does not measure pride directly, it suggests that positive self-evaluation is related to greater self-regulation, a finding that is likely to generalize to pride. Indeed, in the one study that has examined this link directly, Pekrun, Goetz, Titz and Perry (2002) showed that pride was related to the greater use of metacognitive strategies, elaboration, organization, and critical thinking. Pride may therefore be related in this study to greater self-regulation and higher achievement.

Self-efficacy beliefs. Both self-efficacy for a task and self-efficacy for self-regulated learning are important for goal attainment (Zimmerman & Schunk, 2008). In other words, one must feel capable of completing a task and capable of the self-regulation as part of that effort. As noted earlier, more efficacious students work harder and persist longer. Pajares (2004) has shown that self-efficacy beliefs affect all phases of self-regulation (forethought, performance, and self-reflection; Zimmerman, 2000). Pintrich and De Groot (1990) showed that middle schoolers' self-efficacy beliefs were moderately correlated with their self-regulation and strategy use. More specifically, high self-efficacy students use more cognitive and metacognitive strategies and use more effective self-regulatory strategies, while low self-efficacy students engage in more maladaptive help-seeking (Zimmerman & Martinez-Pons, 1990) and students with low self-esteem engage in less instrumental and less formal help-seeking (Karabenick & Knapp, 1991). Berger and Karabenick (2011) showed this relation to be unilateral: self-efficacy beliefs predicted increased strategy use and not the other way around. However, the relation between self-efficacy beliefs and self-regulation may not be simply unidirectional. Schunk (1998) showed that training students in self-regulation led to increases in self-efficacy beliefs as well, although Berger and Karabenick (2011) did not replicate this finding.

Intrinsic task value. Intrinsic task value has been repeatedly demonstrated to relate to self-regulated learning. Pintrich and De Groot (1990) showed that intrinsic value was strongly correlated with middle school students' strategy use and self-regulation, although their measure of intrinsic value included items measuring importance as well. Berger and Karabenick (2011) showed that increased task value for math predicted increased in strategy use over time. Wolters and Pintrich (1998) also provided evidence that middle schoolers' task value predicted use of cognitive and self-regulatory strategies, although they also used a scale that reflected instrumental value as well as intrinsic value. Task value, cognitive strategy use, and self-regulation are correlated (Wolters, Yu, and Pintrich, 1996) and again, the relation may be bi-directional. Wolters (1999) has shown that students have the capacity to self-regulate their levels of motivation, and in his intervention study 9th and 10th grade students who engaged in performance goal self-talk experienced increased task value.

Goal orientation. Goal orientation has been linked to self-regulated learning in a variety of studies with different populations. First, acknowledging that the intrinsic value scale used by Pintrich and De Groot (1990) and Wolters and Pintrich (1998) includes mastery goal orientation, we can conclude that mastery goal orientation is likely related to use of cognitive strategy use and self-regulation. Wolters et al. (1996) provide additional evidence for this hypothesis. Holding an entity theory of intelligence, which is related to endorsing performance goals, is related to defensive strategy use such as self-handicapping (Cury, Elliot, Da Fonseca, & Moller, 2006). Endorsing learning goals, on the other hand, was associated with the use of deeper learning strategies in a pre-med course (Grant & Dweck, 2003). Wolters (1999) provides evidence that this link between mastery orientations or learning goals and self-regulation may be

causal; in his intervention, students using mastery-oriented self-talk increased their effort, persistence, planning, and monitoring behaviors.

Interim summary. Self-regulation is related to many aspects of motivation, including pride, self-efficacy beliefs, intrinsic task value, and goal orientation. It is difficult to establish in the literature what the link is between persistence, motivation, and self-regulation, as different theorists have considered persistence a motivational variable or a self-regulatory behavior, and indeed, some theorists have considered it both at different times. Furthermore, several studies provide evidence that the link between motivation and self-regulation may be reciprocal or bi-directional. The relation needs clarification, particularly in young children. None of this research has been conducted with young children, whose developing capacity for self-regulation may be related to motivation in different ways.

The Present Study

As is clear from the preceding literature review, there are several open questions about the relation between motivation and self-regulation, their link to learning during the preschool year, and the nature of persistence. Bearing in mind that the ultimate goal of this line of research is to improve schooling experiences for young children, it becomes important to consider the perspectives of the providers of these experiences – the teachers. Do teachers use the same conceptualizations of motivation and self-regulation that researchers use, and are some perspectives more applicable to classroom behavior than others? Given the potential overlap between motivated and self-regulated behavior, how do teachers identify student struggles as self-regulatory versus motivational in nature? Finally, what interventions are teachers already using with students who struggle with motivation and self-regulation, and how may these efforts

shape future interventions? Therefore, the present study addresses the following six research questions:

1. What is the relationship between self-regulation and motivation in preschool?
2. When children fail to persist at challenging tasks, can we tell whether they lack motivation and/or self-regulation?
3. Which components of self-regulation and motivation best predict student learning over the course of the preschool year?
4. How do teachers identify student struggles with self-regulation and motivation?
5. How do they define and differentiate between these concepts?
6. How do teachers choose courses of intervention for issues identified as motivational problems versus self-regulatory problems?

The first is a question with theoretical and practical implications. Understanding the relation between motivation and self-regulation in preschoolers will shed light on the theoretical argument about whether they are separate but interrelated systems that we can distinguish in young children, which would indicate that we can intervene separately for each skill, or are they so intertwined that "approaches to learning" is indeed a better category for intervention?

Second, a great deal of research in both the mastery motivation and temperament traditions has used persistence as a key variable, with some groups arguing that persistence indicates motivation and other groups using persistence to indicate self-regulation. Developing a better understanding of persistence will help us to interpret these studies in relation to one another. Further, understanding the determinants of persistence will aid us in developing interventions to increase persistence. The present study assesses persistence across multiple

contexts and relates persistent behaviors to scores on assessments of motivation and self-regulation.

Third, research on older children (e.g., Pintrich & De Groot, 1990) has suggested that motivation and self-regulation are both important for learning. Whereas early childhood practitioners have focused on self-regulation as an important learning-related skill (e.g., McClelland et al., 2007), motivation may be equally important to consider. After all, attention control, working memory, and response inhibition are key abilities for completing school tasks, but if a child feels unable or unwilling to try, self-regulatory skills may not guarantee success. The present study uses multiple assessments of motivation and self-regulation to determine which elements of each best predict preschoolers' learning in reading and math.

Finally, there is an important set of questions that remains about how practitioners view these constructs. To some extent, how we define our constructs seems inconsequential– what matters is how teachers identify behaviors in the classroom, attribute their causes, and respond to them. Further, no such research has been conducted with teachers of young children. I conducted interviews with teachers of the children to answer my fourth, fifth, and sixth research questions. These data supplement and enhance the interpretation of the results of the other three questions.

While several approaches to the assessment of motivation and self-regulation are entirely new for the dissertation study, several measures were pilot-tested during a study of children's self-regulation (Lan, 2009). The pilot study results in the following chapter highlight the psychometric properties of multiple new assessments and also foreshadow the results of the dissertation study, as three of the six research questions can be at least partially addressed by the data.

Chapter Two

Pilot Study of Motivation and Self-Regulation

This following pilot study was conducted to address these questions:

- What is the relation between self-regulation and motivation in preschool children?
- When children fail to persist at challenging tasks, can we tell whether they lack motivation versus self-regulation?
- Which components of self-regulation and motivation best predict concurrent student achievement?

I examined the correspondence between teacher ratings of motivation and self-regulation, as well as direct assessments of children's mastery motivation and self-regulation. Both were then regressed on teacher-rated and directly assessed measures of student achievement. If Bronson and Prawat's arguments are correct, there should be high correlations between our measures of motivation and self-regulation, and teacher ratings of the two may load on their respective factors. If the social cognitive theorists are correct, we should see only modest correlations between motivation and self-regulation, and teacher ratings of these skills may load on different factors.

Method

One hundred thirty seven children (M = 57.4 months; 43% female) from Head Start, Great Start School Readiness, and tuition-based preschool classrooms completed the Woodcock-

Johnson III tests of Letter-Word Identification (LWI) and Applied Problems (AP) as part of a larger study on self-regulation. For the motivation task, children worked with teachers or the experimenter in groups of 4-6 on their own unique tangram puzzle for 8 minutes, after which adults helped children finish. The tasks were videotaped for the coding of persistence and pride (see Chapter 3 for further details). Following the tangram task, 31 children completed a puppet interview using a forced choice format to assess perceived competence and enjoyment of puzzles (see Chapter 3 for detailed methodology). Teachers completed the Competence Motivation sub-scale of the PLBS (Fantuzzo, Perry, & McDermott, 2004) and a brief modified measure of Academic/Social Competence (ASC; Valeski & Stipek, 2001), providing a normative rating of the child's reading, math, and social skills with peers and adults (see Appendix A, second page, for items). Questionnaires were completed for 130 children (95%).

Results

What is the relation between self-regulation and motivation in preschool?

Teacher ratings of self-regulation and competence motivation were entered into an exploratory factor analysis with direct oblimin rotation, which allows the factors to correlate because of the expected relationship between motivation and self-regulation. Results are shown in Table 1. A five-factor solution accounted for 69.74% of the variance, with factors of working memory, response inhibition, avoidance motivation, approach motivation, and attention control. Motivation and self-regulation components loaded as distinct factors with the exception of two motivation items which had secondary loadings on the working memory factor. Correlations between the factors are shown in Table 2. Working memory was directly related to approach motivation and inversely related to avoidance motivation.

Table 1. Factor Analysis of Teacher Ratings of Children's Motivation and Self-Regulation

	Working Memory	Response Inhibition	Avoidance Motivation	Approach Motivation	Attention Control
MOTIVATION ITEMS					
Tackles new activities with enthusiasm				-.823	
Capable of making decisions about what to do	.623			-.640	
Persists when facing difficulty during activities	.607			-.579	
Is eager to talk about his or her activities				-.818	
Seems energetic and interested				-.913	
Shows great interest in activities				-.909	
(R) Seems to take refuge in helplessness			.751		
(R) Claims to have headaches, stomachaches, or pains to avoid participation			.754		
(R) Says tasks are too hard, makes no attempts			.825		
(R) Resistant or fearful about new activities			.779		
(R) Tears when faced with difficulty			.766		
SELF-REGULATION ITEMS					
Follows one-step instructions	.826				
Follows two-step instructions	.845				
Follows multiple step instructions	.846				
Utilizes multiple rules to complete a task	.850				
(R) is easily distracted					.818
(R) has a short attention span					.807
(R) Only pays attention to things s/he is really interested in					.765
(R) fidgets with hands or feet or squirms in seat		.539			.613
(R) Has difficulty remaining still		.637			.602
(R) Runs about or is very active in situations where it is inappropriate		.856			
(R) Interrupts or intrudes on others		.710			
(R) Has difficulty playing or engaging in leisure activities quietly		.815			
(R) Restless, always up and on the go		.736			

Table 2. Correlations between teacher ratings of motivation and self-regulation.

Variable	Working Memory	Response Inhibition	Avoidance Motivation	Approach Motivation
Working Memory	–			
Response Inhibition	.16	–		
Avoidance Motivation	.20*	-.01	–	
Approach Motivation	.35**	.14	.34**	–
Attention Control	-.04	.33**	.03	.11

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

Correlations between direct assessments of motivation and self-regulation are shown in Table 3. Persistence at the challenging puzzle task and performance on the HTKS were modestly correlated ($r = .23$, $p < .05$), and neither mastery pleasure nor perceived competence were related to self-regulation.

Table 3. Correlations among direct assessments of motivation and achievement measures.

	Pride	Persistence	Perceived Competence	HTKS	WJ Reading	WJ Math	Teacher Report Reading	Teacher Report Math
Pride	–							
Persistence	.11	–						
Perceived Competence	.17	-.18	–					
HTKS	.02	.23*	.02	–				
WJ Reading	-.02	.25*	-.11	.32**	–			
WJ Math	-.02	.35**	.21	.51***	.55***	–		
Teacher Report Reading	-.01	.13	.41*	.24*	.68***	.51***	–	
Teacher Report Math	.01	.17	.41*	.29**	.64***	.49***	.92***	–

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

Note: Correlations with perceived competence have *N*s ranging from 24-31. All other correlations have *N*s ranging from 101-134.

When children fail to persist at challenging tasks, can we tell whether they lack motivation versus self-regulation?

Persistence was modestly correlated with self-regulation ($r = .23$, $p < .05$) but not with pride or perceived competence. Children who were less persistent did not express less pride or less confidence in their abilities, but were less self-regulated.

Which components of self-regulation and motivation best predict concurrent student achievement?

Teacher-rated reading and math skills were predicted by teacher-rated self-regulation (working memory and attention control) and approach motivation, while avoidance motivation was a marginal predictor of math skill (see Table 4). Only self-regulation (HTKS and teacher-reported working memory) predicted directly assessed reading skill, while self-regulation (HTKS) and motivation (persistence and teacher-rated approach motivation) predicted assessed

Table 4. Final regression models predicting teacher-rated and directly assessed student achievement in reading and math.

Teacher-Rated Math Skill	R^2 **= .49**	***F* = 26.82***
	β	***t***
Teacher-rated Working Memory	.28	3.25**
Teacher-rated Attention Control	-.17	-2.53*
Teacher-rated Approach Motivation	.55	5.66***
Teacher-rated Avoidance Motivation	.15	1.93[t]
Teacher-Rated Reading Skill	R^2 **= .50**	***F* = 37.90***
	β	***t***
Teacher-rated Working Memory	.26	3.08**
Teacher-rated Attention Control	-.17	-2.48*
Teacher-rated Approach Motivation	.51	5.90***
Assessed Math Skill	R^2 **= .39**	***F* = 19.26***
	β	***t***
Head-Toes-Knees-Shoulders	.45	5.33***
Teacher-rated Approach Motivation	.23	2.76**
Persistence	.20	2.37*
Assessed Reading Skill	R^2 **= .28**	***F* = 17.81***
	β	***t***
Teacher-rated Working Memory	.45	4.74***
Head-Toes-Knees-Shoulders	.17	1.77[t]

Note: [t] $p < .10$,* $p < .05$, ** $p < .01$, *** $p < .001$

Discussion and Implications

Results of the factor analysis suggest that, to teachers, motivation and self-regulation are distinct constructs as social cognitive theorists have argued. The factor structure was similar whether or not the factors were allowed to correlate; motivation and self-regulation loaded on different factors, suggesting that they are empirically separable. Correlations between the factors were modest, indicating some overlap between self-regulation and motivation. Thus, teacher report findings support the conceptualization of motivation and self-regulation as separate but interrelated systems (see Figure 3). The picture is less clear when examining direct child assessments: persistence at the challenging task was correlated with self-regulation, but self-efficacy and pride were unrelated to self-regulation (see Figure 4). There was overlap between persistent behavior and self-regulation, as expected, but not between motivational beliefs and self-regulation or persistence. This does not support either Prawat and Bronson's conjectures (see Figure 2) or the social cognitive model (see Figure 3) that predict relations between motivation and self-regulation.

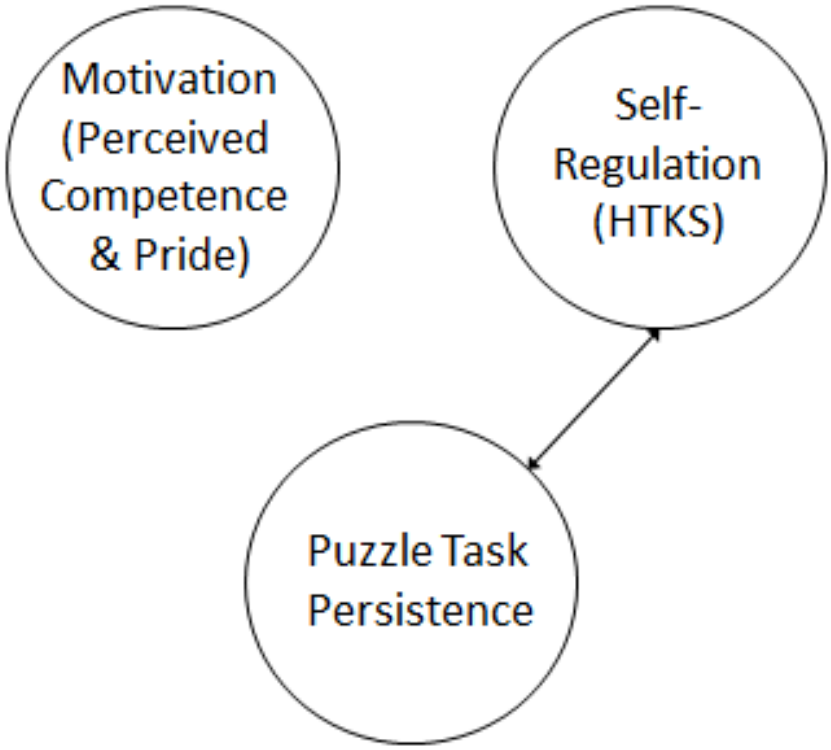


Figure 4. Self-regulation (and not motivation) predicts persistence.

It was surprising that persistence at the challenging task was unrelated to perceived competence, although the sample size was low (n = 31 for perceived competence). It may be that, in four-year-olds, persistence is more directly related to self-regulation than to motivation, as operationalized by efficacy/competence and pride. This conclusion assumes the validity of the puppet interview as a measure of perceived competence (see Appendix B). Given the moderate correlations (r = .41, p < 0.05) between perceived competence and teacher-rated reading and math skills, this assumption seems valid. It is possible that on required tasks in the classroom, non-persistence may be more closely related to a lack of self-regulation than a lack of pride or a low perceived competence, and teachers should be aware that bolstering children's self-

regulatory skills directly, in addition to enhancing interest in tasks, should increase children's persistence.

Finally, regarding the predictive power of self-regulation and motivation for concurrent achievement, aspects of self-regulation and motivation were both important for predicting teacher-rated reading and math skills. Approach motivation was the strongest predictor, suggesting that teachers may have considered children's motivation when rating their abilities. In contrast, self-regulation was the strongest predictor of children's assessed achievement and the sole predictor of children's reading achievement. It is unclear why motivation plays a role in math achievement but not reading achievement, although teachers spend more instructional time on reading than on math. Whereas literacy activities abound, math activities are limited to learning numbers and counting. Perhaps learning mathematical reasoning as tested here requires more active inquiry about the world than does the learning literacy skills tested here. The math problems involved real-world reasoning and problem-solving of the sort not often taught in preschool, while the reading test (identifying letters and words) mapped on perfectly to what children were being taught. Finally, given the powerful role of teacher expectations in shaping a child's education, it is critical to note the role that approach motivation may play in shaping these expectations. Children who are more motivated may not just approach more activities and gain from novel experiences, but may benefit from higher expectations for performance as well. Clearly, however, both children's self-regulation and motivation are important factors in their school readiness.

Methodologically, the assessments used in the pilot study appear to be reliable and valid measures of motivation and self-regulation. The teacher report instrument developed by Lan (2009) had good psychometric properties, and the modified competence motivation scale

(Fantuzzo et al., 2004) was a strong predictor of student achievement. The puppet interview measure appears to have been successful and merits another attempt because it is a pure measure of motivation that does not conflate it with self-regulation. Finally, the Tangram task can be coded reliably and does predict academic outcomes. All of these measures will be used in the dissertation study.

Lessons and Questions for the Present Study

Having shown that motivation and self-regulation uniquely predicted concurrent student achievement, the next question was whether motivation and self-regulation would uniquely predict student learning over the course of the preschool year. That is, if we control for the academic skills children bring with them to preschool, do motivation and self-regulation still make a difference? Accordingly, the present study was set up with a fall/spring pre-test post-test design. Next, which contexts are most useful for predicting student learning, teacher ratings, individual assessment, or group assessment? Having seen that teacher ratings, persistence, and HTKS all predicted various achievement outcomes, the purpose was to determine which assessment tools would be most useful in predicting learning outcomes. Thus the present study assessed motivation and self-regulation in all three contexts. Expanding the number of assessments allows for deeper exploration of the connection between motivation and self-regulation. In addition, it allows for further exploration of the nature of persistence, which was used as a motivation variable in the pilot study but appeared to measure self-regulation as well. Finally, because the teacher ratings were significant predictors, the purpose was to learn more about teachers' attributions of student behavior to specific motivation and self-regulatory behaviors.

Chapter Three

Method

Participants

Participants included 145 children enrolled in a study of preschool self-regulation and motivation in the Midwest. Participants were recruited by letters which were sent home with regular parent-teacher communications by teachers. Children came from a state-funded school readiness program and 10 tuition-based preschool classrooms in five schools. Eight of the eleven classrooms involved use the same curriculum and are taught by teachers who are trained together, and the organization states that these classrooms are relatively homogeneous. The remaining three classrooms were taught by the same pair of teachers. Children's ethnic identities, as reported by parents, were 62% Caucasian, 23.9% Asian American, 8.7% multi-racial, 2.2% Chaldean, and 1.1% Latino. Ninety-three families returned family background questionnaires (see Appendix I), with 68 families reporting a mean family income of $153,132 for a family of 3.96 (range: $34,000-$650,000; median: $135,000). Preschoolers had a mean age of 47.7 months (*SD* = 7.54) in the fall and 54.7 months (*SD* = 7.29) in the spring. The sample was 52% female.

Procedure

Children were given a battery of individual assessments (see below) in the Fall and Spring of their preschool year by the researcher and trained graduate and undergraduate research

assistants working for credit. Teachers completed teacher ratings for children during the Fall and Spring as well. Finally, children completed classroom challenge tasks assessing motivation and self-regulation with their teachers and classmates in the Fall and Spring. Teachers were interviewed about their students' motivation and self-regulation in the Spring following the final child assessments.

Measures

Achievement. Children completed the Woodcock-Johnson III Tests of Cognitive Abilities, Letter-Word Identification and Applied Problems subtests (Woodcock, McGrew, & Mather, 2001). This provided an assessment of letter and word reading and mathematical problem solving. Teachers completed the Academic and Social Competence scale (Valeski & Stipek, 2001), which asks teachers to rate the child's reading and math competence on a scale from 1-5. See Table 6 for all teacher rating scale reliabilities and Appendix A for scale items.

Motivation. Children completed an individual mastery motivation assessment assessing persistence, pride, and goal orientation, three puppet interviews assessing perceived competence and intrinsic value, and a classroom challenge task assessing persistence and pride. Teachers completed a child report assessing approach and avoidance motivation.

Individual mastery motivation assessment. Children completed a mastery motivation assessment using Wedgits (a building block set). Children were shown a card with a simple design and asked to make the blocks exactly like the design on the card. Once they had completed this, they were given a more challenging design and asked to do the same thing. If they finished in less than four minutes, they were given a third card (most challenging) and asked to build this as well. After they tried the third card for four minutes, they were stopped, and

asked, “If you had more time to work, would you like to keep trying this one or build this other one again (they are shown the picture of the second design)? Why?” (If they spent four minutes building the second design, they were asked the same question about the first and second designs instead of the second and third designs.) They were also asked whether they thought the last puzzle was easy, a little hard, or very hard. Children who chose to keep trying the very difficult design were designated as mastery-oriented, unless their reasoning was performance-based (e.g., “Because it’s easy”) and children who chose to rebuild one they had already completed successfully were designated as performance-oriented unless their reasoning was mastery-oriented (e.g., “I wanna do it better this time”). The mastery motivation assessment was videotaped for coding of persistence, pride, and frustration during the child’s most challenging task. Persistence was coded by using a timer to record the number of seconds the child was directing his or her behavioral and visual attention to the task, and pride and frustration were coded by counting the number of instances of pride and frustration expressed during the puzzle (e.g., “I’m good at this!” or “I can’t do it!”). See Table 5 for interrater reliability data on variables coded from video, Appendix C for full administration instructions, and Appendix E for the coding manual.

Table 5. Interrater reliability for motivation and self-regulation coding.

Variable	Interrater Reliability (ICC)
Persistence (Wedgits)	.91
Pride (Wedgits)	.92
Frustration (Wedgits)	.81
Persistence (Tangrams)	.91
Pride (Tangrams)	.81
Frustration (Tangrams)	.84
Attention Control	.87
Freeze Steps	.82
Freeze Time	.83
Freeze Prime Steps	.84
Freeze Prime Time	.83
Working Memory	.84

Puppet interview. Children responded to puppet interview questions about their perceived competence and enjoyment of puzzles, math, and reading after each direct assessment. The child interview measure was adapted from the PISCES (Mantzicopoulos et al., 2008). All questions were modified to relate to puzzles, reading, or math (see Appendix B for questions). After the Wedgits task, each participating child first selected the puppet most like him/her. Then, an identical puppet was produced and both were named (Anna and Beth for girls, Andrew and Bobby for boys). Children were told that the puppets were children like him/her, in a classroom like his/hers and with a similar teacher. The experimenter then explained that the

puppets feel differently about things that happen in school, which is OK because different kids feel different things. Puppets were then made to state different opinions, and the child was asked which puppet is the most like him/her. Two sample items were used to check understanding: "I like pizza" ("I don't like pizza") and "I don't like to play outside" ("I like to play outside"). The researcher then told the child that the puppets would be talking about puzzles like the one the child just did and points to the completed Wedgits puzzle. The puppets voiced eight sets of differing opinions about puzzles (e.g., "Puzzles like this are easy"), varying which puppet spoke first and which puppet felt positively about puzzles. Children indicated their agreement after each item by pointing at the puppet they agreed with, and their responses were recorded.

After the Woodcock-Johnson Letter-Word Identification task, the researcher told the child that the puppets would be talking about reading letters and words like the child just did and the child will respond to puppet statements like "I (don't) like reading letters and words" and "I think reading is easy (hard)". After the Woodcock-Johnson Applied Problems task, the researcher told the child that the puppets would be talking about counting and using numbers like the child just did and the child would respond to puppet statements like "I (don't) like counting" and "I think counting and numbers are easy (hard)".

Classroom challenge task. The classroom challenge task involved a very difficult puzzle administered in small groups of 4-8 to closely parallel challenging schoolwork in preschool. Each child was given a different tangram puzzle made from felt, and after the teacher modeled solving such a puzzle the children were given eight minutes to attempt it. After these eight minutes, the experimenter and teacher placed key pieces so that children could complete the puzzles. If children finished a puzzle before the end of the allotted time, they were given a choice to do another puzzle or to change activities. This task was videotaped for later coding of

persistence, pride, and frustration. Children were continuously coded as being on-task or off-task. Pride was coded as a discrete event each time the child displayed pleasure in accomplishment (e.g., "Yes! I did it!"), and these events were totaled. Frustration was coded as a discrete event each time the child displayed whining, exasperated, or angry affect (e.g., "I can't do it!"), and these events were totaled. See Table 5 for interrater reliability data, Appendix D for teacher administration instructions, and Appendix E for the coding manual.

Teacher rating scale. Finally, teachers rated children's competence motivation using a modified version of the competence motivation subscale of the Preschool Learning Behaviors Scale (PLBS; Fantuzzo, Perry, & McDermott, 2004; see table 1 for items), which has been validated for use with a Head Start population. Teachers indicated on a scale of 1-5 whether items such as "Tears when faced with difficulty" and "Shows great interest in activities" are characteristic of the child. See Table 6 for scale reliability scores and Appendix A for items.

Table 6. Cronbach's α reliability scores for teacher ratings scales.

Scale	Fall Reliability (α)	Spring Reliability (α)
Self-Regulation (all)	.96	.94
Working Memory	.91	.87
Attention	.88	.79
Response Inhibition	.95	.95
Motivation (all)	.90	.92
Approach	.92	.94
Avoidance	.83	.84
Reading	.85	.91
Math	.87	.94
Social Skills	.89	.94

Self-regulation. Children were assessed individually on a broad measure of behavioral self-regulation, and teachers reported on children's attention control, working memory, and response inhibition. Finally, children and their teachers engaged in the classroom challenge tasks for self-regulation, the Freeze game (Lan, 2009), the Freeze Prime game (developed for this project) and the Jumping game (Lan, 2009).

Individual assessment. Children completed the Head-Toes-Knees-Shoulders task (Ponitz, McClelland, Matthews, & Morrison, 2009), a measure of behavioral self-regulation where children must perform the opposite of the experimenter's commands (directions include, "When I say, 'Touch your toes,' touch your head!"). Connor et al. (2007) report interrater reliability for the Head-to-Toes short version of this measure to be 0.95.

Teacher report. Teachers rated children's self-regulation on a measure developed by Lan (2009) and used in the pilot study (see Appendix A). This scale asks teachers to rate children on items such as "Follows two-step directions" and "Has a short attention span" on a scale from 1-7, and typically yields three factors: response inhibition, working memory, and attention control. See Table 6 for scale reliability data.

Response inhibition games. During the Freeze game (Lan, 2009), teachers instructed children to march in a circle to music. When the music stopped, children froze. Children could only unfreeze themselves when the teacher said "unfreeze" or when the music started again. An experimenter controlled the marching music and stopped it at random intervals of less than 15 seconds. The task repeated for three trials and was videotaped for later coding of response inhibition. Points for Freeze Steps were assigned for approximations of the targeted behavior and averaged across the three trials. Points were given based on the speed and accuracy of the child's stopping. Four points were given for immediate stop when the music stops, three for delayed stop with one more step, two points for delayed stop with two more steps, one point for delayed stop with three or more steps, and zero points for forced stop (i.e. the child stops only to avoid running into another child), non-stop or not participating. Points for Freeze Time reflected how long the child stayed frozen. Three points were given to a child that stopped and stayed frozen and did not move for at least five seconds, two points were given to a child that froze but then struck a pose that they then attempted to hold for at least five seconds, one point was given to a child that initially stopped but did not remain frozen for at least five seconds, and no points were given to a child that did not stop when the music stopped.

During the Freeze Prime game, teachers instructed children to march in a circle without music. When the music started, children froze into a certain pose. Children could only unfreeze

themselves when the teacher said “unfreeze” or when the music stopped again. An experimenter controlled the marching music and started it at random intervals of less than 15 seconds. The task repeated for three trials and was videotaped for later coding of response inhibition. Freeze Steps and Freeze Time were coded as described above. See Table 5 for interrater reliability scores, Appendix F for teacher instructions, and Appendix G for coding manual.

Working memory game. During the Jumping game (Lan, 2009), children also marched in a circle to music, but prior to marching, teachers instructed students to “jump three times” (one-step instruction) when they heard the music stop. So, as children marched, they had to monitor the music and remember the instructions, processing two pieces of information in working memory at once. After the one-step instruction trial, the teacher gave the two-step instruction (“jump three times and clap twice”) and three-step instruction (“jump three times, clap twice, and go one step backwards”) respectively. Points were given for working memory based on the accuracy of the action. Lan (2009) reported interrater reliabilities of .80-.85 for this coding task using the following system: Two points were given for the correct response (e.g. jumped three times), one point for attempted but failed response (e.g. clapped three times instead of twice), and zero points for not responding or producing an irrelevant or completely incorrect response. We coded using a modified system, reflecting the nature of group dynamics we saw at play during data collection. Children frequently looked to one another for information when they were unsure of how to proceed. This behavior, while strategic, does not represent true working memory, and thus cued recall (performing the action after seeing a friend do it) deserved a lower score than uncued recall. Thus, the following values were applied:

6 – Perfect Recall (given to a child that performed the actions correctly)

5 – Miscount (given to a child that performed the actions an incorrect number of times, i.e. clapped once)

4 – Bananas (given to a child that performed the action without an attempt to count, "goes bananas")

3 – Cued Perfect (given to a child that performed the actions correctly after learning (visually, verbally) from a peer; there was a delay in performing the actions)

2 – Cued Miscount (given to a child that performed the actions an incorrect number of times after learning (visually, verbally) from a peer, there was a delay in performing the actions)

1 – Cued Bananas (given to a child that performed the actions without an attempt to count but only after learning the action from a peer; there was a delay in performing the actions)

0 – No Response (given to a child that dids not respond or produced an irrelevant or completely incorrect response)

Attention control coding. During the instruction phase for each task (Freeze, Freeze Prime, and each set of directions for the Jumping Game), points were given based on the child's attentiveness to the instruction (this attention control score was a novel code for this study). Two points were given for full attention (body and face directed at the experimenter, attentive expression, no disruptive actions or verbalizations), one point for partial attention (some time of full attention, some occurrences of distraction or disruptive actions or verbalizations), and zero points for no attention. See Table 5 for interrater reliability data and Appendix G for coding manual. See Table 7 for a summary of variables and constructs used in the dissertation study.

Table 7. Constructs and variables used.

	Motivation				Persistence	Self-Regulation			Achievement	
	Perceived Competence	Task Value	Mastery Orientation	Academic Emotions	Time on Task	Working Memory	Attention Control	Response Inhibition	Reading	Math
Individual Assessment	Puppet Interview questions (reading, math, and puzzles subscales)	Puppet Interview questions (reading, math, and puzzles subscales)	Questions about task choice after failure and perceived difficulty	Wedgit Frustration, Wedgit Pride	Wedgit time on task	Head-Toes-Knees-Shoulders (Ponitz, et al., 2009) provides a broad assessment of all three constructs (scores cannot be separated by construct)			Woodcock-Johnson III Letter-Word Identification Test	Woodcock-Johnson III Applied Problems Test
Group Assessment	None	None	None	Tangram Frustration, Tangram Pride	Tangram time on task	Score on Jumping game	Attention to directions on Jumping and Freeze games	Freeze time, freeze steps, freeze prime time, freeze prime steps	None	None
Teacher Assessment	Competence Motivation subscale of the PLBS assesses general motivation related to all constructs; factor analyses provide two subscales, Approach and Avoidance (Fantuzzo, Perry, & McDermott, 2004)				None	Teacher rating scale of working memory (Lan, 2009)	Teacher rating scale of attention control (Lan, 2009)	Teacher rating scale of response inhibition (Lan, 2009)	Reading subscale of ASC (Valeski & Stipek 2001)	Math subscale of ASC (Valeski & Stipek 2001)

Teacher interview. Teachers were interviewed using the protocol shown in Appendix H. Topics included the nature of the relation between motivation and self-regulation as well as defining and differentiating motivation and self-regulation. Using teacher reports of children's motivation and self-regulation, z-scores were computed, and target children from each classroom with the largest discrepancy in z-scores were identified and placed in two groups: high motivation, low self-regulation and low motivation, high self-regulation. These students were used as guides during the questioning process as teachers identified behaviors that were characteristic of "low" and "high" motivation and self-regulation children. Teachers were asked how they identify and differentiate between student struggles with self-regulation and motivation, and also how they choose courses of intervention. Undergraduate research assistants transcribed the interviews from .WMA files. Transcript accuracy was checked on one transcription by each transcriber by myself. All transcripts were read at least three times: once, to get a sense of the teacher's ideas; twice, to mark passages that corresponded to the six research questions; and third, to double-check the passage marking and to make notes about other themes arising from the interviews. Finally, marked passages corresponding to each research question were compiled into a single document for coding and quote selection.

Chapter Four

Methodology Results and Discussion

Table 8 shows the ranges, means, standard deviations, and stability across time of motivation, self-regulation, and achievement variables. Teacher-rated variables and achievement variables tended to be highly stable over time. Scores on challenge tasks were often not correlated from Fall to Spring. All measures yielded adequate variability for analysis, with the exception of mastery orientation (floor effect).

Table 8. Descriptive Statistics

Variable	Fall Range	Fall Mean (SD)	Spring Range	Spring Mean (SD)	Stability Across Time
Letter-Word Identification	0-36	9.24 (5.36)	0-40	12.65 (6.85)	.83***
Applied Problems	0-23	12.52 (5.41)	0-30	14.55 (4.98)	.73***
Reading Competence	0-4	2.62 (1.29)	0-4	2.64 (1.25)	.07
Math Competence	0-4	2.85 (1.15)	0-4	2.98 (1.20)	.03
Puzzle Competence	0-4	2.93 (1.06)	0-4	3.24 (0.94)	.20*
Reading Value	0-4	3.04 (1.12)	0-4	2.99 (1.16)	.00
Math Value	0-4	3.01 (1.20)	0-4	3.05 (1.16)	.04
Puzzle Value	0-4	3.10 (1.08)	0-4	3.05 (1.16)	.26**
Wedgit Persistence	0-240	192.91 (53.26)	29-237	197.96 (37.12)	.39***
Wedgit Pride	0-26	2.43 (3.30)	–	–	–
Wedgit Frustration	0-29	3.96 (4.82)	0-12	2.89 (2.83)	.28**
Tangram Persistence	91-474	352.93 (96.91)	87-472	376.78 (69.57)	.39***
Tangram Pride	0-18	4.45 (3.32)	–	–	–
Tangram Frustration	0-43	4.82 (5.81)	0-24	3.80 (4.03)	.05
Mastery Orientation	0-3	0.94 (0.98)	0-3	0.67 (1.02)	.21*

Perceived Difficulty	0-2	1.58 (.58)	0-2	1.59 (.63)	.05
Teacher-Rated Approach	1-5	3.29 (0.90)	1-5	3.54 (0.94)	.64***
Teacher-Rated Avoidance	1.60-5	4.05 (0.73)	1-5	4.08 (0.69)	.52***
HTKS	0-38	13.05 (12.00)	0-40	19.69 (13.43)	.67***
Freeze Steps	0-12	6.77 (2.25)	0-12	8.36 (2.48)	.08
Freeze Time	0-9	7.18 (1.65)	0-9	8.25 (1.66)	-.05
Freeze Prime Steps	0-12	5.02 (2.72)	0-12	7.32 (3.52)	.21*
Freeze Prime Time	0-9	6.39 (2.48)	0-9	7.55 (2.11)	.10
Attention	0-10	6.61 (2.14)	0-10	6.03 (2.06)	.11
Working Memory	0-18	7.97 (4.80)	0-18	8.37 (5.09)	.17^{t}
Teacher-Rated Resp. Inhibition	1.30-7	4.97 (1.45)	1-7	5.14 (1.38)	.78***
Teacher-Rated Working Memory	1-7	5.47 (1.25)	3.25-7	5.87 (0.84)	.56***
Teacher-Rated Attention	1-7	4.65 (1.60)	1-7	4.56 (1.44)	.59***
Teacher-Rated Reading	1-5	3.16 (0.70)	1-5	3.26 (0.81)	.60***
Teacher-Rated Math	1-5	3.16 (0.67)	1-5	3.35 (0.85)	.48***

Note: *** $p < .001$, ** $p < .01$, * $p < .05$, ^{t} $p < .10$

Several new methods were used to assess motivation in this study, and some existing methods were adapted to assess self-regulation. Given the novelty of these measures, their use merits discussion. Other methods were found to be problematic in minor ways and their potential improvement is discussed.

Puppet interview. The puppet interview to assess perceived competence and intrinsic task value was extended in this study for use with three-year-olds and also to assess attitudes toward reading and math. Pilot work (see chapter two) had established the efficacy of the measure for assessing perceived competence and task value for puzzles in 4 ½ year olds immediately following the tangram task. In this study, three-year-olds had very little difficulty understanding the puppet interview protocol and their responses were similar to those of four- and five-year-olds, suggesting that the puppet interview protocol is valid for use with an affluent sample of three-year-olds. Children's responses to math and reading questions were highly correlated, but less correlated with their responses to puzzle questions. These correlations, along with the fact that reading growth was predicted by children's task value for math, suggest that preschool children's perceived competence at academics may not yet be differentiated by discipline. Both reading and math questions were administered after the Woodcock-Johnson subtests, so children may have been responding to how they felt about that type of testing as a whole. Preschool children may not yet have definitions for academic subjects such as "reading" and "math" (Mantzicopoulos, Patrick, & Samarapungavan, 2008). Attempts were made to make the questions transparent in this case (e.g., "I like counting") but children's comprehension of specific questions cannot be verified.

Children's responses to the puppet interview questions about puzzles were given after a challenging puzzle test (a domain that is familiar to preschool children). It remained unclear

whether children viewed the Wedgits as a "puzzle" or whether they were answering questions about puzzles they do in their classroom and at home. Regardless, their perceived competence after a failure experience was a significant predictor of both reading and math growth. Intrinsic task value for puzzles was also a significant predictor of reading growth. While more work needs to be done to assess children's comprehension of the questions being asked of them, several conclusions can still be made about the puppet interview about puzzles: 1) the answer format of the puppet interview produces scores that yield adequate variability for analysis; 2) children's responses to puppet interview questions are meaningfully connected with their experience during the puzzles (e.g., persistence, frustration); and 3) scores are useful predictors of academic growth. Continued use of the puppet interview, especially after the Wedgits protocol, is recommended.

"Wedgits" mastery motivation task. The Wedgits task was developed for this study based on guidelines issued by mastery motivation researchers for appropriately challenging tasks (Morgan et al., 1992). The task was successful in meeting these guidelines, which included providing tasks of increasing difficulty so that a child could be assessed working on a task where he or she could complete part, but not all, of the solution in the time allotted. Children enjoyed the Wedgits. As predicted, some children worked on the second puzzle for their challenging task while others completed the second puzzle successfully and moved on to the third. In two situations at separate testing sites on the same day, the child successfully completed the third puzzle and needed to be given a fourth puzzle so as to provide adequate challenge. Miraculously, researchers testing children at both sites picked the same fourth puzzle and assessed the children with the fourth puzzle. A fifth puzzle was selected for the spring data collection to prevent future

problems. In both cases where the children needed more difficult puzzles, they had Wedgits at home and were familiar with the tricks for solving the puzzles.

Children seemed comfortable being videotaped, and all videos were of sufficient quality for coding. The abbreviated coding system developed for this project was efficient. Coding time-on-task continuously with hand-held timers worked well, as did training coders to reliably code pride and frustration.

Tangram task. The tangram task to assess motivated behavior in a group situation had been adequately piloted and few problems arose with the administration of the task. As with all group tasks, there were higher rates of missing data because children were occasionally absent on assessment days. Video quality was improved relative to the pilot study, and there was very little missing data due to bad camera angles. Coding was easy and successful, with the exception of the Spring pride data.

Mastery/performance-orientation manipulation. The attempt to assess a mastery vs. performance orientation at the end of the Wedgits task was not successful. At the end of the puzzle that children did not complete, they were asked which puzzle they would like to work on again if they were given more time. More than 90% of the children selected the puzzle they had already completed (performance orientation), yielding little useful data for predictive analysis. In Smiley and Dweck's (1994) original work, close to half of the children were designated as mastery oriented. There are several potential reasons for this difference. First, there were only two puzzles from which to select (Smiley and Dweck had children choose from three unsolvable puzzles and one solvable puzzle). So, statistically speaking, in our case the odds that the child would choose the solvable puzzle were 50%, whereas in Smiley and Dweck's study the odds

were 25%. Second, the challenging puzzle was noticeably difficult, whereas in Smiley and Dweck's study the unfinished puzzles were unsolvable but did not appear to be noticeably more challenging than the solvable puzzle. It can be argued that the present manipulation is more in line with a true mastery/performance manipulation, because the point of the manipulation is to select children who prefer challenge. One choice was considerably more challenging than the other in the present study. Whatever the reason, low variability precluded using the data.

Head-Toes-Knees-Shoulders (HTKS). As has been found in prior work with this measure, some three-year-olds scored a zero on HTKS in the Fall. Fortunately, there were not enough children in this category to create floor effects. Still, the research team found that the directions were difficult to convey to English Language Learner three-year-olds, more so than for other tasks. There was some concern that self-regulatory capacities of these children were not adequately assessed.

Freeze and Freeze Prime Games. The creation of an additional Freeze game, Freeze Prime, added valuable data to the study. Freeze Prime scores were more highly correlated with other self-regulation measures than were Freeze scores, likely because Freeze Prime is a better measure of response inhibition. Children are accustomed to playing Freeze in their classrooms, and it is a dominant response to stop when the music stops. Freeze Prime, where students must freeze when the music is turned on, truly requires activating a subdominant response. In addition, it took very little additional assessment time to add this game, so its continued use is recommended. Giving the students large labels with numbers helped tremendously with the coding of videos. Having identifiers (unrelated to subject numbers) alleviated many of the coding problems faced by Lan (2009).

Teacher report of self-regulation (Lan, 2009). This measure was selected because of its successful use in the pilot study. Still, for future use, several items should be revised. Item 8, "Only pays attention to things he/she is really interested in" conflates motivation and self-regulation. Similarly, the working memory items (2, 6, 9, and 10) all capture variability in motivation and compliance. The items read, for example, "Follows one-step directions." Such an item certainly measures working memory, but it also captures the child's willingness to comply with directions and perhaps also how much the child is motivated to do an activity. For future studies on motivation and self-regulation, the self-regulation scale should be revised to more precisely measure self-regulation without motivation.

Chapter Five

Research Question One

What is the relation between motivation and self-regulation in preschool children?

Results

Quantitative results

Two quantitative approaches were used to determine the relation between motivation and self-regulation in this sample: correlation and confirmatory factor analysis (CFA). A third approach, exploratory factor analysis (EFA), was considered, but according to Kline (2005), EFA capitalizes on chance, and using EFA results to inform the specifications of a CFA compounds this problem. Kline recommends using one approach or the other. Because the CFA allows us to test specific hypotheses about the relations between motivation and self-regulation, CFA was selected for these analyses.

Given the enormity of a correlation table showing the results of correlations between every motivation and self-regulation variable in the data, the results have been divided into a series of smaller analyses. First, correlations are presented between teacher ratings of children's motivation and self-regulation in both the Fall and Spring (Tables 9 and 10). Second, correlations are presented for the results of the group challenge tasks in the fall and spring (tables 11 and 12). Third, correlations are presented between individual measures of children's motivation and self-regulation in the fall and spring (tables 13 and 14). Finally, to provide a sense of how these measures relate, four correlation tables are presented (tables 15-18) showing the relation between teacher, group, and individual measures of both motivation and self-regulation in the fall and in

the spring. The results of four CFAs are then presented, showing the factor structure of the teacher reports of motivation and self-regulation in both the fall and spring, and the group and individual scores in both the fall and spring.

Correlations

Teacher report. Tables 9 and 10 show the relations between teacher reports of working memory, attention control, response inhibition, approach motivation, and avoidance motivation in the fall and spring, respectively (see appendix A for teacher report instrument). Note that avoidance motivation is reverse-coded, so that a higher score on "avoidance" means less avoidant behavior.

Table 9. Correlations among teacher reports of children's motivation and self-regulation in the fall.

	WM	Attention	RI	Approach
Working Memory	---			
Attention Control	.66***	---		
Response Inhibition	.51***	.82***	---	
Approach Motivation	.54***	.24**	.03	---
Avoidance Motivation	.45***	.32***	.16^{t}	.48***

Note: *** $p < .001$, ** $p < .01$, * $p < .05$, ^{t} $p < .10$

Table 10. Correlations among teacher reports of children's motivation and self-regulation in the spring.

	WM	Attn	RI	Approach	Avoidance
Working Memory	–				
Attention Control	.48***	–			
Response Inhibition	.22*	.74***	–		
Approach Motivation	.42***	.16^{t}	-.14	–	
Avoidance Motivation	.36***	.27**	.02	.58***	–

Note: *** $p < .001$, ** $p < .01$, * $p < .05$, ^{t} $p < .10$

Working memory is strongly correlated with all other measures of self-regulation and with motivation in the fall. In the spring, working memory is strongly correlated with all other measures except for response inhibition, where the correlation is still significant ($r = .22$, $p < .05$) but dramatically smaller in magnitude than the fall correlation ($r = .51$, $p < .001$). In both fall and spring, response inhibition and attention control are strongly correlated (Fall $r = .82$, $p < .001$; spring $r = .74$, $p < .001$). Attention control is modestly correlated with approach motivation (fall $r = .24$, $p < .01$; spring $r = .16$, $p < .10$) and more strongly correlated with avoidance motivation (fall $r = .32$, $p < .001$; spring $r = .27$, $p < .01$). Response inhibition is largely uncorrelated with approach or avoidance motivation, with the exception of one marginally significant relation between fall response inhibition and avoidance motivation ($r = .16$, $p < .10$). Approach and avoidance motivation are strongly correlated in both the fall and the spring (fall $r = .48$, $p < .001$; spring $r = .58$, $p < .001$).

In sum, the teacher data suggest that the relation between motivation and self-regulation may be specific to the component of self-regulation being measured. Working memory is correlated with motivation in the .35-.55 range, attention control is correlated with motivation in the .15-.35 range, and response inhibition is uncorrelated with motivation.

Challenge tasks. Tables 11 and 12 show the correlations between motivation and self-regulation as measured by group challenge tasks (scores coded from video). Attention control and working memory are self-explanatory; freeze steps, freeze time, freeze prime steps, and freeze prime time are all measures of response inhibition. Tangram pride, frustration, and persistence are indicators of motivation.

Table 11. Correlations among motivation and self-regulation scores coded from videos of groups performing challenging tasks in the fall.

	Attn	F Steps	F Time	FP Steps	FP Time	WM	Tangram Pride	Tangram Frust-ration	Tangram Persist-ence
Attention Control	–								
Freeze Steps	.45***	–							
Freeze Time	.51***	.46***	–						
Freeze Prime Steps	.34***	.52***	.34***	–					
Freeze Prime Time	.41***	.25**	.41***	.62***	–				
Working Memory	.44***	.26**	.19*	.46***	.39***	–			
Tangram Pride	.22*	.11	.15^{t}	.00	.12	.20*	–		
Tangram Frustration	-.02	-.09	-.20*	-.04	-.12	.01	-.07	–	
Tangram Persis-tence	.20*	.25**	.17*	.31***	.32***	.33***	.21*	-.23**	–

Note: *** $p < .001$, ** $p < .01$, * $p < .05$, ^{t} $p < .10$

Table 12. Correlations among motivation and self-regulation scores coded from videos of groups performing challenging tasks in the spring.

	Attention	F Steps	F Time	FP Steps	FP Time	WM	Tangram Persistence	Tangram Frustration
Attention Control	–							
Freeze Steps	.32***	–						
Freeze Time	.29**	.36***	–					
Freeze Prime Steps	.24**	.58***	.43***	–				
Freeze Prime Time	.30**	.46***	.57***	.55***	–			
Working Memory	.48***	.44***	.30**	.63***	.39***	–		
Tangram Persistence	.11	.01	-.07	.17^{t}	.02	.12	–	
Tangram Frustration	-.06	-.01	.07	-.09	-.04	-.01	-.18^{t}	–

Note: *** $p < .001$, ** $p < .01$, * $p < .05$, ^{t} $p < .10$

As may be expected, the six self-regulation scores are moderately to highly correlated. For example, attention control is correlated in the .35-.50 range with all other self-regulation scores in the fall and in the .25-.50 range with spring scores. Because attention was coded as visual and behavioral attention to the directions given for the tasks, attention would logically be correlated with performance on those tasks. Children who knew what to do scored higher than children who did not. The four measures of response inhibition were also moderately to strongly intercorrelated, with correlations among the measures ranging from .25-.60 in the fall, and .35-.60 in the spring. Working memory was significantly correlated with all other self-regulation

measures in the fall and spring, with correlations ranging from .19-.63. No self-regulation variable was uncorrelated with any other self-regulation variable in the fall and spring, suggesting that different measures of self-regulation are capturing distinct but related aspects of behavior.

In the fall, tangram pride was correlated positively with both attention control (r = .22, p < .05) and working memory (r = .20, p < .05). It was also marginally correlated with freeze steps (r = .15, p < .10). Pride scores are unavailable for the spring data. In the fall, tangram frustration is negatively correlated with freeze time (r = -.20, p < .05). In the spring, tangram frustration and persistence are marginally negatively correlated (r = -.18, p < .10). Notably, tangram persistence was significantly correlated with every self-regulation and motivation measure in the fall (rs ranging from .17-.33 for self-regulation measures and .21-.23 for motivation measures) and was not correlated with a single measure of motivation or self-regulation in the spring. Clearly, in the fall, the freeze and jumping games were capturing shared variance with behavior on the tangram task, but in the spring, this was not the case. Other explanations will be advanced in the discussion; for now, the data suggest that motivation and self-regulation are related in the fall but not the spring.

Individual measures. Tables 13 and 14 show the correlations among individually assessed scores of motivation and self-regulation. Due to the design of the study, self-regulation was individually assessed with a single measure (Head-Toes-Knees-Shoulders), whereas there are many scores on different assessments of motivation. Discussion will focus on the first column of each table; the reader is invited to examine interrelations between motivation scores at his/her leisure.

Table 13. Correlations among individual measures of motivation and self-regulation in the fall.

	HTKS	Reading Value	Reading Compe-tence	Math Value	Math Compe-tence	Puzzle Value	Puzzle Compe-tence	Perceived Difficulty	Mastery Orien-tation	Wedgit Persistence	Wedgit Pride	Wedgit Frustra-tion
HTKS	–											
Reading Value	.25**	–										
Reading Competence	.14	.40***	–									
Math Value	.09	.40***	.35***	–								
Math Competence	.19*	.45***	.42***	.54***	–							
Puzzle Value	.21*	.27**	.17^{t}	.26**	.27**	–						
Puzzle Competence	.18*	.22*	.13	.24**	.27**	.60***	–					
Perceived Difficulty	-.08	-.13	.01	-.04	-.13	.02	-.17*	–				
Mastery Orientation	-.14	-.07	-.00	-.10	-.05	.05	-.05	-.15^{t}	–			
Wedgit Persistence	.34***	.12	.06	.02	.10	.18*	.17^{t}	-.09	.05	–		
Wedgit Pride	.00	.11	.01	.01	.05	.01	.17*	-.04	.03	.18*	–	
Wedgit Frustration	.07	.11	.05	-.08	.02	.05	-.00	.17^{t}	-.15^{t}	.13	-.06	–

Note: *** $p < .001$, ** $p < .01$, * $p < .05$, ^{t} $p < .10$

Table 14. Correlations among individual measures of motivation and self-regulation in the spring.

	HTKS	Reading Value	Reading Compe-tence	Math Value	Math Compe-tence	Puzzle Value	Puzzle Compe-tence	Perceived Difficulty	Mastery Orientation	Wedgit Persistence	Wedgit Frustration
HTKS	–										
Reading Value	.03	–									
Reading Competence	-.10	.40***	–								
Math Value	.18^{t}	.44***	.24**	–							
Math Competence	.20*	.42***	.25**	.43***	–						
Puzzle Value	.23**	.30***	.08	.28**	.42***	–					
Puzzle Competence	.21*	.24**	.17^{t}	.17*	.26**	.29**	–				
Perceived Difficulty	-.06	.09	.10	.01	.09	-.01	.00	–			
Mastery Orientation	.04	.02	.03	.01	.01	-.09	-.00	-.15^{t}	–		
Wedgit Persistence	.24**	.08	.07	.09	.18*	.07	.19*	-.14	-.01	–	
Wedgit Frustration	.04	-.00	.07	-.17^{t}	.08	.02	.00	.04	-.00	-.15^{t}	–

Note: *** $p < .001$, ** $p < .01$, * $p < .05$, ^{t} $p < .10$

Self-regulation, as measured individually by the Head-Toes-Knees-Shoulders game, was correlated with some measures of motivation and not others. The relation between motivation and self-regulation seems to depend on what theoretical approach to the measurement of motivation is used.

Task value and perceived competence (puppet interview). In the fall, HTKS was correlated with value of reading ($r = .25$, $p < .01$) and puzzles ($r = .21$, $p < .05$). In the spring, HTKS was marginally correlated with value of math ($r = .18$, $p < .10$) and slightly more strongly correlated with the value of puzzles ($r = .23$, $p < .05$). Also in the fall, HTKS was correlated with perceived competence at math ($r = .19$, $p < .05$) and puzzles ($r = .18$, $p < .05$). In the spring, HTKS was again correlated with perceived competence at math ($r = .20$, $p < .05$) and puzzles ($r = .21$, $p < .05$). When motivation is measured using the puppet interview of perceived competence and task value immediately after a failure experience (as in the Wedgits task), interview scores are consistently, albeit weakly, correlated with self-regulation. Correlations with math and reading interview scores are less consistent.

Mastery/performance orientation and perceived difficulty. In the fall and spring, HTKS scores were uncorrelated with both goal orientation and perceived difficulty.

Mastery motivation. HTKS was positively correlated with Wedgit persistence in both the fall ($r = .34$, $p < .001$) and the spring ($r = .24$, $p < .01$). Self-regulation was uncorrelated with both pride and frustration in the spring and fall.

In sum, relations between HTKS and individual measures of motivation vary by measure, but HTKS was generally correlated with puppet interview scores in the .15-.25 range and persistence in the .25-.35 range. These results were consistent in the fall and spring. HTKS was

uncorrelated with mastery goal orientation, perceived difficulty of the puzzle, pride, and frustration at both time points. To enable the reader to get a sense of how various measures of motivation and self-regulation are related (particularly those scores assessed across different constructs), Tables 15-16 show the relation among these measures in the spring and fall.

Table 15. Correlations among assessments of motivation in the Fall.

	Reading Value	Reading Compe-tence	Math Value	Math Compe-tence	Puzzle Value	Puzzle Compe-tence	Mastery Orientation	Perceived Diffi-culty	Wedgit TOT	Wedgit Pride	Wedgit Frustration	Tan-gram Pride	Tangram Frust-ration	Tangram TOT	Teacher-rated Approach Motivation	Teacher-rated Avoidance Motivation
Reading Value	_															
Reading Compe-tence	.40***	_														
Math Value	.40***	.35***	_													
Math Compe-tence	.45***	.42***	.54***	_												
Puzzle Value	.27**	.17^{t}	.26**	.27**	_											
Puzzle Compe-tence	.22*	.13	.24**	.27**	.60***	_										
Mastery Orientation	-.07	.00	-.10	-.05	.05	-.05	_									
Perceived Difficulty	-.13	.01	-.04	-.13	.02	-.17*	-.15^{t}	_								
Wedgit TOT	.12	.06	.02	.10	.18*	.17^{t}	.05	-.09	_							
Wedgit Pride	.11	.01	.01	.05	.01	.17*	.03	-.04	.18*	_						
Wedgit Frustration	.11	.05	-.08	.01	.05	.00	-.15^{t}	.17^{t}	.13	-.06	_					
Tangram Pride	-.09	-.10	.08	.16^{t}	-.08	-.02	.16^{t}	-.08	-.03	.01	-.13	_				
Tangram	.05	-.04	-.05	-.07	-.10	-.06	.10	-.11	.14	.24**	.13	-.07	_			

Frustration															
Tangram TOT	.13	.02	-.08	.23**	.13	.25**	-.07	-.07	.30***	.02	.00	.21*	-.23**		
Teacher-rated Approach Motivation	.03	-.10	-.15	.06	.08	.10	.00	.05	.26**	.03	.08	.14	.03	.16^{t}	1
Teacher-rated Avoidance Motivation	.03	.02	-.14	.10	.06	.08	.08	.02	.17*	.02	.08	.09	-.06	.13	.48***	1

Note: *** $p < .001$, ** $p < .01$, * $p < .05$, ^{t} $p < .10$

Table 16. Correlations among assessments of motivation in Spring.

	Reading Value	Reading Competence	Math Value	Math Competence	Puzzle Value	Puzzle Competence	Mastery Orientation	Perceived Difficulty	Wedgit Persistence	Wedgit Frustration	Tangram Persistence	Tangram Frustration	TR Approach Motivation	TR Avoidance Motivation
Reading Value	_													
Reading Competence	.40***	_												
Math Value	.44***	.24**	_											
Math Competence	.42***	.25**	.43***	_										
Puzzle Value	.30***	.08	.28**	.42***	_									
Puzzle Competence	.24**	.16^{t}	.17*	.26**	.29**	_								
Mastery Orientation	.02	.03	.01	.01	-.09	.00	_							
Perceived Difficulty	.09	.10	.01	.09	-.01	.00	-.15^{t}	_						
Wedgit Persistence	.08	.07	.09	.18*	.07	.19*	-.01	-.14	_					
Wedgit Frustration	.00	.07	-.17^{t}	.07	.02	.00	.00	.04	-.15^{t}	_				
Tangram Persistence	.09	.02	.04	.12	.00	.04	-.04	-.12	.40***	-.13	_			
Tangram Frustration	.07	-.03	-.05	-.01	.06	-.02	.14	.06	-.14	.43***	-.18^{t}	_		
TR	.20*	.15^{t}	.26**	.24**	.21*	.12	.14^{t}	-.06	.18*	.06	.05	.09	_	

Approach Motivation TR Avoidance Motivation	.20*	.12	.03	.12	.13	.10	.18*	-.11	.28**	-.03	.27**	-.21*	.58***

Note: *** $p < .001$, ** $p < .01$, * $p < .05$, ^{t} $p < .10$

Teacher reports are a particularly efficient way to gather information about children's motivation. In the fall, teacher reports are correlated with very few other measures of motivation. Notably, teachers' reports of approach motivation were correlated with both individual persistence ($r = .26$, $p < .01$) and group persistence ($r = .16$, $p < .10$). Avoidance motivation was correlated with individual persistence ($r = .17$, $p < .05$). In the spring, however, teacher reports were correlated with many more measures of motivation. For example, approach motivation was correlated with all puppet interview scores except for perceived competence at puzzles (*r*s range from .15-.26). Both approach and avoidance motivation were correlated with choosing a mastery orientation ($r = .14$, $p < .10$ for approach, $r = .18$, $p < .05$ for avoidance). Avoidance motivation was correlated with both individual ($r = .28$, $p < .01$) and group ($r = .27$, $p < .01$) persistence. Approach motivation was correlated with individual persistence ($r = .18$, $p < .05$). One conclusion might be that as teachers know their students better in the spring, their reports more accurately reflect children's behavior and attitudes.

Group tasks are also more efficient than individual assessments of motivation. While the video coding takes a similar amount of time, the task administration is much shorter. In the fall, tangram pride was marginally correlated with perceived competence in math ($r = .16$, $p < .10$) and endorsing a mastery orientation ($r = .16$, $p < .10$). It was also correlated positively with tangram frustration ($r = .24$, $p < .01$). Tangram frustration and persistence were negatively correlated ($r = -.23$, $p < .01$). Tangram persistence was correlated positively with perceived competence in math ($r = .23$, $p < .01$) and puzzles ($r = .25$, $p < .01$). Tangram persistence was also significantly correlated with Wedgit persistence ($r = .30$, $p < .01$). In the spring, tangram persistence was correlated more strongly with Wedgit persistence ($r = .40$, $p < .001$). This suggests consistency in persistent behavior across tasks. Also in the spring, tangram persistence

and frustration were marginally negatively correlated ($r = .18$, $p < .10$). Finally, spring tangram frustration and spring Wedgit frustration were strongly correlated ($r = .43$, $p < .001$). Again, this suggests consistency in frustrated behavior across challenging tasks.

Teacher reports of children's self-regulation also capture variability in children's task behavior (see tables 17 and 18, below). Teacher-rated working memory, for example, was positively correlated with every group and individual measure of children's self-regulation except freeze steps (*r*s range from .17-.35). In particular, teacher-rated working memory and group task-assessed working memory were moderately correlated ($r = .35$, $p < .001$). Teacher-rated attention was correlated significantly with freeze steps ($r = .19$, $p < .05$) and marginally with working memory ($r = .17$, $p < .10$). Teacher-rated response inhibition was correlated significantly with freeze steps ($r = .25$, $p < .01$) and marginally with freeze prime steps ($r = .16$, $p < .10$). In the spring, however, teacher-rated working memory was correlated only with HTKS ($r = .29$, $p < .01$) and teacher-rated attention was correlated marginally with HTKS ($r = .17$, $p < .10$). Thus, in contrast with the results of motivation analyses, teachers' reports of children's self-regulation skills map on *less* well to children's skills in the spring than in the fall.

In the fall, HTKS was correlated significantly and positively with all group measures of self-regulation, with *r*s ranging from .19 (freeze time) to .46 (freeze prime steps). Group self-regulation tasks appear to capture meaningful variability in children's individual self-regulation performance. However, in the spring, HTKS was correlated only marginally with freeze prime steps ($r = .18$, $p < .10$) and freeze prime time ($r = .16$, $p < .10$). Group assessments of self-regulation capture more variability in individual performance in the fall than in the spring.

Table 17. Correlations among assessments of self-regulation in different contexts (fall data).

	HTKS	Attention	Freeze Steps	Freeze Time	Freeze Prime Steps	Freeze Prime Time	Working Memory	TR Working Memory	TR Attention	TR Response Inhibition
Head-Toes-Knees-Shoulders	–									
Attention	.35***	–								
Freeze Steps	.29**	.45***	–							
Freeze Time	.19*	.51***	.46***	–						
Freeze Prime Steps	.46***	.34***	.52***	.34***	–					
Freeze Prime Time	.34***	.41***	.25**	.41***	.61***	–				
Working Memory	.41***	.44***	.26**	.19*	.46***	.39***	–			
Teacher-rated Working Memory	.34***	.17^{t}	.12	.17^{t}	.20*	.31***	.35***	–		
Teacher-rated Attention	.13	.11	-.03	.19*	.04	.12	.17^{t}	.66***	–	
Teacher-rated Response Inhibition	.11	.07	.06	.25**	.10	.16^{t}	.13	.51***	.82***	–

Note: *** $p < .001$, ** $p < .01$, * $p < .05$, ^{t} $p < .10$

Table 18. Correlations among assessments of self-regulation in different contexts (spring data).

	HTKS	Attention	Freeze Steps	Freeze Time	Freeze Prime Steps	Freeze Prime Time	Working Memory	TR Working Memory	TR Attention	TR Response Inhibition
Head-Toes-Knees-Shoulders	–									
Attention	.10	–								
Freeze Steps	.01	.32***	–							
Freeze Time	.09	.29**	.36***	–						
Freeze Prime Steps	.18^{t}	.24**	.58***	.44***	–					
Freeze Prime Time	.16^{t}	.30**	.46***	.57***	.55***	–				
Working Memory	.06	.48***	.44***	.30**	.63***	.39***	–			
Teacher-rated Working Memory	.29**	.03	-.04	.06	.07	.00	-.01	–		
Teacher-rated Attention	.17^{t}	-.07	-.10	.03	.03	.04	-.02	.48***	–	
Teacher-rated Response Inhibition	.05	-.01	-.04	-.05	-.02	.02	.04	.22*	.74***	–

Note: *** $p < .001$, ** $p < .01$, * $p < .05$, ^{t} $p < .10$

Confirmatory Factor Analysis for Dimension Reduction

Confirmatory factor analysis (CFA) was used to model latent variables from observed data and determine the relation between the latent constructs. While the recommended sample size is at least 200 for CFA (Kline, 2005), it is possible to find model convergence with smaller samples. Four types of analyses were run: teacher report data, in the fall and spring, and child assessment data, in the fall and spring. See Figures 5-7 for teacher rating CFA models. For the child assessment data analyses, scores from both group and individual assessments were used to increase the number of indicators for each latent construct. See Figures 8-9 for child assessment CFA models. Four indicators of fit were used to assess each model, as advised by Hu and Bentler (1998): the chi-square test (here, a non-significant result is ideal), the CFI (values of .90 and above indicate good fit), the RMSEA (values of .06 or less indicate good fit), and the SRMR (values of .08 or less indicate good fit). See Figures 5-9 below for CFA results. According to DeCoster (1998), non-nested CFA models can be compared by examining their RMSEAs, allowing researchers to find the model with the best fit.

Fit indices for a four-factor and a five-factor model are nearly equivalent for the fall teacher report data. Both models contain factors for approach motivation, avoidance motivation, and working memory; in the four factor model, response inhibition and attention control are a single factor whereas in the five factor model, response inhibition and attention control are different, albeit highly correlated factors ($r = .91$, $p < .001$). The four factor model provides a slightly better fit for the data (RMSEA = .051, CFI = .957, SRMR = .054) than does the five factor model (RMSEA = .053, CFI = .953, SRMR = .055). Significance tests for the difference between these fit indices do not exist; however, DeCoster (1998) argues that comparing RMSEAs is a valid comparison. In this case, the four factor model is a better fit. As the models are non-nested, it is not possible to compare

the chi-square values to determine which model is a better fit (Kline, 2005). Parsimony would dictate selecting the four factor model; the theory leading to the initial creation of the teacher report measure would support selecting the five factor model. Because the two factors are so highly correlated when modeled separately, the four-factor model is discussed here for parsimony. The relation between motivation and self-regulation depends on the component of self-regulation being measured. Working memory is significantly correlated with both approach ($r = .61$, $p < .001$) and avoidance motivation ($r = .53$, $p < .01$). Avoidance motivation is significantly correlated with response inhibition/attention control ($r = .25$, $p < .01$), but approach motivation is not ($r = .07$, *ns*).

Figure 5. CFA 5-factor results, teacher report data (fall)

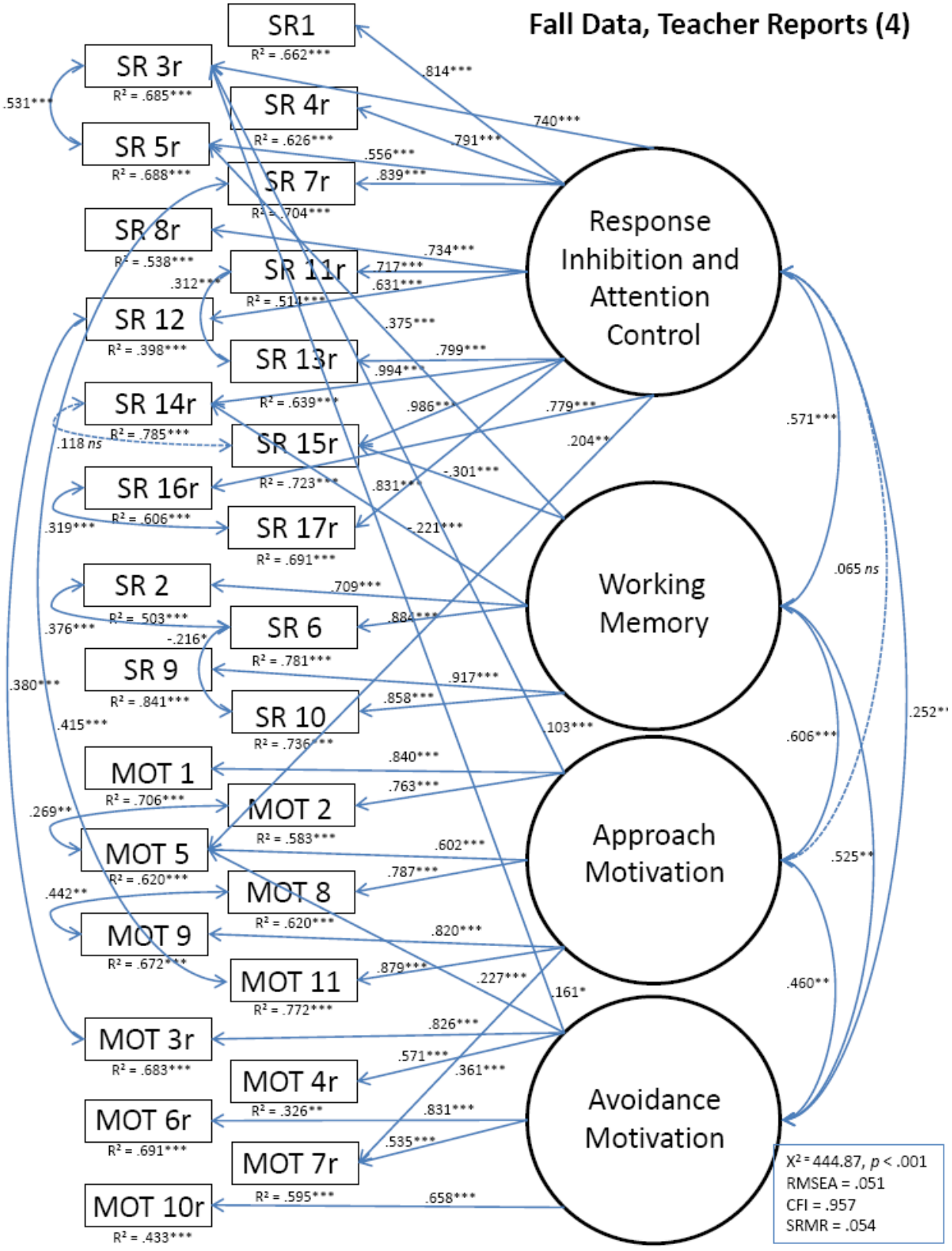


Figure 6. CFA 4-factor results, teacher report data (fall)

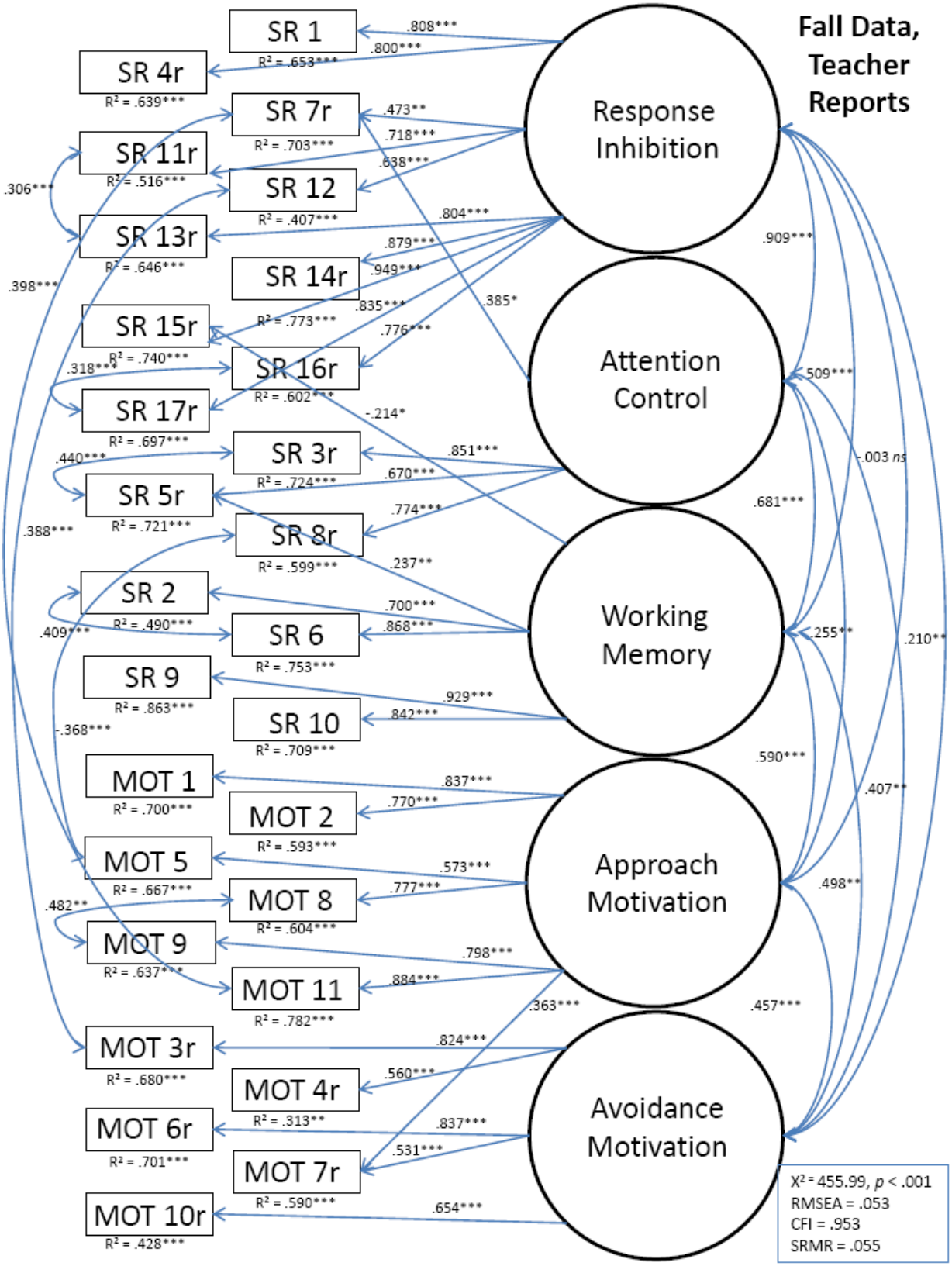
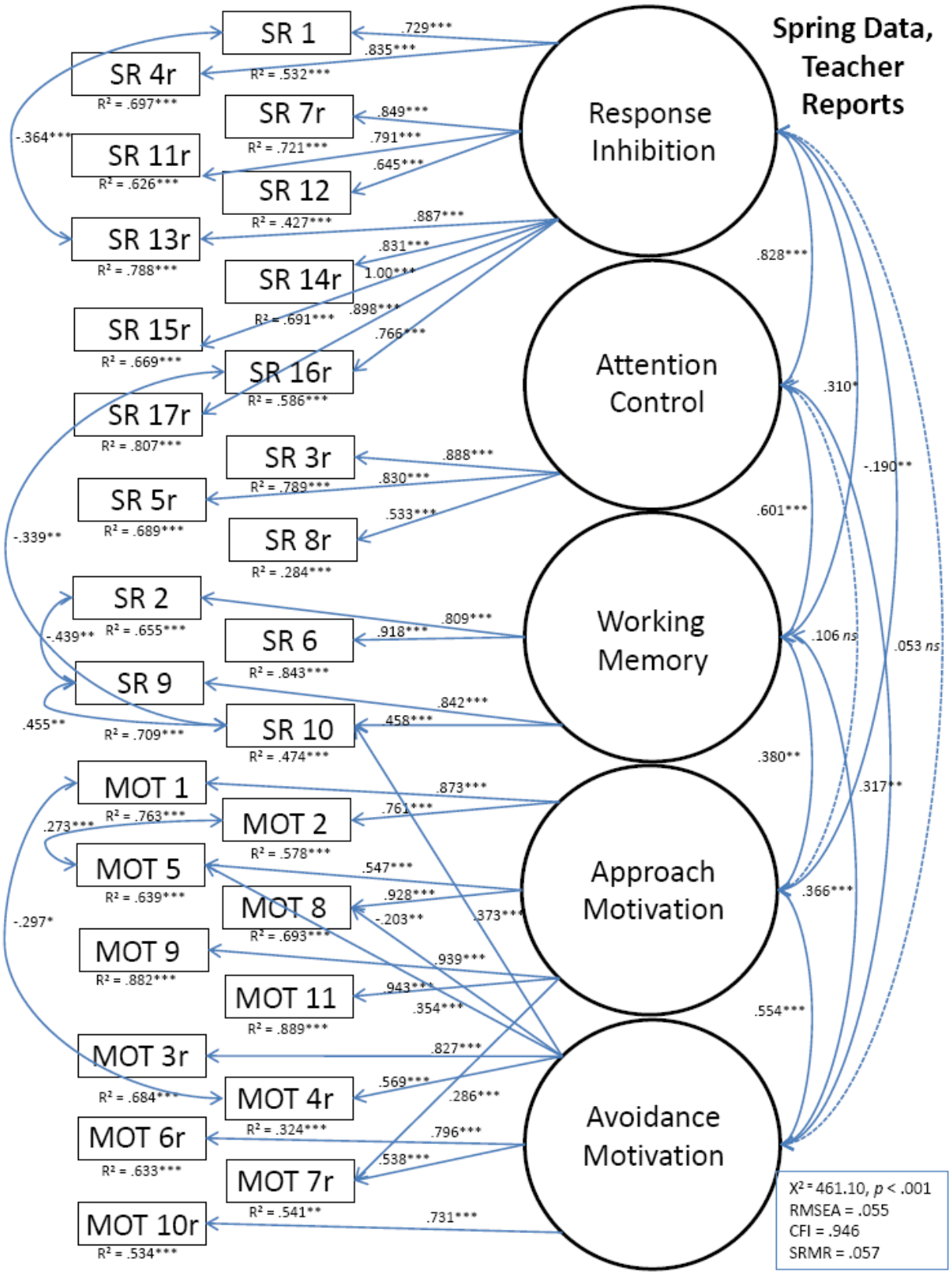


Figure 7. CFA 5-factor results, teacher report data (spring)



The spring teacher report data clearly support a five-factor model, again with factors of response inhibition, attention control, working memory, approach motivation, and avoidance motivation. Fit indices indicate good model fit (RMSEA = .055, CFI = .946, SRMR = .057). The spring results are similar to the fall results. Working memory is significantly correlated with both approach (r = .38, p < .01) and avoidance motivation (r = .37, p < .01). Approach motivation is significantly negatively correlated with response inhibition (r = -.19, p < .01) and not correlated with attention control. Avoidance motivation is significantly correlated with attention control (r = .32, p < .01) but is not correlated with response inhibition.

Selection of indicators for the fall and spring child data CFAs was complex. Models using all available indicators would not converge; nor did the removal of one or two indicators improve the situation. Ultimately, for both analyses, motivation was represented by the three measures of perceived competence (math, reading, and puzzles). Self-regulation was represented by whichever combination of variables produced a solution without error (that is, a model that converged and did not have problems of negative covariance). Some variables that did not load significantly on the factor were retained to assist with problems of model identification. Models are presented in Figures 4 and 5. In both the fall and spring, fit indices supported models with a single factor for motivation and a single factor for self-regulation (fall: RMSEA = .036, CFI = .894, SRMR = .078; spring: RMSEA = .044, CFI = .973, SRMR = .066). In neither model was the correlation between motivation and self-regulation significant. Thus, we may conclude that motivation and self-regulation are distinct and unrelated factors as we assessed them. See Figures 8-9 below for child data CFA models.

Figure 8. CFA 2-factor results, child data (fall)

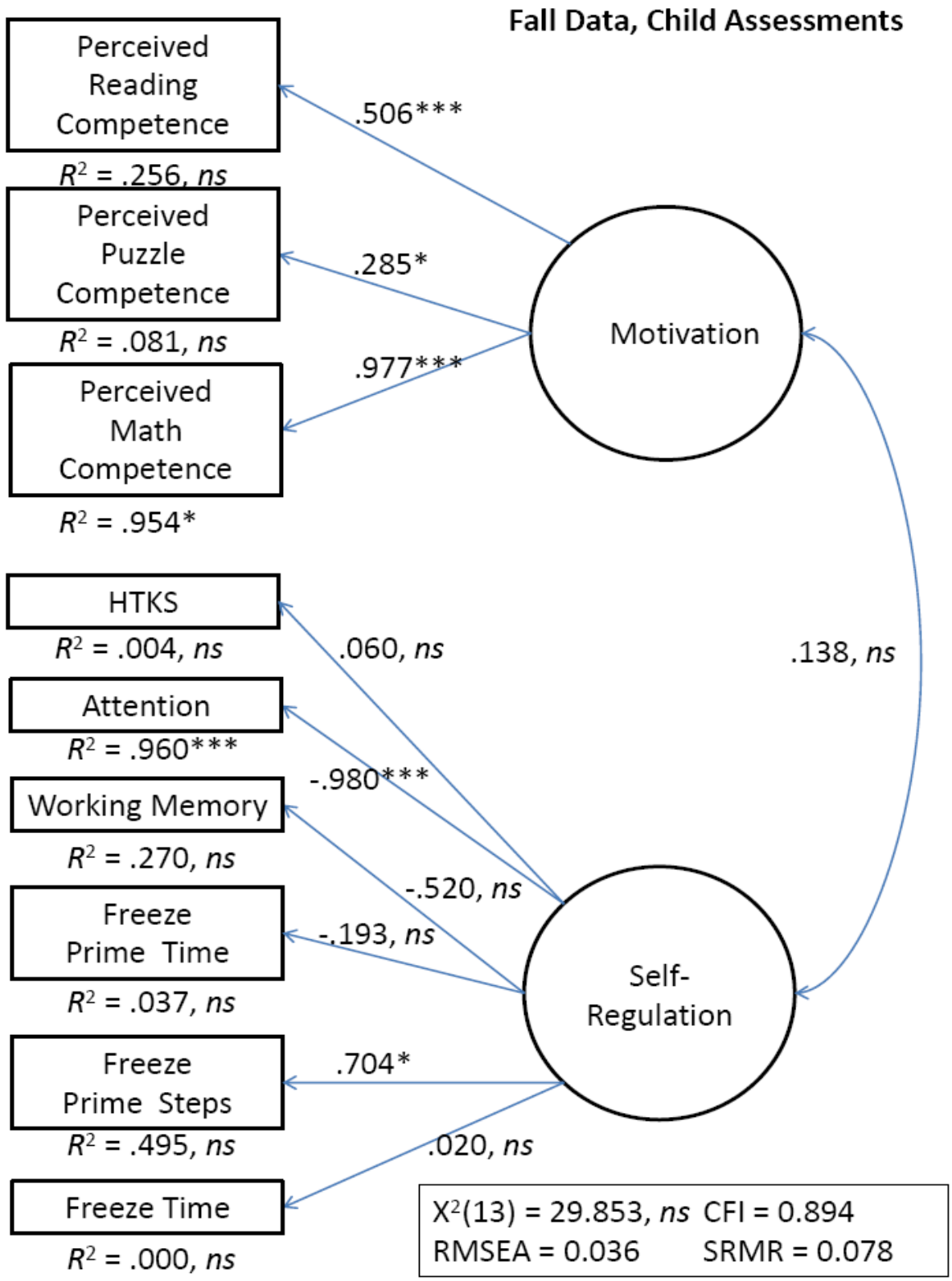
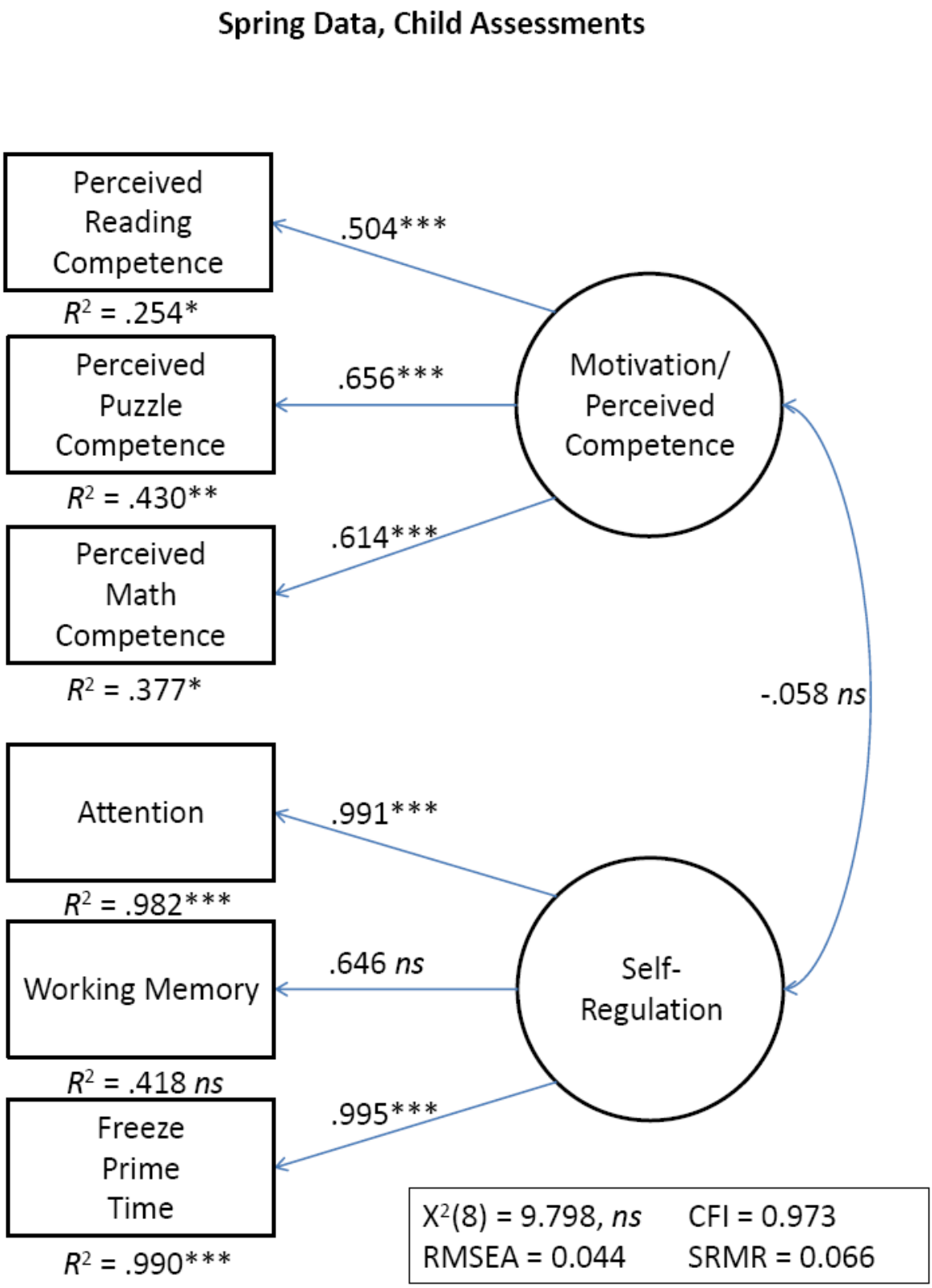


Figure 9. CFA 2-factor results, child data (spring)



Qualitative Data

During the teacher interview, teachers were asked to hypothesize about the relation between motivation and self-regulation. Teachers who needed clarification were asked whether motivation led to self-regulation, self-regulation led to motivation, whether they affected each other, or whether they were unrelated. Four teachers said that you need motivation to be self-regulated. One teacher said,

> "I guess you would have to be motivated to be self-regulated…I know that there's a consequence, I can't just go up to an adult and like shove them, like, I know that I can't do that so I don't do it even though I might think of it but I just have self-control over my own body… motivation is like trying to achieve a goal so if like we don't have any goals then you're just kind of like "I do what I want" like "who cares what's gonna happen," you know, and you don't really care what the consequences or you don't think about what it is if there is going to be one." (Rachel)

Six teachers advanced the opposite theory, that you need to have self-regulation to be motivated. One teacher said,

> "But I almost feel like, to be a real motivated person, you do have to have some regulation, or else you're just going to be a loose cannon, I kind of feel like, bouncing all around." (Patty)

Seven teachers said that motivation and self-regulation affect each other, so that if you have more of one, you'll have more of the other. One teacher explained,

> "I would say that they go hand in hand. I feel like a lot of times you're not going to be able to be motivated to do something, if you can't regulate how, the way you're feeling. Or what it is that you wanna do. Um, if you can't figure that out I don't feel like there's any motivation behind behind any of the actions. Um, and I, as far as motivation I think you you know you have to be motivated and taking part in the activity to be able to regulate yourself when something arises. So I feel like they just kinda go together." (Lindsay)

One teacher initially, and two teachers with probing, responded that motivation and self-regulation need to go together for anything to get done. In other words, one without the other will not get you anywhere. The first teacher explained,

> Janie: I guess, um, you can be motivated to want to do something, but if you don't have the ability to organize your thoughts and your, um, plan, then you might just kind of float around hoping to get something accomplished that you can never really—it's kinda like starting a project, you know the people who start projects around their house but never finish 'em?...I guess that's how I feel like they fit together.
>
> AB: Is that when you have motivation but you don't have self-regulation?
>
> Janie: Yeah so you start out real strong, you wanna get the house painted and you paint, you know, one wall and then you lose interest. And then you decide you're gonna, you know, redo the floor and you get started and you start out real strong and then you kind of lose interest and then it doesn't get finished. And then you decide you wanna redo the kitchen, you pull out all the cupboards, and you're really excited and then you never finish and, you know—
>
> Janie: you can have one without the other, but yeah definitely, but can you be successful without both?

Finally, one teacher pointed out the similarity between motivation and self-regulation:

> "I think the two overlap a little bit in terms of what they look like." (Mary)

While the highest number of teachers said that motivation and self-regulation reinforce each other, teacher opinion was certainly divided on this question. The heterogeneity in teacher responses reflects the heterogeneity of the data – the data suggest that motivation and self-regulation are related depending on how you assess them, and teachers supported different theories depending on how they saw the constructs unfolding in the classroom.

Discussion

Correlations

Given the prevalence of "halo effects" (Stipek & Greene, 2001) in teacher ratings of child behavior, correlations between constructs are to be expected. Halo effects refer to raters' tendencies to attribute positive characteristics to children with other positive characteristics. Attention control and response inhibition are highly correlated in both fall and spring data, reflecting similar behavior from children lacking both abilities (e.g., the item "Restless, always up on the go" could reflect either inattention to what is happening in activities or an inability to inhibit distraction). As may be expected, attention control and motivation are related, albeit slightly more strongly in the fall than in the spring. Children who seem energized about an activity and who display persistent behavior are likely to attend to that activity. Working memory was correlated strongly with every other teacher-rated construct. As noted in the previous chapter, working memory items (e.g., "Follows two-step directions") reflect not only memory of the directions, but compliance with teacher directives, attention to the task at hand, response inhibition (doesn't get distracted while carrying out directions) and motivation to engage in the activity at hand. Thus, correlations between working memory and other constructs are not unexpected. Only teacher-rated motivation and response inhibition were uncorrelated consistently, across approach and avoidance motivation and fall and spring assessments. These constructs may be orthogonal. Children high in motivation may appear to have good response inhibition skills (displaying persistent behavior) or poor response inhibition skills (bouncing from one activity to the next in excitement). An analogy may be made to the situation where a child calls out in class without raising his/her hand: the behavior could be seen as poor response inhibition and an inability to wait, but it could also be seen as highly motivated, in the case where the child is so excited about his/her answer that s/he blurts it out.

Group challenge task data show similarly strong relations between elements of self-regulation. Each measure of self-regulation is correlated with every other measure. It is to be expected that attention, for example, would be correlated with task performance on the jumping and freeze games, as attention was scored from video based on children's attentiveness to the directions for the games. Greater attention likely leads to better performance. What is most interesting about the group data in terms of the relation between motivation and self-regulation is that, in the fall, tangram persistence is significantly correlated with every measure of self-regulation. In the spring, there is only one marginal correlation with freeze prime steps. Why might children's behavior in challenging tasks be so related in the fall but not the spring? Does persistence at the tangram task require more self-regulation in the fall, when the task is new, than in the spring, when children have seen it before? Or perhaps group work demands more self-regulation in the fall, when children may be new to the school setting, than it does in the spring, when children are used to working around each other. Regardless, it is difficult to draw conclusions about the relation between motivation and self-regulation from the group challenge tasks.

Regarding the individual tasks, there was a single measure of self-regulation: Head-Toes-Knees-Shoulders (HTKS). This allows for general analysis of the relation with motivation, and given the results of the teacher ratings, future studies should include separate measures of response inhibition, working memory, and attention control. HTKS measures these skills working in concert with one another. Surprisingly, HTKS scores were correlated with scores on the puppet interviews of perceived competence and task value. In the pilot study, these were uncorrelated. One possibility is that a child's perceived competence at and intrinsic value for puzzles are related to how self-regulated the child is. Perhaps children with greater self-

regulation are better able to focus on puzzle activities, allowing them to gain greater competence and thereby enjoy the process of completing puzzles more. Another possibility is that both HTKS performance and the puppet interview about puzzles reflect an underlying approach motivation: in HTKS, a motivation to play a fun game and do one's best at playing it; in the puppet interview, an underlying good feeling about puzzle activities. Children who are more confident may perform better in both situations. We cannot rule out the idea that HTKS captures some degree of motivation (or at least compliance), but nor can we rule out the possibility that HTKS captures only self-regulation and that self-regulation and motivation are indeed related. It seems unlikely that the puppet interview task itself draws heavily upon children's self-regulatory skills. The instructions are repeated with each trial and attention demands are brief.

Confirmatory Factor Analysis (CFA)

CFA findings give us a mixed picture of the relation between motivation and self-regulation. First, the correlation patterns between fall and spring are different; correlations between motivation and self-regulation factors are stronger in the fall. One reason for this may be a diminished halo effect. As teachers get to know students better, they may be better able to discriminate between causes for children's classroom behavior. Another reason may be that, indeed, children's behavior becomes more differentiated over time. The sample is six months older in the spring; it is impossible to rule out the possibility that children's motivated and self-regulated behavior become more differentiated as children develop. This would support the unitary versus componential discussion in recent literature (e.g., Miyake et al., 2000). The unitary versus componential view of self-regulation is that in young children, self-regulation may be a single skill, becoming more differentiated as children develop. This may also explain why

we see a four-factor solution in the fall and a five-factor solution in the spring – children's skills may actually be more differentiated.

The relation between motivation and self-regulation seems to depend on the component of motivation or self-regulation in question. Teacher-rated working memory is correlated with everything, but as discussed, the items used in this scale seem to measure other aspects of children's behavior. It is unsurprising that working memory is consistently associated with motivation; children need to be motivated to follow teachers' directions. Teacher-rated response inhibition is the least often correlated with motivation. In the fall, response inhibition is uncorrelated with approach motivation, and in the spring, the correlation is significant and negative (which is not unexpected, as impulsivity and high levels of approach often go hand in hand). Response inhibition is the subscale with the most items on the self-regulation measure and may present the most rounded picture of children's impulsive behavior. It was surprising that teacher-rated attention control and approach motivation were not related, especially given item eight ("Only pays attention to things s/he is interested in"). Typically, we would expect children to pay more attention when they are more motivated to do something. However, one possibility in this preschool context is that approach motivation items reflect children's behavior in child-initiated activities, while attention control items reflect children's behavior in teacher-directed activities. This behavior may indeed differ.

Finding convergent CFA models for the child-level data was a challenge, likely due to missing data and small sample size. As noted, Kline (2005) recommends at least 200 subjects for this analysis; there was complete data for approximately 120 children in this sample. Several ideal models failed to converge, including models that separated group challenge task data from individually assessed variables and models where self-regulatory or motivation variables were

entered as a group to determine the underlying structure of motivation and self-regulation as they were assessed. The CFA models presented here are to be considered illustrative, not definitive. The goal when constructing the model was to find variables that loaded on a motivation factor, variables that loaded on a self-regulation factor, and then to determine the correlation between those factors. Several variables of interest caused non-convergence and were omitted. The take-home message from the child-level data using CFA is that motivation and self-regulation load onto separate and uncorrelated factors. That is, at least assessed at the child level, they are distinct and unrelated constructs.

Why do the teacher rating CFAs show so many correlations between motivation and self-regulation factors, while the child-level CFAs show no correlation at all? One possibility is that laboratory-designed measures capture precisely what they are supposed to capture – variability in a single skill – but in the classroom, behavior is multiply determined. For example, during the puppet interviews of perceived competence, research assistants worked hard to maintain children's attention so that perceived competence scores would not be affected by children's attention skills. Similarly, during HTKS, research assistants motivated children to play "a really fun game" so that lack of motivation wouldn't lead to lower self-regulation scores. But in the classroom, particularly in group situations, children's motivation may affect their self-regulation, and vice versa. What these data may suggest is that, indeed, it is possible to measure these constructs separately, but it doesn't accurately reflect real life in the classroom?. Further, teacher rating data is based on teachers' interpretations of the causes of children's behavior. A child running from task to task may be impulsive, distractible, or just excited by the many options for activities. Children can be fidgety and still paying attention, but it is difficult to tell by watching.

My conclusion about the relation between self-regulation and motivation is that the data support Figure 3. Motivation and self-regulation are empirically separable but related constructs that interact to produce behavior. A close examination of the teachers' theories of motivation and self-regulation reveals that no teacher disagrees with this statement. There is some disagreement on whether motivation affects self-regulation or whether it is the other way around, but taken on the whole, we might conclude that the relation is indeed bidirectional as so many theorists have proposed.

Chapter Six

Research Question Two

When children fail to persist at challenging tasks, can we tell whether they lack motivation and/or self-regulation?

Results

Quantitative results

Persistence was measured in four ways: individually, in the fall (Wedgit Time on Task); in groups, in the fall (Tangram Time on Task); individually, in the spring (Spring Wedgit Time on Task); and in groups, in the spring (Spring Tangram Time on Task). Tables 19-25 (below) show bivariate correlations between these measures of persistence and various assessments of motivation and self-regulation at the same point in time (that is, fall persistence is correlated with fall variables and spring persistence is correlated with spring variables). In addition, a Total Time on Task (TOT) variable was created by summing the seconds on task for children across all four tasks and time points. Total TOT, therefore, represents a child's persistence across contexts and across the school year. It is correlated, respectively, with fall and spring motivation and self-regulation variables.

Table 19. Correlations between perceived competence (from the puppet interview) and six measures of persistence.

	Fall Individual TOT	Spring Individual TOT	Fall Group TOT	Spring Group TOT	Total TOT correlated w/Fall Vars	Total TOT correlated w/Spr Vars
Reading Competence	.06	.07	.02	.02	.08	.04
Math Competence	.10	.18*	.23**	.12	.26**	.20*
Puzzle Competence	.17^{t}	.19*	.25**	.04	.26**	.11

Note: *** = $p < .001$, ** = $p < .01$, * = $p < .05$, ^{t} = $p < .10$

Table 19 makes it evident that children's perceived competence in reading is uncorrelated with their persistence at challenging puzzle tasks. This is not unexpected; the puzzle tasks are largely spatial in nature and are unrelated to reading skill. On the other hand, perceived competence in math is correlated with the individual measure of persistence in the spring (r = .18, $p < .05$) and the group measure of persistence in the spring (r = .23, $p < .01$). Perceived competence in math is also significantly correlated with total persistence in both the fall (r = .26, $p < .01$) and spring (r = .20, $p < .05$). Finally, perceived competence at puzzles is correlated with both measures of persistence in the fall (individual r = .17, $p < .10$; group r = .25, $p < .01$) and the individual measure of persistence in the spring (r = .19, $p < .05$). Overall, total persistence was correlated with fall puzzle competence (r = .26, $p < .01$) but not spring puzzle competence.

Table 20. Correlations between task value (enjoyment, interest, and liking; from the puppet interview) and six measures of persistence.

	Fall Individual TOT	Spring Individual TOT	Fall Group TOT	Spring Group TOT	Total TOT (Fall/Spring) w/Fall Var	Total TOT (Fall/Spring) w/Spr Var
Reading Value	.12	.08	.13	.09	.22*	.05
Math Value	.02	.09	-.08	.04	.02	-.03
Puzzle Value	.18*	.08	.13	.00	.22*	.02

Note: *** = $p < .001$, ** = $p < .01$, * = $p < .05$, ^{t} = $p < .10$

Task value for math was uncorrelated with persistence on the challenging puzzles. While reading value was not correlated with any individual or group measure of persistence, fall reading value was significantly correlated with total persistence ($r = .22$, $p < .05$). Similarly, fall puzzle value was correlated significantly with only fall individual persistence ($r = .18$, $p < .05$), but was correlated significantly with total persistence ($r = .22$, $p < .05$).

Table 21. Correlations between emotion expression and six measures of persistence (note: spring data for pride is unavailable).

	Fall Individual TOT	Spring Individual TOT	Fall Group TOT	Spring Group TOT	Total TOT (Fall/Spring) w/Fall Var	Total TOT (Fall/Spring) w/Spr Var
Wedgit Pride	.18*	–	.02	–	.07	–
Tangram Pride	-.04	–	.21*	–	.16^{t}	–
Wedgit Frustration	.13	-.15^{t}	-.01	-.13	.02	-.06
Tangram Frustration	.14	-.14	-.23**	-.18*	-.06	-.11

Note: *** = $p < .001$, ** = $p < .01$, * = $p < .05$, ^{t} = $p < .10$

In the fall, pride expressions during the individual task were significantly related to individual persistence ($r = .18$, $p < .05$). Individual task pride expressions were uncorrelated with group and total measures of persistence. Similarly, in the fall, pride expressions during the group task were related to persistence on the group task ($r = .21$, $p < .05$), and were marginally related to total persistence ($r = .16$, $p < .10$). Simply put, children who experienced more satisfaction with their actions persisted longer in some cases. In contrast, children who felt frustrated during the challenging puzzle tasks persisted less in some cases. In the spring, children who were more frustrated during the individual task persisted less at the individual task ($r = -.15$, $p < .10$). In both the fall and spring, children who were more frustrated during the group tasks persisted less at the group tasks (fall $r = -.23$, $p < .01$; spring $r = -.18$, $p < .05$). Frustration was unrelated to total persistence.

Table 22. Correlations between teacher-rated approach and avoidance motivation and six measures of persistence

	Fall Individual TOT	Spring Individual TOT	Fall Group TOT	Spring Group TOT	Total TOT (Fall/Spring) w/Fall Var	Total TOT (Fall/Spring) w/Spr Var
Teacher-rated Approach Motivation	.26**	.18*	.16^{t}	.05	.25*	.12
Teacher-rated Avoidance Motivation*	.17*	.28**	.13	.27**	.28**	.18^{t}

Note: *** = $p < .001$, ** = $p < .01$, * = $p < .05$, ^{t} = $p < .10$

(*avoidance items are reverse coded; higher scores indicate less avoidance).

Teacher ratings of motivation were generally related to measures of persistence, that is, children rated by their teachers as more motivated and energized when approaching new tasks and less avoidant in the face of challenge persisted longer. Teacher-rated approach in the fall was positively correlated with fall individual persistence ($r = .26$, $p < .01$), fall group persistence ($r = .16$, $p < .10$), and total persistence ($r = .25$, $p < .05$). Spring approach was correlated with spring individual persistence ($r = .18$, $p < .05$). Lower fall levels of avoidance motivation were associated with greater persistence at the individual persistence task ($r = .17$, $p < .05$) and total persistence ($r = .28$, $p < .01$). Lower spring levels of avoidance motivation were associated with higher persistence at the spring individual ($r = .28$, $p < .01$), group ($r = .27$, $p < .01$), and total ($r = .18$, $p < .10$) measures of motivation.

Table 23. Correlations among teacher ratings of components of self-regulation and six measures of persistence.

	Fall Individual TOT	Spring Individual TOT	Fall Group TOT	Spring Group TOT	Total TOT (Fall/Spring) w/Fall Var	Total TOT (Fall/Spring) w/Spr Var
Teacher-rated Response Inhibition	.04	-.07	.18*	.02	.10	.06
Teacher-rated Working Memory	.19*	.21*	.24**	.10	.23*	.21*
Teacher-rated Attention	.09	.04	.19*	.01	.15	.09

Note: *** = $p < .001$, ** = $p < .01$, * = $p < .05$, ^{t} = $p < .10$

Teacher-rated response inhibition correlated with only one measure of persistence, fall group persistence ($r = .18$, $p < .05$). Similarly, teacher-rated attention control also correlated with fall group persistence ($r = .19$, $p < .05$). Neither rating scales were related with total persistence. In contrast, teacher-rated working memory was associated with all measures of persistence except for spring group persistence (*r*s ranged from .19 to .24). Working memory, it seems, may drive the relation between self-regulation and persistence.

Table 24. Correlations between an individual measure of self-regulation and six measures of persistence.

	Fall Individual TOT	Spring Individual TOT	Fall Group TOT	Spring Group TOT	Total TOT (Fall/Spring) w/Fall Var	Total TOT (Fall/Spring) w/Spr Var
Head-Toes-Knees-Shoulders	.34***	.24**	.24**	.18*	.35***	.40***

Note: *** = $p < .001$, ** = $p < .01$, * = $p < .05$, ^{t} = $p < .10$

Head-Toes-Knees-Shoulders (HTKS), the game that assesses individual children's self-regulation skills, was significantly and positively correlated with each measure of persistence. The weakest relation was that with spring group persistence ($r = .18$, $p < .05$), and the strongest relation was between spring HTKS scores and total persistence ($r = .40$, $p < .001$). HTKS and persistence clearly capture shared variance in children's task behavior.

Table 25. Correlations among group challenge task measures of children's self-regulation and six measures of persistence.

	Fall Individual TOT	Spring Individual TOT	Fall Group TOT	Spring Group TOT	Total TOT (Fall/Spring) w/Fall Var	Total TOT (Fall/Spring) w/Spr Var
Freeze Steps	.25**	-.12	.25**	.01	.24*	.02
Freeze Time	.05	-.03	.17*	-.07	.13	.01
Freeze Prime Steps	.30**	.07	.31***	.17^{t}	.33***	.27**
Freeze Prime Time	.11	-.10	.32***	.02	.34***	.01
Attention	.10	-.04	.20*	.11	.19^{t}	.09
Working Memory	.21*	-.05	.33***	.12	.41***	.16

Note: *** = $p < .001$, ** = $p < .01$, * = $p < .05$, ^{t} = $p < .10$

Four group challenge task variables are measures of children's response inhibition skills: freeze steps, freeze time, freeze prime steps, and freeze prime time. These variables differentially predicted persistence. Freeze prime steps, a measure from the more challenging response inhibition game, was significantly related to fall individual persistence ($r = .30$, $p < .01$), fall group persistence ($r = .31$, $p < .001$), spring group persistence ($r = .17$, $p < .10$), and total persistence ($r = .33$, $p < .001$ with fall freeze prime steps; $r = .27$, $p < .01$ with spring freeze prime steps). Fall freeze steps was significantly correlated with fall individual persistence ($r = .25$, $p < .01$), fall group persistence ($r = .25$, $p < .01$), and total persistence ($r = .24$, $p < .05$). Freeze time was only related to group persistence in the fall ($r = .17$, $p < .05$). Fall freeze prime time was related to fall group persistence ($r = .32$, $p < .001$), and total persistence ($r = .34$, $p < .001$). Fall attention control was significantly related to fall group persistence ($r = .20$, $p < .05$)

and marginally related to total persistence ($r = .19$, $p < .10$). Fall working memory scores were significantly related to fall individual persistence ($r = .21$, $p < .05$), fall group persistence ($r = .33$, $p < .001$), and total persistence ($r = .41$, $p < .001$). In general, spring group measures of self-regulation were largely unrelated to persistence.

Correlations were moderate and relatively consistent across motivation and self-regulation variables. All self-regulation variables were correlated with at least one measure of persistence, suggesting a stable relation between persistence and self-regulation. Most motivation variables (with the exception of individual frustration, value of math, and perceived competence in reading) were also correlated with persistence, suggesting that motivation, too, may play a role in persistence. In general, the magnitude of correlations between self-regulation and persistence was slightly higher than the magnitude of the correlations between motivation and self-regulation.

T-tests were used to examine the motivation and self-regulation of children who scored in the bottom quartile of persistence. These children were selected on the basis of being in the bottom quartile of two or more of the four measures of persistence and comprised 24.8% of the sample. Tables 26-28 (below) indicate differences on fall measures of achievement, motivation and self-regulation. Bolded variables showed significant differences between low persisters and their classmates.

Table 26. Differences in fall achievement between low persisting children and their peers.

	Persistence	N	Mean	*t*	*df*	*P* <
Letter-Word Identification	Low	29	6.41	-3.594	116	.0001
	Middle-High	89	10.42			
Applied Problems	Low	29	9.55	-3.480	116	.001
	Middle-High	89	13.38			
Teacher-rated Reading Ability	Low	25	3.02	-1.742	66.478	.086
	Middle-High	83	3.23			
Teacher-rated Math Ability	Low	25	3.06	-1.092	106	.277
	Middle-High	83	3.22			

Note: non-integer *df* values indicate results of Welch's non-parametric *t*-test.

Children in the bottom quartile of total persistence scored lower on direct assessments of reading ($t = -3.59$, $p < .001$), direct assessments of math ($t = -3.48$, $p < .01$), and teacher-rated reading ability ($t = -1.74$, $p < .10$). There was no significant difference between the groups in teacher-rated math ability.

Table 27. Differences in fall motivation scores among low persisting children and their peers.

	Persistence	N	Mean	*t*	*df*	*p*
Reading Value	Low	25	2.76	-1.583	111	.116
	Middle-High	88	3.15			
Reading Competence	Low	25	2.44	-1.049	111	.296
	Middle-High	88	2.75			
Math Value	Low	25	2.88	-.430	110	.668
	Middle-High	87	3.00			
Math Competence	Low	25	2.48	-1.763	110	.081
	Middle-High	87	2.94			
Puzzle Value	Low	27	2.59	-2.283	35.640	.029
	Middle-High	87	3.23			
Puzzle Competence	Low	26	2.42	-2.564	111	.012
	Middle-High	87	3.03			
Mastery Orientation	Low	29	.93	-.112	116	.911
	Middle-High	89	.96			
Perceived Difficulty	Low	24	1.71	1.248	106	.215
	Middle-High	84	1.54			
Wedgit Pride	Low	29	1.69	-1.172	116	.244
	Middle-High	89	2.46			
Wedgit Frustration	Low	28	4.32	-.004	115	.997
	Middle-High	89	4.33			
Tangram Pride	Low	28	4.21	-.571	113	.569
	Middle-High	87	4.61			
Tangram Frustration	Low	26	3.88	-.698	108	.486
	Middle-High	84	4.69			
Teacher-rated	Low	27	3.34	-2.394	110	.018
Motivation	Middle-High	85	3.71			
Teacher-rated	Low	27	3.01	-1.826	110	.071

Approach Mot.	Middle-High	85	3.36			
Teacher-rated	Low	27	3.73	-2.456	110	.016
Avoidance Mot.	Middle-High	85	4.13			

Note: non-integer *df* values indicate results of non-parametric Welch's *t*-test

Children in the bottom quartile of persistence scored lower than their peers in assessments of perceived competence at math ($t = -1.76$, $p < .10$), perceived competence at puzzles ($t = -2.56$, $p < .05$), and value for puzzles ($t = -2.28$, $p < .05$). They were also rated lower than their peers in total motivation ($t = -2.39$, $p < .05$), approach motivation ($t = -1.83$, $p < .10$), and avoidance motivation ($t = -2.46$, $p < .05$), by their teachers. There were no differences between the groups on task selection and perception variables or motivation-related emotions.

Table 28. Differences in fall self-regulation scores between low persisting children and their peers.

	Persistence	N	Mean	*t*	*df*	*p*
Head-Toes-Knees-	Low	25	10.04	-1.768	110	.080
Shoulders	Middle-High	87	14.83			
Attention	Low	26	6.40	-.721	108	.472
	Middle-High	84	6.74			
Freeze Steps	Low	25	6.42	-1.344	112	.182
	Middle-High	84	7.08			
Freeze Time	Low	28	7.23	-.205	112	.838
	Middle-High	86	7.30			
Freeze Prime Steps	Low	28	4.23	-1.782	112	.077
	Middle-High	86	5.29			
Freeze Prime Time	Low	28	5.13	-3.059	112	.003
	Middle-High	86	6.78			
Working Memory	Low	28	5.34	-3.322	112	.001
	Middle-High	86	8.71			
Teacher-rated Self-	Low	27	4.71	-1.353	105	.179
Regulation	Middle-High	80	5.11			
Teacher-rated	Low	28	4.91	-2.172	35.757	.037
Working Memory	Middle-High	86	5.63			
Teacher-rated	Low	29	4.20	-1.452	113	.149
Attention	Middle-High	86	4.70			
Teacher-rated	Low	30	4.74	-.756	112	.451
Response Inhibition	Middle-High	84	4.98			

Note: non-integer *df* values indicate results of non-parametric Welch's *t*-test

Children who scored in the bottom quartile of total persistence scored marginally worse than their peers on the Head-Toes-Knees-Shoulders assessment ($t = -1.77$, $p < .10$) and freeze prime

steps (t = -1.78, p < .10). Low persisters scored significantly worse on freeze prime time (t = -3.06, p < .01), working memory (t = -3.32, p < .01), and teacher-rated working memory (t = -2.17, p < .05). While the bottom quartile group scored worse than their peers on every measure of self-regulation, the other differences are not statistically significant.

Children who scored in the bottom quartile of persistence had lower academic skills, motivation scores, and self-regulation scores during the fall. Tables 29-31 (below) show the differences between children scoring in the bottom quartile of persistence and their peers during the spring.

Table 29. Differences in spring achievement scores between low persisting children and their peers.

	Persistence	N	Mean	*t*	*df*	*p*
Letter-Word Identification	Low	30	9.73	-3.039	119	.003
	Middle-High	91	14.02			
Applied Problems	Low	30	10.83	-4.948	119	<.0001
	Middle-High	91	15.69			
Teacher-rated Reading Ability	Low	28	2.98	-2.312	116	.023
	Middle-High	90	3.37			
Teacher-rated Math Ability	Low	30	3.03	-2.526	118	.013
	Middle-High	90	3.47			

Note: non-integer *df* values indicate results of Welch's non-parametric *t*-test.

Children in the bottom quartile of persistence scored below their peers in every measure of academic achievement in the spring. Their scores were lower in directly assessed reading (t = -3.04, p < .01), directly assessed math (t = -4.95, p < .001), teacher-rated reading (t = -2.31, p < .05), and teacher-rated math (t = -2.53, p < .05).

Table 30. Differences in spring motivation scores between low persisting children and their peers.

	Persistence	N	Mean	*t*	*df*	*p*
Reading Value	Low	29	3.03	.181	118	.857
	Middle-High	91	2.99			
Reading Competence	Low	30	2.37	-1.265	119	.208
	Middle-High	91	2.71			
Math Value	Low	29	3.10	.276	117	.783
	Middle-High	90	3.03			
Math Competence	Low	30	2.47	-2.631	40.798	.012
	Middle-High	91	3.19			
Puzzle Value	Low	29	3.14	-.568	117	.571
	Middle-High	90	3.28			
Puzzle Competence	Low	30	3.07	-.941	118	.349
	Middle-High	90	3.26			
Mastery Orientation	Low	30	.63	-.122	119	.903
	Middle-High	91	.66			
Perceived Difficulty	Low	30	1.67	.753	118	.453
	Middle-High	90	1.57			
Wedgit Frustration	Low	28	3.43	.801	109	.425
	Middle-High	83	2.92			
Tangram Frustration	Low	30	4.80	1.544	119	.125
	Middle-High	91	3.49			
Teacher-rated Motivation	Low	30	3.58	-1.677	118	.096
	Middle-High	90	3.84			
Teacher-rated	Low	30	3.36	-1.154	118	.251

Approach Motivation	Middle-High	90	3.59			
Teacher-rated Avoidance Motivation	Low	30	3.84	-1.694	37.373	.099
	Middle-High	90	4.14			

Note: non-integer *df* values indicate results of Welch's non-parametric *t*-test.

Children scoring in the lowest quartile of persistence reported significantly lower levels of perceived competence in math ($t = -2.63$, $p < .05$). Teachers also rated these children as lower in total motivation ($t = -1.68$, $p < .10$) and avoidance motivation ($t = -1.69$, $p < .10$).

Table 31. Differences in spring self-regulation scores between low persisting children and their peers.

	Persistence	N	Mean	*t*	*df*	*p*
Head-Toes-Knees-Shoulders	Low	29	13.14	-3.037	117	.003
	Middle-High	90	21.64			
Attention	Low	23	5.74	-.959	102	.340
	Middle-High	81	6.21			
Freeze Steps	Low	25	8.48	.150	107	.881
	Middle-High	84	8.39			
Freeze Time	Low	25	8.20	.084	107	.934
	Middle-High	84	8.17			
Freeze Prime Steps	Low	25	5.88	-2.173	107	.032
	Middle-High	84	7.62			
Freeze Prime Time	Low	25	7.60	.391	107	.697
	Middle-High	84	7.40			
Working Memory	Low	25	7.34	-1.197	106	.234
	Middle-High	83	8.70			
Teacher-rated Self-Regulation	Low	27	5.05	-.693	106	.490
	Middle-High	81	5.23			
Teacher-rated Working Memory	Low	30	5.77	-.758	117	.450
	Middle-High	89	5.90			
Teacher-rated Attention	Low	28	4.24	-.966	110	.336
	Middle-High	84	4.55			
Teacher-rated Response Inhibition	Low	29	4.99	-.507	113	.613
	Middle-High	86	5.15			

Note: non-integer *df* values indicate results of Welch's non-parametric *t*-test.

Children who scored in the bottom quartile of persistence scored lower in Head-Toes-Knees-Shoulders (t = -3.04, p < .01) and freeze prime steps (t = -2.17, p < .05). There were no other significant differences between the two groups on self-regulation measures.

There are fewer differences between typical and low persisters in the spring data, although the gap between the two groups has grown in both math ability and teacher-rated math ability. Persistence is associated with fewer motivation and self-regulation variables in the spring.

Qualitative results

Part of the teacher interview protocol (see Appendix H) involved a classification exercise where teachers were asked to identify a given learning behavior as "motivation, self-regulation, or both". Two behaviors are relevant here. First, teachers were asked about persistence. Of the eighteen teachers, seven identified persistence as "both," six called it "mostly motivation" (i.e., with some contribution from self-regulation), and four teachers said it was motivation. One teacher said it was self-regulation. It follows, then, that the majority of teachers believed persistence to be either motivation or a combination of motivation and self-regulation. Second, teachers were asked about perseverance in the face of frustration. Of the seventeen teachers responding to this item, eight people said perseverance was "both," two people said it was "mostly motivation," and six said it was motivation. One teacher identified perseverance as self-regulation. This was a different teacher than the one identifying persistence as self-regulation. On the whole, the majority of teachers believe that persistence is either motivation or a combination of motivation and self-regulation.

Another aspect of the interview protocol involved two questions: first, "When you see children doing well at an academic task, can you tell if they're doing well because of high motivation or good self-regulation, or both? How?" Second, "When you see children struggling at an academic task, can you tell if it's because they have low motivation, poor self-regulation, or both? How?" We turn first to teachers' interpretations of children doing well.

Fourteen teachers mentioned motivation as a force that makes a child keep trying in the face of challenge (two separately mentioned interest). Teachers said,

> "It's probably motivation driven more so than self-regulation…the kids who really wanna really see it through the end and try all the different possibilities with it are just so excited and motivated about it no matter what it may be, it's just that it's something new and it's different and it's interesting and how can I find ways to put this together and…" (Kelly)
>
> "If there's an interest level, then they are a lot more engaged, but if it's something that they're not interested in doing—" (Janie)

Nine teachers mentioned self-regulation as an important contributor to persistence. Teachers said,

> "I mean because in order to sit and attend to something like writing at this age, you have to be, you have to have a good sense of self-control, cause you can't, you can't be looking all over here and getting that information and knowing what you're supposed to be doing. (Stacy)
>
> "I think it takes both to want to learn how do to it and then to be able to sit and do and do it and and be there for a certain amount of time to work on it." (Helen)

Teachers also mentioned other important factors, such as peer support, environmental support, and intelligence. Finally, one teacher presented examples of successful students who were high in one area and low in the other, advancing her theory that persistence could come from motivation or self-regulation but was better with both:

> "X can do well, and he' s not self-regulated. I am not sure how motivated Y is... But she can usually... if we're talking coloring or... I mean, she tries her

> best, but I don't consider her highly motivated… Um, I think that good work can be either or…Better if you get both." (Patty)

As in the identification exercise, the majority of respondents implied that persistence is more motivation than self-regulation, but is usually comprised of both. To summarize,

> "[Doing] well, it's kind of a combination of both, um, somebody that's really focused and into something, they definitely need a little bit of both, they need the motivation to get better and motivation to keep working at it, and you need the self-regulation to be able to sit down and focus and do the task." (Jeff)

Teachers' responses were slightly different when interpreting the behavior of a struggling student. Ten teachers mentioned low motivation as a primary cause of low persistence, with four more separately mentioning low interest as a cause.

> "I want to say motivation sometimes um where you know, they're trying and then all of a sudden I can't. And I don't want to do this anymore." (Lindsay)

> "You know if you don't have the motivation to do the task, no matter how hard we try to get them to stick to it, try it again, it's really hard for them to do it." (Leah)

Six teachers mentioned low self-regulation as a reason for low persistence:

> "…self-regulation as far as, you know, they're, they're just getting easily distracted, they're not sitting in their chair but they're standing up and walking away so they almost, I don't know if this is fair to say, but it's almost if they haven't given the task a chance. You know, before they even know what it is, they're already ready to go and do something else and wandering off and need to be pulled back, you know, more than once which I think is a sign of self-regulation." (Kelly)

> "Sometimes with the regulation you know as they're starting to form their letters if they have a problem sometimes it's just instead of you know erasing it or moving to a new area on the paper to try that letter again it's just scribbling all over and I'm done." (Lindsay)

Seven teachers mentioned frustration as a central cause of low persistence, including frustration interacting with low self-regulation (3), frustration due to perfectionism (3), and frustration due to low motivation.

> "If they're not self-regulated they might get frustrated quickly and then just walk away from it." (Jeff)

> "For self-regulation, we have a few children that want it to be perfect like my name doesn't look like the same as you write it or as she writes or something. So, sometime, those days are when they kinda crinkle up the paper and throw it away. And I feel like that is a sign of low self-regulation, um, being upset about um something small like that, um, but wants it to be exactly right." (Elizabeth)

Teachers also mentioned the non-compulsory nature of academics in their programs (sixteen of the eighteen teachers teach in the program where small group activities are offered but not required, and the child can say "I'm done" at any point), children's low confidence, and distractibility as reasons for poor persistence.

Interim summary

Neither the quantitative nor the qualitative results give us a clear sense that persistence is simply motivation or self-regulation. Both sets of results imply that persistence may, indeed, result from a complex interplay of the two. Self-regulation variables were more strongly and more often correlated with persistence variables than were motivation variables, but in both the spring and fall data, measures of motivation continued to be related to persistence. Similarly, children identified as "low persisters" fell behind their peers in motivation, self-regulation, and academics. Finally, teachers overwhelmingly supported the idea that persistence requires either motivation or a combination of motivation and self-regulation. In sum, it would be incorrect to infer from these data that persistence indicates a single learning-related behavior.

Discussion

The sheer number of correlations in the preceding section makes a discussion of every relation unwieldy. Nevertheless, there are several important findings to consider. First, it was surprising that persistence on the puzzle tasks was related to perceived competence in math in this age group. Although the tasks themselves require spatial reasoning and knowledge of

shapes, it is unlikely that those concepts are included in a four-year-old's definition of "math" (particularly as the puppet interview questions were about 'counting and numbers'). While it is tempting to argue that the puppet interview taps into the same domain of functioning as the puzzle tasks, there is little evidence for the relation of these skills or a preschoolers' ability to accurately self-assess in this domain. It may be the case that the perceived competence in math questions tap a more general confidence in school-related tasks, which is in turn related to greater persistence.

Following this reasoning, we would expect children's perceived competence at puzzles to be more closely related to their persistence. Children who were more confident in the fall did persist longer at the fall puzzles and score higher in total persistence, but spring confidence was unrelated to tangram and total persistence. This does little to support the general confidence hypothesis proposed above. Furthermore, perceived competence in reading was unrelated to persistence at each task. If children's puppet interview scores reflected general levels of confidence, we would expect similar correlations between perceived competence in reading and persistence. As in the previous chapter, we are forced to conclude that our knowledge of children's thought process when responding to the puppet interview questions is incomplete, and further study is necessary.

Pride and frustration were reliable predictors of the tasks for which they were coded, suggesting that positive and negative academic emotions play a role in supporting persistence. In addition, teacher-rated avoidance motivation was a significant predictor of spring persistence, suggesting that by the end of the school year, teachers have an adequate sample of children's task behavior to reliably predict performance on tasks. Similarly, teacher-rated working memory was a consistent predictor of both single-task and total persistence in the fall and the spring,

lending further support to the idea that teacher-rated working memory captures elements of compliance and task behavior.

Self-regulation variables were consistently and positively related to persistence. Head-Toes-Knees-Shoulders (HTKS) was correlated between .18 and .40 with each measure of persistence. This, along with similar findings in the pilot study, suggests that persisting at tasks may recruit the same executive functions tapped by HTKS. Finally, freeze prime and working memory scores were positively related to persistence in the fall but not the spring. As discussed in the previous chapter, it is unclear why scores on the various activities are correlated at the first time point but not the second. One idea is that in the fall, when the games and puzzles are new, working memory is recruited in remembering instructions and making sense of the task. In the spring, the tasks are familiar, and working memory may play less of a role. It would be interesting to change the tasks from fall to spring and see if this result is replicated.

T-tests revealed many differences in academic skills between "low persisters" and their classmates, particularly by the spring assessment. Spring Applied Problems and Letter-Word Identification scores differed between the groups by a large magnitude – in Applied Problems, medium and high persisters solved 50% more problems correctly than did their low persisting classmates. Interestingly, while there were many differences between the groups on motivation and self-regulation variables in the fall, by the spring many of these differences had disappeared. The optimistic view is that less persistent children, while still scoring below their peers, caught up on important motivational and self-regulatory skills during the school year.

Correlations and *t*-tests did little to resolve the overarching research question of whether persistence indicates motivation or self-regulation. Instead, the results are more nuanced: it depends on the component of motivation or self-regulation being assessed and how and when it

is assessed. The strongest relation – that between HTKS and persistence – suggests that persistence certainly involves self-regulatory processes. The smaller but consistent relations with teacher-rated motivation and perceived competence suggest that motivation, too, plays a role. From these data, it seems that we may conclude that persistence requires both motivation (because one has to *want* to accomplish the goal) and self-regulation (because attention, working memory, and response inhibition are required to keep going).

Teachers' responses to the interview questions suggested that they overwhelmingly thought persistence indicated motivation or both motivation and self-regulation. These opinions fit nicely with the quantitative data, but have important implications for intervention. Because teachers are likely to see non-persistence as a motivational issue, they are likely to use motivational strategies such as planning activities around children's interests to encourage persistence. But because the quantitative data suggest that self-regulation plays an important role in persistence, it is important for teachers to try other approaches as well, such as reducing distractions, repeating instructions, and helping focus children's attention on the task at hand if teachers are to increase persistence.

Chapter Seven

Research Question Three

Which components of self-regulation and motivation best predict student learning over the course of the preschool year?

Results

Quantitative results

The ideal analysis of these types of data would use 2-level HLM models to answer these questions, with children nested within classrooms. Doing so corrects for the shared variability in classrooms that may affect the extent to which motivation or self-regulation affects children's literacy and mathematics growth over the course of the year. This is particularly relevant given a recent analysis of the ECLS-K data which suggested that the relation between Approaches to Learning (an amalgam of self-regulation and motivation) and reading growth over the course of kindergarten varied across classrooms. However, power analyses suggest that such HLM analyses will be fruitless. This study has eleven participating classrooms with, on average, 13 students apiece, and if the true effect size is .20, power will be .13 at $p = .10$. If the true effect size is .40, my power will still only be .36 at $p = .10$. Given these estimates, using HLM is inappropriate. Thus, OLS regressions are used. Spring scores are used as outcome variables and regressions control for fall scores (rather than using growth scores as an outcome), which allows for the starting level of student achievement to contribute significantly to the model.

Backwards stepwise regression was conducted to determine which elements of motivation and which elements of self-regulation significantly predicted student learning in

directly assessed reading and math. In backwards stepwise regression, all variables of interest are entered into a regression model together. In each step, the variable with the least significant contribution (i.e., the highest *p* value) is removed and the regression is re-run without that variable. The end result is a model that contains only variables that uniquely contribute to predicting learning. Regressions model spring achievement controlling for fall achievement, school type, and age. School type is included as a proxy variable for classroom effects. Because eight of the classrooms were considered homogeneous by their organization and the other three classrooms were taught by one pair of teachers, it was apparent that instead of eleven separate classrooms, modeling two school types would be more accurate. Table 32 presents final regression models for reading and math learning attributable to fall motivation.

Table 32. Motivation models of academic growth.

Variable	Final Model F (df)	β	
Letter-Word Identification	$F(6,117) = 57.04$***		Model R^2=.75
Letter-Word Identification - Fall		.83***	
Age		.10^t	
Task Value - Puzzles		.21**	
Perceived Competence - Puzzles		-.22***	
Task Value – Math		.09^t	
Frustration – Wedgits		-.12*	
Applied Problems	F (4,122) = 45.51***		Model R^2=.60
Applied Problems - Fall		.46***	
Age		.30***	
School Type		.21**	
Perceived Competence - Puzzles		.14*	

Note. N = 126. ^{t} $p < .10$, * $p < .05$, ** $p < .01$, *** $p < .001$.

As can be seen in Table 32, motivation, age, and prior achievement account for 75% of the variance in spring reading scores (F (6, 117) = 57.04, $p < .001$). Motivation variables that predict growth on the Letter-Word Identification test are value for puzzles (standardized $\beta = .21$, $p < .01$), perceived competence at puzzles (standardized $\beta = -.22$, $p < .001$), value for math (standardized $\beta = .09$, $p < .10$), and frustration during the individual puzzle assessment (standardized $\beta = -.12$, $p < .01$). Notably, children who valued puzzles and math more learned more during the course of the year about letters and words; paradoxically, children who reported lower perceived competence with puzzles learned more as well. Finally, children who became less frustrated during the individual puzzle assessment learned more in reading.

Motivation played less of a role in learning math during the preschool year. Variables in the final model, including prior achievement, age, school type, and motivation, accounted for 60% of the variance in spring math scores (F (4, 122) = 45.51, $p < .001$). The only significant motivation variable was perceived competence at puzzles. Unlike the case with reading, greater perceived competence at puzzles contributed to *more* learning in math (standardized $\beta = .14$, $p < .05$).

Table 33 (below) reports findings of the backward stepwise regressions using only self-regulation variables to predict learning in reading and math. Again, the control variables were fall achievement, child age, and school type. Significant predictors are shown in the table below.

Table 33. Self-regulation models of academic growth.

Variable	Final Model F (df)	β	
Letter-Word Identification	F (3,122) = 91.38***		Model R^2=.69
Letter-Word Identification - Fall		.77***	
Age		.05	
HTKS		.11^t	
Applied Problems	F (6,114) = 32.77***		Model R^2=.63
Applied Problems - Fall		.44***	
Age		.14^t	
HTKS		.14^t	
Freeze Time		-.15*	
Freeze Prime Time		.12^t	
Working Memory		.23**	

Note. N = 125. ^{t} p < .10, * p < .05, ** p < .01, *** p < .001.

As can be seen above, self-regulation, age, and prior achievement account for 69% of the variance in spring reading scores (F (3, 122) = 91.38, p < .001). The only self-regulation variable that predicted learning reading during preschool was Head-Toes-Knees-Shoulders (HTKS), and this result was marginally significant (standardized β = .11, p < .10)

Self-regulation played a much greater role in learning math during the preschool year. Variables in the final model, including prior achievement, age, and self-regulation, accounted for 63% of the variance in spring math scores (F 6, 114) = 32.77, p < .01). HTKS was again a marginal predictor of learning (standardized β = .14, p < .10), as was freeze prime time (standardized β = .12, p < .10). Working memory predicted learning in math (standardized β = .23, p < .01). Contrary to expectation, freeze time was a negative predictor of learning in math (standardized β = -.15, p < .05).

Table 34 (below) displays the final motivation and self-regulation models for learning reading and math in preschool. These models were obtained by including the significant motivation and self-regulation predictors for reading or math, along with the three controls (prior achievement, school type, and age).

Table 34. Predicting academic growth.

Variable	Final Model F (df)	β	
Letter-Word Identification	F (7,113) = 48.89***		Model R^2=.75
Letter-Word Identification - Fall		.81***	
Age		.07	
HTKS		.08	
Task Value - Puzzles		.20**	
Perceived Competence - Puzzles		-.23***	
Task Value – Math		.09^t	
Frustration – Wedgits		-.12*	
Applied Problems	F (8,109) = 24.73***		Model R^2=.65
Applied Problems - Fall		.34***	
Age		.17*	
School Type		.12^t	
HTKS		.16*	
Freeze Time		-.14*	
Freeze Prime Time		.12^t	
Working Memory		.20**	
Perceived Competence - Puzzles		.14*	

Note. N = 120. ^{t} p < .10, * p < .05, ** p < .01, *** p < .001.

As can be seen above, self-regulation, motivation, age, and prior achievement account for 75% of the variance in spring reading scores (F (7, 113) = 48.89, p < .001). Notably, no self-regulation variables predicted reading growth in preschool once motivation variables were entered into the model. Motivation variables that predict growth on the Letter-Word

Identification test are value for puzzles (standardized β = .20, $p < .01$), perceived competence at puzzles (standardized β = -.23, $p < .001$), value for math (standardized β = .09, $p < .10$), and frustration during the individual puzzle assessment (standardized β = -.12, $p < .01$). As in the motivation-only model, we see a surprising negative relationship between perceived competence and reading growth, and positive associations with task value and lower frustration.

In contrast, the model predicting growth in math over the course of preschool was dominated by self-regulation. Variables in the final model, including prior achievement, age, school type, motivation, and self-regulation, accounted for 65% of the variance in spring math scores (F (8, 109) = 24.73, $p < .001$). The sole motivation predictor of math growth was perceived competence at puzzles (standardized β = .14, $p < .05$); in the case of math, perceived competence is a positive predictor of learning. HTKS was again a predictor of learning (standardized β = .16, $p < .05$), as was freeze prime time marginally (standardized β = .12, $p < .10$). Working memory predicted learning in math (standardized β = .20, $p < .01$). Again, contrary to hypotheses, freeze time was a negative predictor of learning in math (standardized β = -.14, $p < .05$).

In sum, children's progress in reading during preschool is largely a factor of their motivation, whereas their progress in math is a product of both their self-regulation (working memory, in particular) and their motivation. Notably, teacher ratings of motivation and self-regulation did not predict learning in reading and math, nor did persistence and pride, elements of mastery motivation.

Qualitative Results

During the teacher interviews, after teachers had defined motivation and self-regulation, they were asked, "How important is motivation [self-regulation] for learning in preschool?" Teachers' responses were coded on a 1-5 scale to enable us to get a general feeling of the importance of motivation and self-regulation. (Note: this coding is preliminary and was completed by me alone; final coding will include a second rater and tests of interrater reliability.) The scale was as follows:

1: not important

2: not very important

3: important

4: very/pretty/really important

5: essential, fundamental, the most important, have to have

On average, the 18 teachers who responded about motivation gave it a 3.81, which falls between "important" and "very important". Similarly, the sixteen teachers who responded about self-regulation gave it a 3.94, approaching "very important". Teachers seemed to feel that both approaches to learning are important or very important for learning in preschool, which echoes the results of the quantitative analysis. Several teachers explained the reasoning behind their answers. Asked why self-regulation was important for learning, one teacher said,

> "I feel like it's, it's pretty important, um… There are kids that still, even after a year of being with us, cannot sit still for literally the three to five minutes. And we're animated; we're not boring. But you know, they really struggle, and I always think those kids are missing so much that they could be picking up." (Susan)

Another explained the social importance of self-regulation:

> "If you don't have the self-regulation the kids... you're going to find you have a hard time with the other kids…They're not gonna want to play with you if you can't wait, if you are yanking things out of everybody's hands." (Patty)

A third explained the consequences for behavior in school:

> "I also think it's [self-regulation] important for children later on to become successful in school because, um, you know, it's the, it's the kids that can't, you know, kind of quell that impulsivity that are the ones that are, you know, deciding that they're done sitting and are done and, you know, start kind of wandering off and doing other things that maybe aren't as desirable." (Janie)

Overall, teachers seemed to feel that self-regulation was very important as a life skill, a learning skill, and a social skill.

While teachers ranked the importance of motivation slightly lower, they were more varied in their explanations of why motivation was important. One teacher talked about missed opportunities:

> "I think it's [motivation] important, I mean, I see some of the children in the class not very motivated to do certain activities, I feel like they're missing out on important skills that they could be learning through that." (Todd)

Another teacher related motivation directly to learning:

> "I think it's [motivation] very important, to be successful. Because you have to have a curiosity about learning to be successful…I think you learn more. Because if you're interested in a topic…And you're curious about it, you're going to learn all you can about it." (Carrie)

A third teacher related it to a much more basic set of skills she's teaching:

> "Oh, very important. Um because they have to be motivated to be able to be independent. So if they don't have that motivation it's going to take that much longer to reach that goal of being able to be independent and doing those types, those basic skill sets on their own." (Lindsay)

One of her colleagues explained that, in one way at least, motivated kids are easier to teach:

> "I feel that they are not going to learn as much if we don't encourage them to do it...it's hard to know where they are developmentally if they are not participating." (Elizabeth)

Our last teacher explained that motivation is important for preschool and life beyond:

> "I think it's kind of fundamental… once preschool is done, you go to kindergarten. No one helps you in kindergarten (laughs), you help yourself. And then from kindergarten, you know, all the sudden you're in college, no one is going to sit down for you and do your homework. So I think it is one of those things that's essential. If you don't have motivation, it kind of, you know, snowballs. And if you are not getting motivated now, you're going to have issues, you know, until you really get kicked in the butt." (Samantha)

Every teacher interviewed said motivation and self-regulation were at least "important" for preschool, with one exception. One teacher's answer was coded as a 1 because the teacher interpreted the question to mean academic motivation, and because preschool is not academic, she did not feel that a motivation for academics was important in preschool.

In sum, the teacher interview data suggest that both motivation and self-regulation are very important. They are important for learning, social interactions, appropriate behavior, independence, teachers' ability to diagnose skills, and success in life in general.

Discussion

The take-home message from chapter seven is that motivation predicts reading growth, while self-regulation (and a little bit of motivation) predicts math growth. Whereas previous studies have linked self-regulation more strongly with math than reading (see Blair & Razza, 2007; Lan, 2009), this is the first study to my knowledge to find no link between self-regulation and reading skills. This is particularly interesting because teachers rated self-regulation as more important than motivation for learning in preschool. Understanding this result requires an understanding of how learning occurs in preschool, particularly the type of preschools in this study.

In eight of the 11 classrooms studied (so for roughly 100 of the students in the study), a preschool curriculum is used that encourages but never requires participation. Thus if a child

feels like not participating in a large group activity, he or she does not have to. Similarly, if a child does not want to participate in small group activities, he or she may make another choice. Given the mixed ages of children in these classrooms (2 ¾ - 5 years), large and small group activities are typically short, as is developmentally appropriate. Students have at least an hour a day of "work time" (which in other contexts might be called play time). Because the curriculum focuses so much on children's own choices and intrinsic motivation to participate, teachers plan activities around student interests and do quite a bit of encouraging students to participate. As Elizabeth explained (above), students who aren't motivated get less out of activities (possibly because they don't do them). Todd and Carrie's quotes reflect the same idea. And Lindsay, who linked motivation to independence, extends the point: if children who are more motivated are more independent, they will have more opportunities to engage in learning activities because they won't be standing around waiting for help.

When we discuss the importance of self-regulation for learning in school, a formal learning context is typically considered – children need to pay attention and follow teachers' directions in order to complete a prescribed task. They need to inhibit distraction and inhibit their response to other children so that they may get their work done. There is generally an underlying assumption that children would rather be doing other things besides the task at hand. But in this preschool curriculum, cognitive self-regulation may not be as important, because children are pursuing their own goals. According to Self Determination Theory (SDT; Ryan & Deci, 2000), when we are pursuing our own goals, we are inherently self-regulated. It is possible that children who score poorly on adult-directed self-regulation assessments are still capable of focused, self-regulated work when they are approaching their own goals. In this case, we might see a weaker-than-expected relation between our self-regulation tasks and children's learning. Motivation

would be the instrumental variable. And it is perhaps for this reason that we see motivation, and not self-regulation, as the key predictor of reading growth in preschool. Children are meaningfully pursuing knowledge of letters and sounds, but on their own terms. Lessons are not being provided that require children to focus their attention and stop their bodies from wiggling around. Rather, children are exploring letters and sounds when they are motivated to do so. A good deal of this exploration may be happening at home, with parents encouraging children's interests in reading and helping them map the relation between letters and sounds.

It is entirely possible to be satisfied with such an explanation of the lack of relation between reading and self-regulation. In an intrinsically motivated environment, motivated children will learn more. Yes, but then what can be made of the findings that self-regulation is so important for learning math? If it is children's motivation that helps them learn, why is motivation a smaller (but still significant) predictor of math learning than self-regulation? This study provides no definitive answer to this question. In a sense, this is a difficult question to answer, because math is not formally taught in the preschools where this study was conducted.

One hypothesis has to do with the ability to intuitively learn math instead of effortfully learning to read. For most children, learning to read is an effortful, deliberate process (Hasher & Zacks, 1979). Yet infants and young children are able to subitize (that is, automatically recognize quantity) of small numbers of objects (up to four; Rouselle & Noel, 2008). So although children may begin the preschool process with no concept of print, they already have a concept of quantity. They also have experiences with sharing, and even in informal classroom settings, mathematical problem solving is modeled (e.g., "Hmm, how many blocks do we have?" *Counts them.* "We have six blocks, so you can each play with three.") Furthermore, counting may be an activity that parents encourage at home. Even parents with limited educational backgrounds may

be effective at modeling counting and mapping the counting numbers onto objects. The argument here, then, is that basic mathematical problem solving skills (as measured by the Applied Problems subtest) may be more readily absorbed from the environment than reading. Children with better attention skills may catch on to more of these real-life problem solving examples. Children with better working memory skills are better able to represent quantities mentally for problem-solving. And children with better response inhibition skills are less likely to become distracted and fidgety when someone is counting with them. So the individual cognitive skills encompassed by "self-regulation" may each uniquely contribute to children learning mathematics from the world around them.

One further result requires consideration. In regression analyses, children's perceived competence at puzzles (a key motivational variable) was a significant predictor of math growth, indicating that motivation plays a role in the acquisition of problem solving skills. However, perceived competence at puzzles is a significant, *negative* predictor of reading growth. So, why might feeling competent at solving puzzles after a failure experience (not completing the final Wedgit puzzle) positively predict math and negatively predict reading growth? The best hypothesis has to do with the choices that children make in the classroom and the skills that are nurtured by these choices. As indicated above, a great deal of instructional time in preschool (in all eleven classrooms) is choice time. Perceived competence in puzzles is highly correlated (around .60) with liking and being interested in puzzles. Perhaps children who feel more competent at puzzles choose to work on spatial tasks, like puzzle solving and building with blocks, more often than children who do not feel competent in these skills. Building with blocks and solving puzzles promote problem solving skills with materials, which could possibly be linked with problem solving with numbers. Children who are working with objects may have

more opportunity to understand quantity. And these problem solving skills may even be linked to the development of working memory skills, as children consider their structures and mentally plan ways to make them structurally sound. This remains an open question and merits consideration.

So what of the children who feel less competent at solving puzzles? They may choose to work with materials less often, preferring activities like looking at books, drawing pictures and having teachers transcribe the stories they tell, and dramatic play which builds vocabulary. Perhaps *not* choosing to play in the block corner every day provides these children with opportunities to engage in activities that promote early literacy skills. To test this hypothesis, it would be interesting to study the link between children's perceived competence, task value, and the choices they make during work/play time in the classroom. Careful observational research would enable us to document the links between preferred activities and skill development. Until such research is conducted, this argument remains hypothetical.

In summary, both children's motivation and self-regulation uniquely predict children's learning in preschool, controlling for their skills at the beginning of the year. Teachers believe that both skills are fundamentally important for learning in preschool, and the data bear out their conclusions. Understanding why motivation drives reading growth and self-regulation drives math growth requires further research.

Chapter Eight

Research Questions Four and Five

Because the content of the responses to research questions four and five is similar, and merits comparison between the two, results of the two research questions are presented sequentially in chapter eight and then discussed jointly.

How do teachers identify student struggles with self-regulation and motivation?

How do teachers define and differentiate between motivation and self-regulation?

Results

Research Question Four

Qualitative results

The criteria teachers listed for identifying students struggling with issues of low motivation differed substantially from criteria used to identify students struggling with low self-regulation. Teachers' descriptions of low motivation included many descriptions of lack of drive, negative emotionality, poor social skills, and helplessness. Teachers' descriptions of poor self-regulation included trouble following the routine, negative emotionality, attention/focus, impulsivity, and negative behaviors. Teachers' responses were fairly consistent. There were no descriptions of children's behavior that did not fit readily into one of these categories.

Motivation. Children's low motivation was generally described as being a problem at "work time," or "play time," when children were reported to be engaging in fewer directed activities with their peers. Low motivation was also problematic during small group time, when

children were resistant to trying new activities or would not persist at learning a new skill. The most frequent descriptions of children with low motivation were classified in a category of "lack of drive" (see Table 35, below). (Note: these classifications were obtained by me summarizing each description into a few words and then classifying the descriptions into categories. Final coding will include summaries and classifications by a second coder, along with measures of interrater reliability.) One typical example was,

> "She doesn't show a lot of initiative to go out and play creatively or get engaged in materials. She does a lot of sitting around and watching." (Janie)

Seven other teachers made similar comments about low motivated children just sitting and observing others doing activities. Some children were more extreme in their lack of motivated behavior:

> "A lot of times she will instead of making a choice on what she wants to do she'll just sit and sometimes that's her plan after small group, is I'm going to sit and do nothing. And she'll sit and do nothing. And I mean she sat there for forty five minutes because she doesn't wanna do anything." (Lindsay)

Table 35. Descriptions of children struggling with low motivation.

Lack of Drive	Negative Emotionality	Lack of Social Skills	Helplessness
No drive	Like Eeyore	Shy (2)	Gives up easily (4)
Just looks/ observes/watches (8)	Frightened	Quiet (5)	Says "I can't" (3)
	Easily frustrated (2)	Inarticulate	Low confidence (2)
Wanders around (3)	Dislikes new things	Follower (3)	
No direction	Not happy (2)	Forgotten	
No plan (2)	Crying (2)	Alone (2)	
Not into anything (3)	Uncomfortable		
Just sits there (4)	Whining		
Boring	Anxious		
Running around (3)			
No initiative			
No goals			
Only wants to do one thing (6)			

Note: Numbers in parentheses indicate the number of teachers reporting this descriptor.

Teachers typically described children with low motivation as playing a minimal role in classroom life. Leah explained,

> "When you have a kid who's not motivated, and they're just kind of like, 'I don't know,' they're just kind of bumps on a log…"

Patty, her co-teacher, said,

"Those are the forgotten kids."

Children with low motivation were described as followers, shy, quiet, and often alone. During play with others, one teacher explained, they typically joined the play of others rather than initiating their own games.

> "I think they um…maybe look to others a little bit more for the ideas, of play even, you know, or like there might be a game going on and they can join the other game, but they might not have come up with the other game on their own; they're more of a joiner." (Susan)

Another commonly mentioned set of characteristics of children with low motivation was negative emotionality and helplessness. Two teachers described this pattern of behavior quite clearly:

> "I look at some kids that we have that I feel are a little like lacking motivation and they're the ones that you know are whining and crying. And they are the ones that really need your help and don't want to do it themselves." (Samantha)

> "[They often] need help, like um, will say like before they even try to attempt to do something for themselves, will a lot of times "I can't," or "I need help," …like they're just quick to give up or not even attempt it." (Susan)

In the preschool classroom, this helpless behavior crosses over into many daily routines, including toileting, hand washing, eating, putting on snow pants and boots, and academic tasks. Teachers felt that fostering this independence was a central goal of preschool.

In general, teachers used tones of mild concern when describing children with low motivation. One teacher described a real sense of frustration when working with children of low motivation, asking herself, "Gosh, did I ever even reach them?" (Leah).

Self-regulation. The difficulty with routines and negative behavior described and attributed to low self-regulation appeared throughout the school day in teachers' descriptions,

suggesting that self-regulation may hinder many parts of a child's school experience. See Table 36 for a complete list of descriptions of children with poor self-regulatory skills.

Table 36. Descriptions of children struggling with low self-regulation.

Routine	Negative Emotionality/ Lability	Focus/Attention	Impulsivity	Negative Behaviors
Doesn't follow rules (4)	Explodes (4)	Doesn't pay attention (3)	Hard time stopping (2)	Puts hands on others (3)
Does own thing	Quick to anger (2)	No focus (3)	All over the place (2)	Ruins work when frustrated (4)
Needs lots of reminders (2)	Easily upset (2)	Distractible	High energy (3)	Overbearing
Tough transitions	Easily frustrated (6)		Impulsive (3)	Poor communication skills (5)
	Needs adult help to solve problems (5)		Not aware of body in space (2)	Tone of voice
	Vomits when upset		Hard to wait (2)	Aggressive (9)
	Hard to calm (5)		Fidgets (4)	Eats non-food (e.g., worms)
	Whines			Licks people
	Cries			Destructive (2)
	No persistence when frustrated (6)			

Note: Numbers in parentheses indicate the number of teachers reporting this descriptor.

Several teachers mentioned that children with low self-regulation have difficulty following aspects of the classroom routine, needing many reminders about what to do or not following classroom rules and expectations. One teacher's description of a low self-regulated

child touched on four categories of teachers' responses: routines, attention/focus, impulsivity, and negative behaviors:

> "Somebody that's not [self-regulated] would have a hard time stopping if they're into something, would have a hard time like during transitions, like in line and things like that, and time keeping their hands off other people's bodies, um, they would just have a hard time in all aspects of the day… and being able to focus." (Jeff)

This teacher next mentioned negative emotionality as a part of self-regulation, also:

> "And then if they get upset with somebody, they might explode, they might get angry too fast, um, and then it might ruin what they were working on, too, so…So they can't focus any more on what they were doing." (Jeff)

Many teachers mentioned negative emotionality as one aspect of poor self-regulation. Several teachers described children with serious difficulty controlling their emotional responses. One notable example is,

> "His self-regulation is way down and um, he's like vomited—like he's just so upset he kind of gags and throws up. Yeah, I mean it's, he'll cry and kind of like excessively drool. I mean it's like a physical reaction; he gets so upset, um, and it takes him, like, it can take him up to a half an hour to calm down." (Crystal)

While many of the examples were less extreme than this, thirteen of the eighteen teachers interviewed described problems calming down or managing negative emotions as a descriptor of poor self-regulation. Notably, teachers who mentioned persistence in the context of poor self-regulation described children giving up at the first sign of frustration:

> "Our kids don't push through. More of them do not keep trying something if it's not working. They you know in an instant, the first chance without a teacher saying anything, they're, they'd be done. You know, if we kind of encourage then they'll stay a little bit longer. But their first reaction when hit with, you know, academic frustration over half of them is just to give up." (Melissa)

Thirteen of the seventeen teachers addressed emotional regulation as a skill necessary for kindergarten readiness.

Other central factors emerging from teachers' responses include impulsivity and negative behavior. Behaviors categorized as "impulsivity" in this section are commonly included in teacher rating scales that screen for ADHD, including "high energy" and "fidgety". Patty describes one child whom she believes to have high impulsivity:

> "He would be the one kid that I would say needs to get to the pediatrician. Cannot sit still. Cannot control his behavior. We see it even at lunch, in the gym. It's not just in here. He just can't... in lunch he just... he's all over the place. His feet are going. His hands are going. He just cannot control himself, and I think he's got ADD, ADHD, whatever…I think that he just doesn't know any other way…he cannot come and sit at the carpet. He has to slide into first, every single time... I think he wants to pay attention…We lose him after about four minutes…He's a great kid. He will wear on your every last nerve by the end of the day, but he's just a wonderful kid."

This child scored very poorly on all individual, group, and teacher ratings assessments of self-regulation in the study.

Finally, children with low self-regulation were described as engaging in negative behaviors in the classroom, from breaking things in the classroom to being unable to keep their hands off of other children's bodies. Lindsay provides a description of one particularly challenging set of behaviors:

> "We have a boy that if he sees something that he wants he'll just take it or he'll knock over other people's creations or structures that they've built. He steps on the toys, he and you know and it continues after we problem solve with him and we talk about you know if you would like to use this, what else can you do? Um, I mean, he, he puts all sorts of things in his mouth… but like today he was eating worms outside… but I feel like he's low regulation. You know, because because he'll grab other children, he's he's physical and he licks them and licks teachers…"

All teachers who mentioned negative behavior in their interviews mentioned it in the context of low self-regulation except for one. Kelly described a boy in her class who has high self-regulation and uses it to be sneaky, so he looks around to make sure no one is watching when he

pinches someone or takes their materials. In all other cases negative behavior was described as low self-regulation.

Comparing motivation and self-regulation. Several indicators were used to describe both states: four teachers described a lack of persistence as indicating a lack of motivation, while six teachers described it as indicating low self-regulation. Teachers in both cases described children as "all over the place" or "running around," and both types of children were noted to be easily frustrated. In general, the descriptors used were distinct and suggest that teachers think of motivation and self-regulation quite differently.

Notably, the "negative emotionality" category of teacher responses describes quite different behavior in cases of low motivation and low self-regulation. Children with low motivation were reported to be frightened or uncomfortable, while children with low self-regulation were reported to be quick to anger and hard to calm. Children with low motivation could be said to display negative internalizing behaviors, while children with poor self-regulation are often displaying negative externalizing behavior. Children in both groups were described as having poor social skills, but in the case of low motivation it was more often playing alone or following others' plans, whereas children with low self-regulation were described as having more conflicts with other children and teachers.

In sum, teachers use distinct criteria when identifying struggling students as having low motivation or poor self-regulation. Certain behaviors, such as persistence, are attributed to both causes (see Research Question 2).

Research question five: How do teachers define and differentiate between motivation and self-regulation?

Qualitative results

Motivation. Teachers' descriptions of children with high motivation closely paralleled their descriptions of children with low motivation. Four of the six categories of responses were the converse of the four categories of low motivation: drive (lack of drive), positive emotionality (negative emotionality), social skills (lack of social skills), and independence (helplessness). In addition, teachers described reasons why children are motivated extrinsically and described the higher level of knowledge and skills demonstrated by highly motivated children. See Table 37 for descriptors teachers used in describing highly motivated children.

Table 37. Descriptions of children with high motivation.

Drive	Positive Emotionality	Social Skills	Independence	Extrinsic Motivation	Knowledge and Skills
Drive to achieve a goal (4)	Eager	Outgoing (2)	Persists (3)	Be ready for K	Achieves a lot
Has own goals (8)	Willing	Social (3)	Tries to solve problems many ways (3)	Do what friends do (2)	Likes academics
Interested (7)	Excited (4)	Communicates (5)	Explores on own	Eager to please (2)	Reads
Hands-on	Energetic	Maturity	Figures out on own (6)	Be like siblings	Masters new skills
Curious (3)	Patient		Follows through (2)	Motivated by parents	Likes books (4)
Asks questions (4)	Confident (2)		Independence (2)		Likes words
Wants to learn (6)	Happier (2)				Smart (2)
Spark	Self-worth				Knows a lot
Focused	Pride (3)				Big vocabularies (3)
Attentive					Writes
Takes initiative (3)					Creative play
Puts in time and effort					
Wants to do best					

Note: Numbers in parentheses indicate the number of teachers reporting this descriptor. "Follows directions" left out of table.

One teacher interviewed defined motivation beautifully:

> "The desire to do something or have something, you know, whatever that drive is that's kinda pushing you to wanna be a part of it and—or not wanna be a part of it." (Kelly)

Many teachers mentioned similar criteria, discussing drive (4), having one's own goals (8), and being interested in the world around them (7). Teachers also touched frequently on independent skills like persisting in the face of frustration (3) and wanting to figure things out on one's own (6), and the higher level of knowledge and skills these children have acquired (e.g., likes books (4), big vocabularies (3)).

Four teachers interviewed described similar children when thinking of high motivation, emphasizing drive, positive emotionality, independence, and knowledge and skills:

> "She likes to hear stories. She wants to know things. She asks about words. She asks how to spell things. She writes. She, um, wants to learn about the world around her. She's very confident in what she does and she doesn't care what you think about it. She knows she did her best... And she understands that's important." (Patty)

> "One that's high in motivation, the kid I'm thinking of, he's learning new skills every day, he's drawing all day, and he wants to get better at his drawing so he tries different things, um, he wants to read, so he's always looking at books, and looking at easy reader books, and looking at words, and talking about words, and how to spell them." (Jeff)

> "He's very curious and he asks a lot of questions and he's really interested in a lot of things, and when he's interested in them, you know he wants to know all about them, and he wants to look at books on them, and you know figure things out." (Ashley)

> "He is willing to kind of think outside the box and he'll try to figure out to solve a problem one way and it doesn't work, he doesn't give up very easily. He's pretty determined, um, and is able to communicate." (Crystal)

While most teachers described this type of intrinsic motivation, one teacher described extrinsic sources of motivation propelling preschoolers to learn:

> "There's motivation to fit in with their peers…and to be at the same level as their peers. I feel like there's motivation to be like their siblings. We have a lot of preschoolers with um, older siblings so I see the motivation to act like their older

> sibling in some of them. Um, in some of them you know it's more of the um intrinsic motivation where they try to figure out a problem on their own without having help from their teacher or a peer… it's their will to want to try different things and to learn different things." (Melissa)

In this quote, it is evident that children are emulating peers' and siblings' skills, but most teachers thought that this extrinsic motivation came more from personal goals of competition and mastery rather than pressure from parents (e.g., "Why can't you be more like your brother?"). Finally, highly motivated children were described as having better social skills, including being able to communicate with children and adults and initiating play with other children.

Self-regulation. Teachers' descriptions of children with good self-regulation skills also closely mirrored their descriptions of children with low self-regulation. Five of the six categories overlapped: routines, emotion regulation (negative emotionality), focus/attention, lack of impulsivity, and positive behaviors (negative behaviors). In addition, teachers described children with high self-regulation as independent and self-directed. See Table 38 for a full list of descriptors.

Table 38. Descriptions of children with high self-regulation.

Routine	Emotion Regulation	Focus/Attention	Lack of Impulsivity	Positive Behaviors	Self-Directed
Follows rules (3)	Calms/self-soothes (11)	Listens/pays attention (5)	Monitors behavior	Indoor voices (3)	Follows interests (2)
Asks questions	Handles frustration	Focus (2)	Raises hand	Uses words (3)	Solves problems on own (4)
Follows routine (4)	Slow to anger	Situational awareness	Controls self	Apologizes	Do activity on own
Follows directions (2)	Calm		Controls body (2)	Shares	Conscientious
Transitions well	Can walk away		Can stop activity	Tells teacher (3)	Persists (3)
Compliant (5)	Talks about feelings (2)		"That's enough"	Helps others (2)	Delays gratification (2)
Knows right and wrong (2)	Can reboot		Waits (3)		"Together" (2)
Helps clean up			Stops and thinks (3)		Makes own choices
Participates			Aware of body in space (2)		Assertive
			Keeps hands to self (2)		
			No grabbing		
			Sits (2)		
			Self-control (2)		

Note: Numbers in parentheses indicate the number of teachers reporting this descriptor.

Eleven of the eighteen teachers interviewed described being able to calm down or self-soothe as a hallmark of self-regulation. Several teachers defined self-regulation as an emotional process, without mentioning additional factors:

> "I think that deals with more like emotional things, like how they can regulate themselves like when they are dealing with a conflict or if they get frustrated, how they can handle that situation. Is that, I don't really know." (Ashley)

> "I guess in this environment I think of it more like social and emotional. Um, if a child is being dropped off at school and they don't want to leave their parents and they're really sad, um, I mean they have to figure out a way to cope through the day and, um, because they're not coming back for a while. Um, and so, you know, self-regulating emotionally or socially, you know, like if a kid is taking a toy away and they really want it back and they're trying to figure out a way, you know to get it back, um, you know instead of screaming or grabbing the toy back, you know, the kids who have gotten to the point where, um, they start negotiating and, you know, problem solving. I think those kind of—that's what I think of when I think self-regulation. I don't know if I'm on the right track or not but…" (Crystal)

It is clear from the above quotes that these teachers were slightly unclear about the nature of self-regulation, but they thought it might be about emotional regulation.

Other teachers mentioned emotion regulation in conjunction with other skills, such as following the routine, controlling your body, following multiple step instructions (working memory), independence, and inhibition.

> "Being able to calm yourself down if you get upset, being able to solve problems on your own, being able to do an activity on your own, um, being able to go through the schedule without having to be reminded of what to do next all … being able to control yourself, control your body, especially around others, control the volume of your voice…being able to follow like, a couple step directions, being able to stop what you're doing and move onto the next step, transitions, stuff like that." (Jeff)

Two teachers also mentioned being able to control one's body in space, in addition to other categories mentioned.

> "Sometimes it could even be, you know, regulating yourself that you have enough space to move that you're not moving around the room in a way that bumping into all the other children." (Kelly)

Teachers were also quick to point out the positive behavior seen in children with high self-regulation.

> "We've got a boy that um, when he when he has a conflict with another child, um, and he, and he knows that he's done something that you know he could've made a different choice, um he will say on his own he will apologize he will say I'm sorry, I'm not going to do that to you anymore, and right now I'm going to go play with the blocks, or I'm gonna go make another choice. So I feel like he regulates himself." (Lindsay)

Finally, several teachers mentioned aspects of self-regulation that we would think of as cognitive self-regulation:

> "They can focus and I feel like that is high self-regulation." (Elizabeth)

> "The ability to kind of postpone what, you know, your brain is telling you you might like to do." (Janie)

As teachers discussed children's self-regulated behavior, they sometimes mentioned categories of behavior that would be appropriate classified as "self-directedness" or even drive. They mentioned following one's own interests, solving problems on one's own, and persistence. A close look at the self-directedness column reveals that many of the behaviors described are also listed in the motivation descriptors table. This reveals that there may be some overlap in the way that teachers think about motivation and self-regulation.

Discussion

Motivation

When discussing children who were perceived to be struggling with motivation, teachers described indicators that generally fit into four categories: lack of drive, negative emotions, poor

social skills, and helplessness. One indicator, "gives up easily," did not fit neatly into the categorization but was grouped in with helplessness. It may also belong to "lack of drive," or it may be its own category. As was discussed in Research Question 2, the theoretical placement of persistence within motivation and self-regulation is debatable. When teachers discussed indicators of high motivation, their responses fit into very similar categories: drive, positive emotionality, social skills, independence, extrinsic motivation, and knowledge and skills. When coding teachers' responses, there was again some question about the placement of persistence. It was included in the "independence" category because teachers implied that children persisted on their own without asking for help. But again, the argument could be made for including persistence in "drive."

Drive. The terms "drive" and "lack of drive" were selected as descriptors for behavior that is goal-directed or aimless. The actual term "drive" was mentioned by four teachers and "no drive" was mentioned by one. In the preschool curriculum used by sixteen of the eighteen teachers, making a plan or setting a goal and then following through with it is a major component of the program. At the beginning of "work time," children are asked to make a plan for what they want to do. If they choose to change activities, they are asked to make another plan. At the end of work time, children are asked to summarize the activities they did and how well their plan worked. Accordingly, the sixteen teachers using this curriculum are well-attuned to how readily children can set goals and follow through with them. Some other indicators of "lack of drive" include wanders around, no direction, no plan, not into anything, just sits there, running around, no initiative, and no goals. Responses from the other two teachers fit into this category as well. Because goal-setting and developing interests are important in all classrooms, teachers tended to express concern about students perceived to be low in drive.

The indicators of "drive" involved more varied descriptions of behavior. Indicators repeated by multiple teachers included drive to achieve a goal, having one's own goals, being interested in things, being curious, asking questions, wanting to learn, and taking initiative. It would be difficult to argue that any of these behaviors did not indicate motivation. It is more difficult to identify precisely which theories of motivation teachers are using. These descriptors fit theories of achievement goals, intrinsic motivation, interest, and help-seeking (Pintrich & Schunk, 2002). But it is worth noting that all of the above indicators are related to intrinsic motivation, which is part of the theoretical framework emphasized by the preschool curriculum the majority of teachers are using. Forty-one separate indicators of intrinsic motivation were mentioned by teachers, while only seven indicators of extrinsic motivation were mentioned (see discussion below). It is worth noting that eight teachers separately mentioned having one's own goals, seven teachers mentioned being interested, and six teachers mentioned wanting to learn. Indicators of drive were by far the most common descriptors mentioned by teachers.

Emotionality. Teachers frequently mentioned positive emotions in the context of high motivation and negative emotions in the context of low motivation. Positive emotions included eagerness, excitement, confidence, happiness, and pride. Negative emotions included unhappiness, fright/anxiety, crying, whining, being easily frustrated, and being "like Eeyore" (a character from A. A. Milne's Winnie the Pooh). Our previous research (see Berhenke, Miller, Brown, Seifer, & Dickstein, 2011) has examined several of these emotions in the context of motivation. Emotions direct behavioral goals and induce motivation (Barrett & Morgan, 1995; Izard & Ackerman, 2000; Pintrich, 2000), with positive emotions associated with more self-reported intrinsic motivation among older children, and negative emotions such as sadness, shame, and fear associated with decreased intrinsic motivation (Linnenbrink & Pintrich, 2000;

Pekrun, Elliot, & Maier, 2006). Therefore, given that teachers are primarily focused on intrinsic motivation, it is theoretically sound that they associate positive emotionality with high motivation and negative emotionality with low motivation.

Social skills. It was in part surprising that teachers mentioned social skills in the context of motivation, particularly the context of low motivation. Children struggling with motivation were reported to be shy, quiet, inarticulate, forgotten, alone, and followers. Children with high motivation were reported to be outgoing, social, good communicators, and mature in social situations. Given, however, that a primary goal of preschool is socialization, and given how focused teachers are on children's social skills, it is perhaps not entirely surprising that teachers are thinking about social skills in the context of other early learning skills. One theoretical approach to the study of motivation comes from temperament research (see Rothbart & Hwang, 2005). In this framework, approach motivation is seen as a subcomponent of a larger aspect of temperament, surgency/extraversion. Rothbart and her colleagues have demonstrated through research with parent ratings that extraversion and the tendency to approach novelty are consistently correlated. Approaching new achievement situations and approaching other people are, they argue, related. This theoretical approach explains the connection between outgoingness, sociability, shyness, being quiet, being alone, and motivation.

What about communication skills? Children reported to have low motivation were described as inarticulate by one teacher, while five teachers reported that children with high motivation are good communicators. One report sheds light on this finding. In a small study of 15 toddlers, Fagan (2008) reported that children's motivation for goal attainment determined their persistence in the face of communication difficulties. Perhaps children with higher "drive" (for the moment, viewing motivation as a personal characteristic and not situationally

determined) develop better communication skills through this mechanism. They are more motivated to get what they want or attain a goal, so they persist longer when they have difficulty communicating. This increased persistence leads to the development of better communication skills.

Another argument based on temperament is that if children with more approach motivation are indeed more extraverted, they may have more frequent interactions with others and through those interactions develop better communication skills. Both of these arguments require viewing motivation as a characteristic of a child, as temperament theory does. Many motivation researchers would argue for a more situated perspective on motivation (e.g., Hickey, 1997), having repeatedly demonstrated that environmental characteristics have a significant impact on motivation. One point of note is that teachers in the study tended to talk about motivation as a characteristic of a child. Three teachers made points similar to this one:

> "I just feel like that's, that's a part of someone's personality, if you've got a good level of motivation about yourself, you're confident and you can take initiative and you can follow through with things, I, I think you're always going to have those tools." (Mary)

Other teachers were less direct, but discussed children who were motivated and children who were not. This may be entirely the fault of the interview protocol, which asked teachers to discuss "a child who is high in motivation and one who is low in motivation". Perhaps personality theories of motivation were inadvertently primed. Still, the interview data show evidence of personality theories of motivation, so perhaps using a personality theory of motivation to explain teachers' relating motivation and communication skills is appropriate. For now, we will conclude that teachers certainly believe motivation and communication skills to be related, and suggest that future work directly investigate this connection by assessing both sets of skills.

Helplessness/independence. Teachers described children with low motivation as giving up easily, saying "I can't," and having low confidence. These characteristics are similar to those described by Harter (1981) and Lepola (2004) as helpless behavior. Children with high motivation, on the other hand, were described as persistent, independent, trying independently to solve problems in many ways, exploring things on their own, and figuring things out on their own (six teachers said this). Both Harter and Lepola view independent behavior as not only indicating motivation but also as an indicator of successful development. It is important to note that teachers did not describe help seeking as a lack of motivation. Only help seeking before an honest effort had been made was viewed as a sign of low motivation.

Extrinsic motivation. It was a surprise that several teachers mentioned sources of children's extrinsic motivation to achieve. Both preschool contexts were highly focused on fostering children's intrinsic motivation. Still, several teachers mentioned that children are motivated to be ready for kindergarten, to be able to do what their friends do, to please teachers, to be able to do what their siblings do, or to please their parents. Fortunately, no teachers mentioned these extrinsic forces in the context of low motivation. The interview data suggest that external forces are affecting children in an approach valence (e.g., "I want to be able to read as well as my friend") but not in an avoidance valence (e.g., "I'm sad because I don't know my letters like my friends do"). While motivation researchers continue to debate the value of performance approach goals (e.g., Midgley, Kaplan, & Middleton, 2001), they do not appear to be universally harmful and have been found in some studies to lead to increased achievement (see Pintrich & Schunk, 2002, for a review). Butler (1989) reported preschool children making social comparisons for the purpose of learning, and not comparing their relative abilities. From the teachers' quotes, it is impossible to judge the cognitive processes in which children were

engaging. For now, we will simply note that teachers are aware of children's extrinsic goals, consider them a part of children's motivation, and do nothing in the classroom to foster such goals.

Knowledge and skills. Teachers discussing children with high motivation made frequent mention of their superior knowledge, skills, and enjoyment of academics. They discussed children with big vocabularies (see discussion of communication skills, above), children who could read and write, children who were smart and knew a lot, and children who liked books, academics, and words. What is interesting is that children with low motivation were never mentioned as having lower skills than their peers. Every available theory of motivation has linked greater motivation to greater competence, so the idea that children who are more interested and who are more persistent know more is not surprising. But do children with low motivation know less? Recall from chapter 6 (see Table 29) that children in the bottom quartile of persistence scored significantly lower than their peers in each measure of achievement (teacher-rated as well as directly assessed reading and math). The magnitude of the difference in Woodcock-Johnson scores was tremendous. Yes, this reflects the contribution of their lower self-regulation as well, but it seems safe to say that children who are less persistent are also less motivated. It remains an open question why teachers made the link between high motivation and high achievement, but not low motivation and low achievement. One hypothesis is that, because preschool is not academic, teachers are not regularly evaluating their students' academic achievement. They may not have considerable expectations for what children should know at this age, and so "low achievement" may not really exist for these teachers. High achievement would stand out (because it's noticeable when a four-year-old is reading out loud), but a lack of

knowledge of letters and numbers would not be seen as deficient. Preschool may be an academic context where one can succeed, and achieve at very high levels, but one cannot fail.

Self-Regulation

As with motivation, teachers' descriptions of high and low self-regulation closely mirrored each other. Indicators involved following the routine (not following the routine), emotion regulation (negative emotionality and lability), focus and attention (lack thereof), impulsivity (lack thereof), positive behaviors (negative behaviors), and self-directedness (only a characteristic of high self-regulation). Given a view of self-regulation as both emotional and cognitive, we see three types of categories: emotion regulation, cognitive self-regulation, and classroom functioning. Classroom functioning may be a direct result of emotional and cognitive regulation, as will be discussed.

Routine. Teachers discussed difficulty with the routine (not following rules, doing one's own thing, needing lots of reminders, and tough transitions) as a hallmark of low self-regulation. Children with high self-regulation were described as following the rules, following the routine, asking questions about the routine, following directions, and transitioning well, among other things. It is possible that all of these indicators are the result of emotional and cognitive self-regulation as theorized. For example, children with better working memory skills likely need fewer reminders, remember the rules better, remember directions that are given, and remember the routine better from day-to-day. In addition, children with better emotional self-regulation skills are more likely to transition well between activities. When teachers discussed difficult transitions, they spoke of emotional meltdowns when children had to stop doing preferred activities. Children with better emotion regulation skills are likely to handle transitions better. Therefore, I will argue that the self-regulation indicators that teachers provided that dealt with

following the routine are in line with existing theories of self-regulation (e.g., McClelland et al., 2007; Miyake et al., 2000).

Emotion regulation/lability. Although the theoretical framework for this study used a definition of self-regulation as working memory, attention control, and response inhibition (see McClelland et al., 2007; Ponitz et al., 2009), it was clear from the first interview that teachers considered emotion regulation to be a major component of self-regulation. Blair and Diamond (2008) have argued that cognitive and emotion regulation are related components of self-regulation. So, despite our quantitative focus on cognitive self-regulation, the qualitative data include much about emotion regulation. In a sense, the teachers were simply using a broader theoretical perspective on self-regulation than we were. Children with high self-regulation were described by eleven teachers as being able to calm themselves or self-soothe. They were also described as being able to talk about their feelings, handle frustration, and being slow to anger. In contrast, children with low self-regulation were described as whining, crying, exploding, being easily upset, quick to anger, easily frustrated, hard to calm, and needing adult help to solve socioemotional problems. One teacher described a child who would get so upset, he would vomit. Teachers also described these children as lacking persistence (specifically when frustrated). All of the behaviors described are completely in line with theoretical conceptions of emotional self-regulation (e.g., Bronson, 2000; Blair & Diamond, 2008).

Focus/attention. Children with high self-regulation were described as listening and paying attention by give teachers. They were also noted to be able to focus. In contrast, children with low self-regulation were described by three teachers as not paying attention, three teachers as not being able to focus, and by one teacher as distractible. These descriptions align well with our componential definition of self-regulation, which includes attention control.

Impulsivity. Children with low self-regulation were described as impulsive, all over the place, high energy, having difficulty waiting, fidgeting, having a hard time stopping behavior, and not being aware of their bodies in space. Again, this aligns nicely with our working definition of self-regulation, which includes response inhibition. Many of these descriptors appear as questions on the teacher rating scale of self-regulation (see Appendix A). The discrepancy comes with being aware of one's body in space (mentioned by two teachers in low self-regulation and two different teachers in high self-regulation). Teachers described children with low self-regulation as bumping into others or not spacing themselves out properly for group activities, or placing their bodies in locations that were inconvenient (for example, lying on a walkway). This could reflect poor response inhibition. Response inhibition involves suppressing a dominant response and activating a subdominant response. In this case, the dominant response could be "I wanna fling my arms around" and the subdominant response could be "I need to check to see if there is space around me". Just as waiting one's turn requires response inhibition (repressing the "I want it now" response for the "I need to be patient, other people are waiting" response), being aware of one's body in space could require response inhibition. It is not a characteristic of self-regulation that is popular in the literature, but it is logically consistent with other examples of response inhibition.

Teachers nicely mirrored these descriptions with indicators of positive self-regulation. These included monitoring one's own behavior, raising one's hand, controlling one's self and one's body, being able to stop activities, waiting, thinking about consequences before acting, keeping one's hands to oneself, not grabbing things from friends, being able to sit, and general self-control. These behaviors are all positive indicators of response inhibition. In this category as well, teachers' definitions of self-regulation align well with established theory.

Behavior. Teachers described children with high self-regulation as engaging in various positive classroom behavior, such as using indoor voices, using their words, apologizing, sharing, telling the teacher when there is a socioemotional problem, and helping others. Using one's indoor voice is a sign of response inhibition. Using one's words (instead of hitting), apologizing, and getting a teacher when there is a problem are all signs of emotion regulation. Sharing is a prosocial behavior; sharing could possibly be linked to delay of gratification, which is another part of self-regulation. Helping others is a prosocial behavior as well, and could indicate good emotion understanding (children were discussed as helping others solve problems when the other children were frustrated or in a conflict). Although the positive behavior category is somewhat widespread, links can be made between self-regulation skills and these positive behaviors.

Children with low self-regulation were described as engaging in a variety of negative behaviors, some of which are more readily linked to self-regulation than others. For example, children were described as putting their hands on others when upset, being aggressive, using nasty tones of voice, ruining their work when frustrated, and not being able to communicate when upset. These all seem to be problems related to emotion regulation. Being destructive involves not following classroom rules (working memory, perhaps) and a lack of response inhibition or impulse control. Other indicators are more difficult to explain. For example, being overbearing with peers seems more like poor social skills, although theoretically it could involve not reining in one's feelings and desires (emotion regulation and response inhibition). The last two indicators on the list, eating worms and licking people, were descriptors of the same child. One could argue that these both involve response inhibition, or not activating the subdominant responses of "only food goes in my mouth" and "people don't like to be licked".

One issue with this argument – and the one advanced above, where not following the rules was attributed in part to working memory and response inhibition – is that working memory and response inhibition are skills. To make the argument that licking people, eating worms, breaking things, or not following the rules are indicators of self-regulation is to ignore the issues of motivation and free will. Response inhibition gives one the *ability* to stop oneself from licking others, but it does not *force* someone to stop licking people. If one is very, very motivated to lick other people or eat worms, that motivation can override the response inhibition. To inhibit a response, it is necessary to have both the ability to inhibit the response and the desire to inhibit the response. Rachel's quote in Chapter 5 illustrates this perfectly. She argues that one has to be motivated to be self-regulated, and that her desire to not face a consequence is what motivates her to inhibit her desire to punch someone. So it is important to ask, when labeling negative behavior as poor self-regulation, whether the child is actually *trying* to self-regulate and failing, or if s/he is unmotivated to self-regulate. Preschool teachers, who are a particularly nurturing group of people, are unlikely to believe a child is simply "being bad" or misbehaving for the fun of it. And self-regulation is currently a "hot topic" in early childhood education (see, for example, the website of the National Association for the Education of Young Children, www.naeyc.org). One implication of this focus is that teachers may be primed to see negative behavior as indicating poor self-regulation rather than willful misbehavior. This could lead to situations where teachers simply wait for children to grow out of the behavior, or work on intervening with self-regulation skills, instead of punishing and extinguishing the behavior. Punishing preschoolers will never be a popular stance, and it is not being advocated here. Instead, perhaps educating teachers about the joint roles of motivation and self-regulation in

misbehavior may help them make more accurate attributions for the causes of misbehavior and may help them deal with misbehavior more effectively in the classroom.

Motivation and Self-Regulation

For the most part, teachers reported quite different indicators of motivation than of self-regulation. For low motivation and self-regulation, the overlapping indicators were frustration, being all over the place, and low persistence. So, as noted in chapter six, teachers' views of persistence match the quantitative findings from the data: low persistence may indicate poor self-regulation or motivation. "Being all over the place" indicates both behaviors just as arguably. Children who lack drive, or interests, may wander from activity to activity rather aimlessly in the classroom. But so could children who lack attention control skills, who are distractible, or who impulsively shoot from one idea to another. Two teachers described children with low motivation as easily frustrated. One idea that occurs is that if children are less motivated to engage with a task, they will exert less effort to master their frustration and continue working. Here, again, is an argument that motivation may activate self-regulation, and in the face of low motivation, emotions may not be regulated as well. The quantitative data in this study show that frustration is correlated with lower persistence, but perceived competence and task value were not correlated with frustration. Similarly, in Berhenke et al. (2011), frustration was not correlated with interest. Therefore, our data cannot support the assertion that less motivated children are more easily frustrated. It would be interesting to follow up with the teachers who described this to better understand the phenomenon.

High self-regulation and high motivation were more closely related in terms of the indicators teachers used to describe behavior. Again, persistence was mentioned in each category by three teachers. For the most part, descriptors in every self-regulation category were unique,

with the exception of "self-directed". Several responses fit into a category loosely labeled self-directed, or perhaps even self-determined, and these were not discussed under the heading of self-regulation because self-regulation theory does not predict any of them directly. Several of these responses are more closely related to motivation, which suggests that at least when considering positive behavior, teachers consider motivation and self-regulation interchangeably. For example, the first indicator is "follows interests". This indicates motivation, but it arguably indicates self-determined behavior. According to SDT, people are most self-regulated when they are engaged in intrinsically motivated behavior (Ryan & Deci, 2000). The second indicator is "solves problems on own", which fits readily into the Independence category of motivation indicators, as does the third, "does activity on own". Children were also described as conscientious, "together", making their own choices, assertive, and delaying gratification. Delaying gratification is the only indicator in this category that fits neatly in with self-regulation theory. Conscientiousness could reflect response inhibition, or it could reflect moral development. Assertiveness is a communication and social skill, although arguably it can only be achieved once we have managed emotions like anxiety and anger. Being generally "together" indicates not having problems. Perhaps this is the pinnacle of self-regulation – when one has oneself together, one's emotions are calm, one remembers things well, one is focused, and in control. Perhaps it is related more to being confident and happy. Further probing of several of these indicators would clarify this picture. The general impression this "self-directed" category leaves is that there are behaviors that kids who are motivated and self-regulated engage in, and teachers, who think about self-regulation constantly, label them as self-regulation.

Overall, with the exception of just a few adjectives, it can be concluded that teachers' definitions of motivation and self-regulation actually align neatly with academic theories.

Furthermore, teachers use these definitions when they identify children perceived to be struggling with motivation and self-regulation. Conceptually, researchers and teachers seem to be on the same page.

Chapter Nine

Research Question Six

How do teachers choose courses of intervention for issues identified as motivational problems vs. self-regulatory problems?

Results

Qualitative results

Teachers were asked what they do in the classroom to foster motivation and self-regulation. While there were some similarities in teachers' responses across subjects, teachers' interventions and general practices tended to correspond to either motivation or self-regulation as teachers defined them.

Motivation. Thirteen of the 18 teachers interviewed mentioned uncovering children's interests and then building off of or planning around those children's interests. Teachers would often think of skills that particular children needed to work on, and then plan the activities around the interests of those specific children. Kelly explained,

> "I think the biggest thing is that we really try to do planning based on the children's interest. Um, which brings up a lot of motivation because those kids who are really interested in, you know, certain things and only get motivated when [laughter] it's something that they're interested in [laughter] um, we can kind of plan activities that are based around that interest and then put in what we need to see, you know…And that motivation was all driven by taking the interest of one child and putting it into an activity just to see what that one child would do, you know."

While teachers generally found this to be a successful strategy for increasing interest, some

teachers felt frustrated when they planned an entire small group activity around the interest of one child who turned out not to be interested. Still, this is a popular teaching skill, particularly advocated by the preschool curriculum that many of the teachers were using. One teacher was even craftier in her explanation. She told about a group of boys whom she needed to get to practice fine motor skills by dressing the classroom's dolls. This group, she said, was only interested in trains. So, she said,

> "I would say we're gonna take a train ride with the dolls but they have to have their clothes, you know it would be the way that I would approach it…you have to kind of use your words to to get their interest in order to get them to focus and to want to to try something." (Melissa)

Indeed, the dolls were dressed and the activity was a success.

Nine of the 18 teachers talked about using encouragement instead of praise, which is another tenet of the preschool curriculum they used. Todd explains the difference:

> "We try and foster a lot of self-confidence and I feel like that's a big one for motivation. We hmmm, we don't do praise, we do encouragement which is to say, the child writes their name, "Wow! You wrote your name! Look at how much better…" You point out the things that they did, you point out any improvements that they've made, things like that. You don't just say "Wow, that was great, you really…you impressed me" or something like that. You tell them what they did so that they know inside of them what they're doing well."

Other teachers mentioned similar ideas such as fostering self-confidence, using validating language, providing lots of teacher support, and making sure that the environment is intrinsically motivated – no rewards.

Six teachers mentioned teacher enthusiasm and having fun as essential to motivation. Two more added that it is important to be flexible and to model skills on the child's level. Patty, who is a fun teacher, shares her philosophy:

> "... if you can't have fun, you're gonna lose them all…If you can't be silly and switch things up and not necessarily... So they have to adapt. They... they have to be able to do things differently. Um, we took the kids down to the gym the other day, and I was doing head shoulders knees and toes. That's not how I do it. I will do it: bellies, hips. So they really have to listen...And they have to listen through all of their giggling…And just changing things up so it's fresh and fun."

When children are having fun, she says, children will enjoy school more and be more motivated.

Another set of strategies advocated by teachers involved individualizing the learning process. Teachers discussed strategies such as using open-ended materials so that children could set their own goals, providing choices, not pushing children, and showing them different opportunities as important for motivation. These opportunities allow children so set their own goals with regard to learning. One teacher explained the importance of one's own goals:

> "I think just meeting kids where they are and, like I said, you know, um, really recognizing efforts…um, versus accomplishments is probably the biggest thing…I think if you're always trying to live up to someone's expectations, um, you may always feel like you're falling short. But if you're setting standards for yourself, um, if you already know what you can accomplish or how much you can do, then you're meeting them much quicker." (Crystal)

Other teachers mentioned the importance of building children's confidence before challenging them, build good relationships with children, scaffolding their learning to increase challenge, and teaching in baby steps when children resist difficult tasks. Not only do these strategies increase learning, but they increase a child's sense of importance as well, according to Kelly:

> "Scaffolding their learning … anytime that you do that you're gonna increase motivation in children because they feel like they're a valuable member of the society of the classroom because you're taking what they're saying and what they're doing and you're taking it to the next level, you know, and helping them kind of expand on that. And I think that expands their motivation."

Teachers provided some uniformity in their responses to interview questions, showing the effectiveness of their training, but also provided unique and interesting ways to build children's motivation.

Self-regulation. Ten of the 18 teachers interviewed discussed acknowledging children's feelings as a central component of their strategies to improve self-regulation. After children's feelings are acknowledged, teachers can apply other strategies, like teaching children the power of using their words, using calming touch, giving them suggestions when their frustrated, and getting children to identify coping strategies. Several teachers explain:

> "Like when we see it, we use that word "You look really frustrated," or we've said "You know what, teachers are feeling really frustrated right now. We are frustrated because we have to stop again." So we use the words if they're getting familiar with it and with the feeling, um but I think yeah, it's important in so many different ways for them, just to even be able to say – when they start crying, you know – we talk about taking a deep breath and then telling them "Calm your body. Take a deep breath. Okay, are you ready to talk now? Tell me what happened. Oh, so you're frustrated because so and so did this." So, we're trying to help them learn how to – I guess – regulate their body, and not let their emotions take all over." (Susan)

> "I think we mostly just try to communicate about it with the kids. Um, and again kind of give them the opportunity to identify what they need to self-regulate… we might say: 'You know what you're so sad because you don't want mom to go. What, what will help you right now? What do—what can you do?' Um, and they might be able to identify. You know, 'I need a hug, I need to write her a note, I need to go get my blankey'—those kinds of things. Um, and then just really try to support what they need or however long they need it, um, so they can achieve that. (Crystal)

> "We help them with that, one by validating what they're feeling…You're frustrated about that, and then talking through it I think that's what we do a more than anything is talk them through it. You're frustrated that your shoe won't go on that foot, I wonder what we can do about that. How do you think we can do that differently? And just talk it, talk with them through it...And you know we wouldn't just do it for them if they were frustrated. You know we have this saying of respect the struggle because we know that it's going to get them to where they need to be, so we try to do that." (Helen)

This process, of helping children identify their emotions and calming them down, usually leads into another component of the preschool curriculum that sixteen of the teachers use, which is the six steps of problem solving. Todd explains,

> "What we do is we sit down with the children and we try, I can just go through the list right there, our steps of conflict management. We just go through those, we identify the problem with the children, we put ourselves in between them to stop any conflict that's still continuing, we identify the problem, we acknowledge the children's feelings, we talk about possible solutions and then we agree on a solution that both kids can deal with."

Elizabeth discusses how well the problem-solving method works:

> "Always acknowledging their feeling so they know that we know that it is okay to feel that way. Um, then depending on what they are frustrated about, we have them tell us about it…Oh so how are we going to solve that problem to make you feel better? So we just kind of go through the six steps of problem solving, um, that we do here… it is amazing how calm they do get because they are in control. They are deciding what is going to work for them. They are understanding that we know that they are frustrated... so... and being at their level and keeping a calm voice, things like that really help too."

Sometimes, problem solving consists of helping children negotiate sharing of materials, or conflicts with friends. Often, problem solving has to do with helping the child learn to regulate his or her emotions. Teachers partner with children in finding these solutions. Kelly helps her students meet their emotional needs with more appropriate behaviors. She says,

> "Redirecting, um, and just giving them, you know, if this is the child's need and this is what they're showing you, how are ways that we can meet that in other ways, and I think that when you do that the child feels like 'Okay my needs are being met,' and it helps them to learn that self-regulation of 'Alright, well I can't hit friends but I can clench my fist or but I can throw squishy balls at the wall,' you know, [laughter] 'When I'm frustrated I can do other things that will help me to feel better but I can't hit friends. Dang it,' you know? I think you develop and kind of, um, foster that self-regulation when you show them that, um, there are other ways, you know, to kind of meet their needs."

Most of the emotions that teachers are trying to contend with involve frustration. There are multiple strategies for dealing with frustration. Teachers go out of their ways to help children deal with academic frustration, including helping them find strategies for getting help and the teacher doing modeling at the child's level. Open-ended activities are also helpful in this process:

> "I think we give them different activities where there are lots of ways for it to be completed, there's not one right way to do something. I think maybe that can help

> with frustration. Or we also have them communicate with other preschoolers and they can ask them for help. Um, yeah, or we can demonstrate of like how we would do something, like if they are having a hard time writing cause of the way they hold their pencil, we would not correct the way they were holding their pencil, we could say "This is how I'm holding my pencil." So maybe modeling different things to help them complete a task." (Ashley)

In this way, the child does not face the additional frustration of being corrected, but learns new strategies to get through the frustrating task. These are also strategies that help children learn to persist.

Not all of teachers' strategies are about regulating emotions, although a large proportion of them are. Patty touches on another facet of self-regulation when she talks about how teachers plan activities to meet children's needs:

> "I think you have to be aware of time, and how long these kids really can sit…Hello, they're four. So I think you have to be very aware of what their level is and build into your day time they don't have to regulate. Where they can just do what they want. And it's a give and take. And it's easier for them to learn how to do it if they know that they don't have to do it for the whole day."

She has noticed that children have a developing ability to do things like sit and listen, and that teachers really need to understand their students to plan appropriately.

Kelly also recognizes the limits of children's inhibitory control during the school day, and makes plans to facilitate activities where inhibition is necessary.

> "You know, especially like, you know, if it's moving down the hallway and you that a child has no reg—[laughter] no regulation as far as like sound loud or quiet, you know, making a game out of it: 'Okay so we're gonna be mice. We're gonna move down the hallway like mice,' or whatever it may be."

By using strategies like these, she not only improves the outcome (the children move down the hall quietly), but she turns it into a game, so instead of children trying hard to be "good," they are having fun playing a game.

Other strategies suggested by teachers are to develop close, personal relationships with the students (which make it easier to prevent frustrating situations and easier to calm the children), explaining the consequences of non-regulated behavior, capturing children's attention with songs and chants to improve attention control, and modeling words and behaviors that lead children toward more self-regulated interactions.

Discussion

Motivation Strategies

Teachers' strategies for fostering motivation all center on promoting intrinsic motivation. Teachers were quite deliberate about this, especially when discussing the importance of encouragement versus praise. This is a strategy developed by the authors of the preschool curriculum that 16 of them used, and their explanations of why they used it were uniform. Encouragement helps children see what they can do on their own, and promotes persistence and self-confidence, while praise teaches children to comply with external standards and seek social approval instead of judging their own work. Not all forms of praise are equal in terms of their effect on young children's motivation. A careful look at the results of Kamins and Dweck's (1999) study of person-based, outcome-based, and process-based praise reveals that children's product ratings, self-assessments, affect, and persistence were all quite high for children in the process-based praise group. Research on encouragement versus process-based praise has not been widespread; a search of the topic reveals it to be a hot-button issue on parenting websites but not in academic articles. It seems that there might still be a role for process-based praise in the classroom, even in one where the focus is encouragement. A typical comment for a teacher using the aforementioned preschool curriculum would be, "I notice you used a lot of colors in

this picture," whereas process-focused praise might be along the lines of "Look at carefully you held your crayon so you could draw straight lines!" These preschool teachers put a lot of time and effort into commenting on children's processes very neutrally so that children learn to be the judges of their own success. But it seems that a valuable learning opportunity is being missed. If a child is praised for learning to move the paper instead of the scissors when cutting shapes, he or she might acquire that skill faster than he or she would with the teacher neutrally commenting. Before becoming advocates for encouragement versus praise, it seems important to assess the effects of encouragement versus process-focused praise on children's motivation and learning.

Another facet of the preschool curriculum in use is planning activities around children's interests. Thirteen of the 16 teachers using this curriculum mentioned this strategy. It is important to again note that, in these preschools, no child is required to engage in any activity. If a child does not care for that day's small group activity, he or she may make another choice. Therefore, it is critical that teachers make the activities as compelling as possible, particularly focusing on the interests of the children who most need to develop the targeted skill. Of course, in an ideal world, everyone would be interested in all of their activities. From the standpoint of intrinsic motivation, this classroom setup is ideal. Teachers did note, however, that it took a tremendous amount of their time and effort, and it could be quite frustrating to plan an activity around the interest of a specific child and have him or her simply look at it and make another choice. Debating this practice requires specifying the goals of a preschool education. If the goal is to make children love school and to socialize them, then this practice is ideal. If there are school readiness and specific skill goals in mind, this becomes rather difficult. In many kindergartens, children are required to participate in activities and often to even complete the activities. One wonders if children who have never been required to complete an activity in

preschool will adjust well to the new expectations. Furthermore, when children really need to learn a particular skill, it may take superhuman effort on the part of the teachers to design an activity to make them stay at the table.

Another concern is whether letting children give up an activity whenever they want to might not be helping them develop persistence. School success often requires persisting at something that is not entirely enjoyable. At some point, this skill will need to be developed. Does it need to be developed in preschool? It is not clear. A final concern is for the development of interest and further intrinsic motivation. The teacher is working to develop activities that specific children are interested in and will choose to do. This is analogous to the parent who prepares specific meals that his or her family will like. The nutritional equivalent of this instructional plan is to hope that children will consume a balanced diet even when they are allowed to refuse any food they want. Many children will. But some children will staunchly refuse any form of vegetable, prepared in any way, any time it is offered. And every parent who has coaxed a child – "Try it! You might like it!" – now understands the process of teaching in this way. When children will not try activities, how can they develop new interests and skills? So despite the fact that motivation theorists will almost certainly embrace a curriculum designed to be interesting – of course school should be interesting – it should not be forgotten that there is a tradeoff between intrinsic motivation and learning to do what one has to do.

Teachers were focused on helping children build confidence and acquire new skills. Several teachers mentioned scaffolding as a way of building confidence, that is, breaking down a task and providing an appropriate level of support at each step so that the child experiences success. Teachers mentioned using "baby steps" as well, and of course, encouragement to build self-confidence. Another approach teachers use is designing open-ended activities and providing

materials for creative use. Open-ended activities foster confidence because a student can be successful regardless of the direction in which he or she takes the project, while closed-ended activities are thought to undermine confidence when the child's product does not match the teacher's model. Along these lines, teachers talked about modeling at the child's level. Todd explained that if his small group was drawing pictures, he would draw a simple picture at a child's level, because if he draws something elaborate, children will compare their skills unfavorably to his. On the other hand, seeing that they can draw something like he can draw fosters confidence.

Finally, several teachers made important points about the importance of developing warm, personal relationships with children, encouraging them, being enthusiastic and fun, and being flexible and letting the children lead sometimes. This matches a widely-held stereotype about the type of person who teaches preschool. ☺

Self-Regulation

Cognitive self-regulation strategies. Several teachers discussed strategies for improving response inhibition skills and attention control. Patty discussed the importance of planning activities with consideration for children's self-regulation skills. For example, when choosing a story to read, think about how long three- and four-year-olds can be expected to sit and listen. An extension of this idea is to increase the sit time gradually over the course of the year, by a few seconds at a time. Plan for and help students develop those response inhibition skills. Kelly offered a terrific strategy for helping children control their voices, also (see results, above). If her students are having a rowdy day, and they need to walk quietly down the hall, she finds a way to make it easier, like having the children pretend they are mice. This may be helpful because it

motivates her students to self-regulate – it is fun to pretend to be a mouse – which may increase their use of self-regulation. This is only a strategy that works if children already have the ability to walk quietly, but in this case, the children did, and the game was quite successful. The extension of this idea is that when students are having trouble self-regulating (when the class is having a "wild" day), find a way to motivate them to self-regulate. Finally, several teachers talked about getting and maintaining children's attention. Kelly explained that to get children's attention, she usually sings a song or does a finger play that captures their interest. Samantha discussed taking "attention breaks" during large group time. She explained that she and Elizabeth could tell when they were starting to lose children's attention, and at the beginning of the year, they used to try to just push through it and keep going so they could finish. But they realized that by monitoring students' attention, and interspersing songs and games and movement with activities like stories and message board, that they were able to maintain student attention for much longer.

Emotion regulation strategies. The majority of the self-regulation strategies offered by the sixteen teachers using the same preschool curriculum were focused on helping children learn to manage their emotions, especially frustration. Many teachers talked about the importance of acknowledging and naming children's feelings, which makes children feel understood and helps children develop emotion understanding. Teachers would then try to get children to use their words to explain why they were feeling that way and give suggestions on how to cope. Quite a few teachers mentioned the six steps of problem solving or conflict resolution that has been developed by the authors of the preschool curriculum they use. Todd explained to me why using the six steps of problem solving is worth it. If two children are having a conflict over sharing cars, and the adult steps in and divides up the cars, only the adult has practiced problem solving.

The children have not developed any skills for resolving the same problem when it comes up the next day. So even though the process of stopping the conflict, listening to the problem and defining it, acknowledging feelings, and coming up with a solution that is acceptable to both parties can take a long time and a lot of patience, over time, children learn to solve problems because they are the ones who are practicing finding solutions. Kelly had a student who had been in the preschool for three years, and she explained that the child had gotten so good at the steps of problem solving that she would step in and mediate for other pairs of children when they had conflicts. Finally, teachers talked about helping students manage frustration specifically with activities. They use many of the same strategies that they use to build self-confidence, specifically, open-ended activities and child-like modeling. The goal is to prevent children from feeling frustrated because they cannot work at the teacher's level. Teachers also spend a lot of time teaching children appropriate outlets for their frustrated and angry feelings. As Kelly said (above), children can throw squishy balls at the wall as hard as they can, but they can't hit friends. In all, it seemed that teachers spent a lot of time and effort structuring the environment to prevent frustration and helping children calm down from frustration.

Teachers provided an interesting set of intervention strategies for working with children struggling with motivation and self-regulation. One helpful change to the interview protocol might have yielded a richer data set. Once several teachers had mentioned the same few strategies, it would have been interesting to ask the rest of the teachers if they had any strategies besides those. The effect of teachers' training is clear – teachers know the program strategies, and they know why and how and when to use them – but most of the teachers gave the same answers. It would be interesting also to interview teachers who use different programs and those with different training to yield a larger set of responses.

Chapter Ten

General Discussion

These results tell three interrelated stories about the theoretical conceptions of motivation and self-regulation, their importance for preschool learning, and potential interventions to strengthen these skills. The purpose of research questions one, two, four, and five was to clarify theoretical and definitional issues with motivation and self-regulation: how are motivation and self-regulation related, where does persistence fit into this relation, and how do teachers conceptualize these ideas? Research question three asked how important motivation and self-regulation are for children in preschool. Finally, research question six built on the findings of research questions three, four, and five: having established the importance of motivation and self-regulation for preschoolers' learning, and in the context of how teachers perceive these concepts as affecting learning-related behavior, what are some ways teachers intervene to improve children's skills?

Theory

The investigation into the relation between motivation and self-regulation was an important step because although theories of self-regulation have been extensively studied in preschool-aged children, theories of motivation were generally developed with older children or universal principles in mind, and all prior work connecting motivation and self-regulation focused on self-regulated learning and its relation to motivation in older children and adults. Previous findings showing that motivation and self-regulated learning are related skills and mutually influential suggested that such an investigation was necessary. The results of this study

do not provide conclusive evidence regarding the nature of the relation between motivation and self-regulation at this age. Rather, results suggest that estimates of the strength of the relation differs depending on how and when the constructs were measured. Teacher ratings of children's behavior suggest that motivation and self-regulation are distinct and moderately related constructs. Child assessments suggest that motivation and self-regulation are distinct constructs that are empirically separable and correlations between the constructs vary depending on the sub-constructs (e.g., working memory, perceived competence) being assessed. The hypothesis that motivation and self-regulation are so intertwined as to be empirically inseparable (see Figure 2) can be dismissed on the basis of confirmatory factor analysis with child-level data. The prevalence of correlations between motivation and self-regulation constructs and the strength of the confirmatory factor analysis results of the teacher-rated data suggest that the hypothesis that motivation and self-regulation are distinct and related constructs (see Figure 3) is better supported.

Figure 3 gives us a different way to consider the nature of persistence. In research question two, correlations between various assessments of motivation, self-regulation, and persistence were examined. The motivation and self-regulation scores of children very low in persistence were also reported. It is easy to lose sight of the narrative about persistence by examining the individual correlations. Several conclusions about the correlations can be drawn. First, while the magnitude of the correlations between persistence and other measures varied, the direction never did. On average, persistence was correlated around .20 with motivation and .30 with self-regulation measures. Second, children who were in the bottom quartile of persistence scored considerably worse than their peers on all academic measures. Third, *t*-test results supported the correlations: children in the bottom quartile of persistence had lower motivation

and self-regulation scores on every measure showing significant differences. It follows that persistence is related to both motivation and self-regulation, and that it is an important early learning behavior. Considering Figure 3, persistence fits nicely into the circle labeled "observable behavior." Persistence is observable, and it makes theoretical sense to consider it an outcome of both motivation and self-regulation. Persistence requires both wanting to pursue a goal and having the cognitive skills to remember the directions to the task, control one's attention, and inhibit responses to distracting stimuli. This study supports the conclusion that persistence is a product of motivation and self-regulation.

Research questions four and five explored the theoretical definitions that teachers use when observing and intervening with students. Previous theoretical papers discussing motivation and self-regulation have focused on academic conceptions. From a practical standpoint, how teachers understand motivation and self-regulation is essential. If motivation is not solely a matter of personality or temperament (and most theorists believe it is not), then children's classroom environments may influence their motivation. Interview data showed teachers to be concerned with student motivation and revealed that teachers make instructional decisions based on their understanding of student motivation. Therefore, a complete consideration of the influence of classroom environments on student motivation must include an understanding of how teachers define motivation. Similarly, preschool teachers are bombarded with information about self-regulation. They will interpret this information according to their own understanding of what self-regulation means. If researchers hope to communicate clearly with teachers, we need an understanding of teacher knowledge (just as with any instruction, where understanding students' background knowledge can make all the difference between success and failure). One purpose of this study component was to lay groundwork for understanding existing teacher

interventions for motivation and self-regulation and how we may develop new intervention techniques.

Two findings stood out from this exploration: one, teachers are using a general, atheoretical view of motivation in their practice. Many indicators of motivation listed could be argued to belong to several different theories. Intrinsic motivation is the dominant theoretical approach that preschool teachers are using. Second, teachers use a full, unconstrained definition of self-regulation. While this study considered a componential view of cognitive self-regulation, teachers considered a broader view that includes emotion regulation and delay of gratification. This is more consistent with a broad view of self-regulation (Bronson, 2000) or a view of executive function that includes "hot" and "cold" components (Zelazo & Cunningham, 2007). Teachers are particularly concerned with frustration tolerance. Notably, this study assessed frustration as an academic emotion but without meaningful theoretical predictions about the relation between frustration and motivation. Still, frustration was entered into regression models and was a significant negative predictor of children's reading growth. Almost by accident, the data supported what teachers explained: emotion regulation, and particularly frustration tolerance, are important for learning and functioning in preschool. Future studies should include fuller definitions of self-regulation, as well as examining the link between emotion regulation and motivation.

The Importance of Motivation and Self-Regulation for Preschool Learning

The results of research question three underscores the importance of the rest of the dissertation questions. All theoretical work is meaningful, and understanding teacher thinking helps us connect theory to practice. Those who are more focused on factors that promote learning will be most interested in how motivational and self-regulatory factors support early learning.

While definitive causal relations are impossible to determine from these data, it has been demonstrated that both motivation and self-regulation are important predictors of student learning in preschool. Notably, only motivation was shown to be important for reading growth in this sample. This is a critical finding, as there is little research on preschoolers' motivation and a great deal of focus on preschoolers' self-regulation. These findings suggest that both motivation and self-regulation are good focal points for intervention. One question for further exploration is, given that motivation and self-regulation are related processes, do children with greater motivation develop self-regulatory skills more quickly? Do children with better developed self-regulation skills develop greater motivation? If so, then a motivational intervention would affect not only reading skills, but also math skills, via improving self-regulation. The next step for this line of research is clear.

Intervention

Interviewing teachers about the processes they use to intervene with children struggling with motivation and self-regulation provides important information for developing future interventions. First, when more than 70% of the teachers interviewed report using the same practice, and report that it is effective, that indicates particular relevance of that practice. This dissertation does not report the full details of each intervention practice (this will be published separately), but summarizes common practices used effectively by teachers to boost self-regulation and motivation skills. These common practices are important to include in future interventions. Second, teachers feel efficacious about improving children's motivation and self-regulation skills. Teachers reported wanting to know even more to be able to reach struggling students and feeling frustrated that training did not focus enough on these skills. This indicates teacher motivation for participating in such a motivation and self-regulation intervention. Third,

training is effective for shaping the practices of preschool teachers. The practices mentioned as effective repeatedly by teachers were often those promoted by the preschool curriculum they were using. Teachers' flawless explanation of how and why those practices work suggests that training teachers to use similar practices will be highly effective.

Limitations

There are several limitations of this dissertation, several of which need to be considered alongside the results. First and foremost are characteristics of the sample that make generalizing these results to a greater preschool population unwise. The children studied were overwhelmingly affluent and Caucasian or Asian-American. There were no African-American students in the sample, and only one student whose reported ethnicity was Latino/a. While this does not invalidate the results of the study, further studies need to be conducted with more diverse participants before general conclusions may be drawn about preschoolers' motivation and self-regulation. Conducting future studies with a larger sample would also allow for HLM analyses to parse out classroom and child effects.

Another limitation is the limited data received from families about children's backgrounds. Approximately half of the children's families returned their background questionnaires after they were sent home twice (which, in this sample size, is too little to impute the remaining data). Thus, family background information is limited. In other studies, specially designated research assistants work to get background questionnaires returned. We did not have such resources available. We do have more information about our students than we are able to quantify, however. At our public school site, parents tend to select preschool classes for four-year-olds based on the tuition (more hours per week = a more expensive class; the most expensive class is around $1000 per semester). At our private school sites, sending a child to

preschool full time costs around $1,000 per month. Thus, one can imagine socio-economic differences between children at the two school sites, which is why school type was used as a proxy variable in the regression analyses. Collecting more information about the number of hours per week that children attended preschool would have allowed for calculating the cost of preschool for each child's family based on the programs' tuition rates, and that would have served as a proxy for socio-economic status. Hours per week attending preschool would have been a valuable variable to collect in and of itself, allowing an estimation of the effect that schooling has on children's academic growth. These data will be collected in future work.

The timing of the teacher interview was not as planned, and this may have influenced the teachers' responses to interview questions in certain ways. The original plan was to conduct the teacher interviews in late March-early April, which would have been before the spring data collection. Instead, interviews were conducted in June, after the spring data collection. Thus, the teachers had recently been thinking about motivation and self-regulation as they had just completed our challenge tasks and filled out teacher reports for the participating students in their classes. Reading the items on the teacher reports could have primed their thinking, and conducting the games could have taught them what behaviors we were interested in studying. One way to check this would have been to ask teachers if they considered the teacher reports or the games in forming their answers. In one case, a teacher mentioned forming more of an opinion of a child's self-regulation after watching him play the games. No other such references were made, but in future studies, more carefully timing the components of the study or asking teachers more about what influenced their opinions might be helpful.

Implications

This study has implications for theoreticians as well as practitioners. For those who study young children's learning, a better understanding of the interplay between motivation and self-regulation may inform our understanding of the development of early math and literacy skills. In addition, these results explain why focusing on both motivation and self-regulation provides a better picture of early learning than focusing on just one construct. These results highlight the importance of motivation to early learning, which is a relatively understudied phenomenon. They beg the question of why motivation is more important for reading while self-regulation is more important for math, but suggest that a study of young children's motivation is critical for those wishing to improve early literacy skills.

These results also help us interpret the results of many studies of young children that use persistence as a central variable. For example, the field of mastery motivation has studied the development of very young children's persistence for over 30 years. Suspecting, as we now do, that persistence also indicates self-regulation skills, means that we can review those studies of infants and toddlers' persistence to better understand the development of early self-regulation skills. In a sense, we now know that we know more than we think about early self-regulation.

Understanding how practitioners think about motivation and self-regulation is particularly important for the motivation and self-regulation theorists who spend time debating various theories. How much difference does it make to be an achievement goal theorist, or an expectancy value advocate, or a self-determination theorist, if teachers, the people actually shaping students' motivation, are all three in one way or another? Teachers' beliefs are complex. Doing more to understand how teachers think about motivation may help us better shape motivational interventions than beginning with a rigid theory.

Self-regulation is in a similar situation. Researchers working on developing interventions to improve self-regulation are likely working from one version or another of a cognitive theory of self-regulation – some view of working memory, attention control, response inhibition, and cognitive flexibility or shifting – and may not be simultaneously considering emotion regulation. In teachers' minds, these concepts are very, very related. We need to study just how, in fact, they are related – not using "Hot Executive Functioning" tasks (Zelazo & Muller, 2002) like gambling and delay of gratification, but frustration-inducing tasks that can produce meltdowns. According to the teachers in this study, the most important self-regulatory skill is frustration tolerance, and when children cannot tolerate frustration, it doesn't matter what memory or attention control skills they have. Perhaps self-regulation interventions can focus on both cognitive and emotional regulation, so that when children are faced with challenge, they have the frustration tolerance to persist and the cognitive skills to attend and process effectively.

One final implication of this study is that preschool teachers are a valuable and untapped source of information about children's development and learning. Few studies have interviewed teachers, and the data that our interviews yielded was rich and complex. And it matters what teachers think. When our intervention frameworks don't match teachers' beliefs and conceptions, they may be less likely to be implemented effectively. But when training is sufficient to shape teachers' beliefs and conceptions, interventions can be implemented with high fidelity. Interviewing teachers may even be a good test of fidelity. I was able to pinpoint the important concepts in the preschool curriculum my preschool teachers were using, because teachers repeated those concepts to me in a consistent and clear manner. Finally, teachers enjoy being interviewed. Not only does interviewing produce rich data about beliefs, conceptions, and fidelity, but recruiting participants is easy. Teachers work in isolation. The opportunity to talk

about their methods and practices is often a valuable opportunity. Teachers should be interviewed more frequently.

Conclusions

Motivation and self-regulation are related but empirically separable process that both uniquely and jointly predict academic success. The majority of teachers feel that to be successful, you need both motivation and self-regulation. Motivation is more important for preschoolers' reading growth, while self-regulation is more important for math. Teachers feel that both processes are important in preschool, which is consistent with the data. Persistence, which has been used in research as an indicator of both motivation and self-regulation, actually requires contributions from both processes and is related to academic performance. Teachers tended to believe that persistence in preschool was more due to motivation, but indicated a role for self-regulation in persistence as well.

Teachers' conceptions of motivation and self-regulation are theoretically diverse and complex. Teachers can readily identify whether students are struggling with motivational or self-regulatory issues and can intervene appropriately, but tend to attribute frustration to poor self-regulation (not focusing on tasks) and lack of persistence to low interest (not focusing on self-regulation). Teachers' definitions of motivation and self-regulation are distinct and overlap in very few ways, aside from being self-determined and persistent. Finally, teachers have a wide variety of strategies at hand to intervene when children struggle with motivation and self-regulation, but feel that they lack training in improving motivation.

Appendix A

Teacher Report Measure

Child's Name: _____ Teacher: _____

Child ID: _____ (*to be filled in by the research team)*

We are interested in learning about how this child approaches classroom tasks. Please respond to each of the following items using the scale below.

1: does not describe this child at all

2: does not describe this child

3: describes this child

4: describes this child well

5: describes this child very well

____ 1) Tackles new activities with enthusiasm

____ 2) Capable of making decisions about what to do

____ 3) Seems to take refuge in helplessness

____ 4) Claims to have headaches, stomachaches, or pains to avoid participation

____ 5) Persists when facing difficulty during activities

____ 6) Says tasks are too hard, makes no attempts

____ 7) Resistant or fearful about new activities

____ 8) Is eager to talk about his or her activities

____ 9) Seems energetic and interested

____ 10) Tears when faced with difficulty

____ 11) Shows great interest in activities

We are interested in learning how this child is doing, compared to other children his or her age who attend preschool in a variety of settings. Please respond to each of the following items using the scale below.

1: well below children this age

2: below children this age

3: about average for children this age

4: above children this age

5: well above children this age

____ 1) Please rate this child's reading skills.

____ 2) Please rate this child's math-related skills.

____ 3) Please rate this child's social skills.

____ 4) How well do you expect this child to do next year in reading?

____ 5) How well do you expect this child to do next year in math?

____ 6) How well do you expect this child to do next year socially?

Please complete all 17 items on this instrument for each child on your list by circling the response number that best indicates the degree to which you agree with the statements.

This child:	Strongly Disagree	Disagree	Somewhat Disagree	I don't know	Somewhat Agree	Agree	Strongly Agree
1. waits patiently for her/his turn	1	2	3	4	5	6	7
2. follows one-step instructions	1	2	3	4	5	6	7
3. is easily distracted	1	2	3	4	5	6	7
4. is prone to disturb other children	1	2	3	4	5	6	7
5. has a short attention span	1	2	3	4	5	6	7
6. follows two-step instructions	1	2	3	4	5	6	7
7. leaves seat in classroom in situations in which remaining seated is expected	1	2	3	4	5	6	7
8. only pays attention to things he/she is really interested in	1	2	3	4	5	6	7
9. follows multiple step instructions (e.g., first, wash your hands; second, get some water; third, eat your snack)	1	2	3	4	5	6	7
10. utilizes multiple rules to complete a task	1	2	3	4	5	6	7
11. fidgets with hands or feet or squirms in seat	1	2	3	4	5	6	7
12. waits to be called on before responding	1	2	3	4	5	6	7
13. has difficulty remaining still	1	2	3	4	5	6	7
14. runs about or is very active in situations where it is inappropriate	1	2	3	4	5	6	7

15. interrupts or intrudes on others (e.g., butts into others' conversations or games)	1	2	3	4	5	6	7
16. has difficulty playing or engaging in leisure activities quietly	1	2	3	4	5	6	7
17. restless, always up and on the go	1	2	3	4	5	6	7

Appendix B

Puppet Interview Questions

This child interview measure was adapted from the PISCES (Mantzicopoulos, Patrick, & Samarapungavan, 2009). All questions were modified to relate to puzzles, reading, or math. After completing the puzzle task, each participating child first selects the puppet most like him/her and gives it a name. Then, an identical puppet is produced and named. Children are told that the puppets are children like him/her, in a classroom like his/hers and with a similar teacher. The experimenter then explains that the puppets feel differently about things that happen in school, which is OK because different kids feel different things. Puppets are then made to state different opinions, and the child is asked which puppet is the most like him/her. Two sample items are used to check understanding: "I like pizza" ("I don't like pizza") and "I don't like to play on the playground" ("I like to play on the playground"). The puppets then voice eight sets of differing opinions about puzzles, varying which puppet speaks first and which puppet feels positively about puzzles. Children indicate their agreement after each item and their responses are recorded. Then, after the reading task of the Woodcock-Johnson, the puppets are brought out again and eight statements are made about reading. Finally, after the math task of the Woodcock-Johnson, the puppets make eight statements about math and children's responses are recorded.

Puzzles

I (don't) like doing puzzles

I (don't) have fun doing puzzles

I (don't) want to know more about puzzles

I (don’t) feel happy when I am doing puzzles

Puzzles are easy (hard)

I (don’t) know how to do puzzles

I can(‘t) do puzzles

I’m (not so) good at puzzles

Reading

I (don’t) like reading

I (don’t) have fun reading

I (don’t) want to know more about reading letters and words

I (don’t) feel happy when I am reading letters and words

Reading is easy (hard)

I (don’t) know how to read letters and words

I can(‘t) read

I’m (not so) good at reading

Math

I (don’t) like counting and numbers

I (don’t) have fun with counting and numbers

I (don’t) want to know more about counting and numbers

I (don’t) feel happy when I am counting and using numbers

Counting and numbers are easy (hard)

I (don’t) know how to count and use numbers

I can(‘t) count and use numbers

I’m (not so) good at counting

Appendix C

Wedgit Administration Instructions

Mastery Motivation

Materials needed: Wedgits, camera, stopwatch, answer sheet

Researcher instructions:

1. Make sure the camera is pointed at the child and recording; make sure that you will not block the camera when you sit down.
2. Show the child the blocks and the design on the first card (8 square). Say, **"First, I want you to make the blocks look exactly like the blocks in this picture. Can you make the blocks look like this picture?"**
3. Let the child work until he/she is finished. You can help him/her if he/she does not understand how to make the blocks look like the card.
4. Now show the child the design on the second card (3 square). Say, **"You did a great job with that! Now, I want you to make the blocks look exactly like this picture."**
5. Let the child work without helping him/her. Stop the child at 4:00 if s/he is still working.
6. If the child takes less than 4 minutes to finish puzzle 2 (most children), skip to step 7. Otherwise, tell the child, **"We are out of time. If we had more time, would you want to work more on this one** *(hold up the first picture)* **or this one** *(hold up the second picture)***?"** Record child response. **"Why?"** Record child response.
7. Now show the child the design on the third card (14 circle). Say, **"You did a great job with that one, too! Let's do another one. Make the blocks look exactly like this picture."**
8. Let the child work without helping him/her. Stop the child at 4:00 if s/he is still working. If s/he was still working, go to step 13. Otherwise, continue with puzzle 4.
9. Now show the child the design on the fourth card (1 circle). Say, **"You did a great job with that one, too! Let's do another one. Make the blocks look exactly like this picture."**
10. Let the child work without helping him/her. Stop the child at 4:00 if s/he is still working. If s/he was still working, go to step 13. Otherwise, continue with puzzle 5.
11. Now show the child the design on the fifth card (14 triangle). Say, **"You did a great job with that one, too! Let's do another one. Make the blocks look exactly like this picture."**
12. Let the child work without helping him/her. Stop the child at 4:00 if s/he is still working.

13. Tell the child, **"We are out of time. If we had more time, would you want to work more on one of these** *(hold up the pictures of the completed puzzles)* **or this one** *(hold up the last picture)***?"** Record child response. **"Why?"** Record child response.
14. Ask the child, **"How hard was the last puzzle?** *(Point to it)* **Was it easy, a little hard, or very hard?"**

Did the child choose a puzzle he had finished successfully or one he had not finished successfully to try again? (Circle one) **Finished** **Unfinished**

Why did the child want to try that one again?

How hard did the child think the puzzle was? (Circle one) **Easy** **A Little Hard** **Very Hard**

Appendix D

Tangram Administration Instructions

Motivation Challenge Task

Administration Protocol

Supplies

- Tangram puzzles
- Protocol sheet
- Stopwatch
- Class list for describing children's outfits, session, and placement

Tangrams:

During the tangram task, teachers work with small groups of children on a challenging puzzle task in a setting similar to small-group instruction. The teacher gives the children instructions and models doing the task. Then, each child is given a puzzle and pieces and works on it on his or her own for eight minutes. During this time, the teacher and researcher do not help the children. After eight minutes are up, the teacher and researcher help the children finish their puzzles by first placing the two large triangles correctly and then helping with other pieces as necessary so that every child finishes successfully.

Teacher directions:

1. Call small groups of about six students to the table.
2. Say, "Today, we are going to be working with puzzles. Everyone is going to get a different puzzle and a baggie with puzzle pieces." *Show them.*
3. Say, "You have big pieces and little pieces. Start with your two big pieces. Put them on the yellow. Cover up all the yellow. I'm going to show you first."
4. Model placing the first big triangle correctly
5. Model placing the second big triangle so it overlaps with the first one. Say, "Is this right?"
6. Say, "Make sure your pieces go next to each other and don't hang over the edge."
7. Finish the puzzle. Say, "See how all the yellow is covered up?"
8. Say, "When you have your pieces you may start. Remember to start with your two big pieces. I'm just going to watch you. We want to see what you can do on your own."
9. Give out puzzles.
10. Give out puzzle pieces.

11. After eight minutes, help students place their big pieces first, then help them finish.

Researcher directions:

1. Point both cameras at the group, making sure there's a good shot of each child.
2. Draw a diagram of the table for each group, listing the child's name in each place.
3. Describe the child's outfit on the class roster.
4. When eight minutes are up, help children finish the puzzles by placing the two big pieces.

Things you can say when students are asking for help/struggling/frustrated:

- Don't let the blue touch blue
- When it's done we can't see any more yellow
- I wonder what you can do with this piece
- Sometimes we need to move other pieces around to make a piece fit
- I wonder if that piece could go somewhere else
- You know what I know about that? When the yellow is left over…

Appendix E

Wedgit and Tangram Coding Manual

- For Wedgits, watch the tape (can skip around) to determine whether puzzle number 2 or 3 is being coded (the puzzle the child works on for 4 minutes without finishing).
- It is extremely important to ensure that exactly 4 minutes are coded for Wedgits and 8 minutes are coded for Tangrams. In some tapes, you may hear the researcher start the timer. If you hear the timer start, write down this time as the "start time" and code for 4 or 8 minutes past the beep. In other tapes, you may need to forward to the end of the puzzle and listen for the timer to beep. In this case, write down the beep time as the "end time" and code starting 4 or 8 minutes before that. Write down the start and end times of the interval coded.
- Coding begins with Time on Task (TOT; persistence).
    - TOT is coded using a timer or stopwatch. Start the timer when the task begins (unless the child is off-task). When the child goes off-task, stop the timer. Start the timer when the child's attention returns to the task. Repeat. ☺ The time displayed on the timer after 4 or 8 minutes is the total amount of time that the child was on task.
    - Convert the child's time on task to number of seconds (60 seconds per minute).
    - Code each 4 or 8 minute interval two times and average the time on task.
- Next, code frustration.
    - Frustration is coded by watching the video from the start to end time and writing down each time frustration is observed.
    - Videos are watched twice to determine potential episodes of frustration.
    - After watching the video twice, skip to each marked episode and determine whether it is, indeed, frustration.
- Finally, code pride, following the same procedure as coding frustration.

What do the codes look like?

On task is coded when the child's visual, behavioral, or verbal attention is on the task. An on-task child may be actively working on the task, looking for where a piece goes, or asking the experimenter for help (e.g., "Does this piece go here?"). Glances away from the task are coded as off-task if they last for 3 seconds or longer. Talking to the experimenter or another child is coded as off-task if it is not about the puzzle or if the child waits longer than 3 seconds for an experimenter to reply (experimenters tried not to engage children in discussion).

Pride is coded when a child makes a specific display of pleasure in his/her accomplishments (even if accomplishment is facilitated by the experimenter). Child may call the experimenter's attention to a completed product ("look, I did it!"; "yeah!"; "cool!"), sit up tall and smile (erect posture), put hands on hips or throw arms out to demonstrate work (expanded posture), tilt head back or throw head back confidently.

Frustration is coded when child directs exasperated or negative affect toward the task in a manner that is clearly in response to inability to solve problem. This may include Sad or Angry displays, as well as verbal remarks (e.g., "I can't do this!"), shoving or throwing of puzzle pieces, pushing chair back in order to "get away" from task, sighing, slamming puzzle piece down on table, withdrawing and/or putting head down on table following realization of inability to complete task. Context is critical: look for sequence when child is attempting to solve the problem and exhibits negative reaction when unable to solve.

Appendix F

Freeze and Jumping Games Teacher Directions

Self-Regulation Challenge Tasks

Administration Protocol

Supplies

- Boombox
- Music CD
- Protocol sheet
- Labels for children
- Class list for matching children and numbers

Freeze Game:

During the Freeze game, teachers instruct children to march in a circle to music. When the music stops, children must freeze into a certain pose. Children can only unfreeze themselves when the teacher says "unfreeze" or when the music starts again. An experimenter controls the marching music and stops it at random intervals of less than 15 seconds. The task repeated for three trials and is videotaped.

Teacher directions:

12. Get the children in a circle.
13. Say, "We are going to play the game **Freeze.** You are going to walk in a circle when the music is playing. When the music stops, freeze like a statue. Then when the music starts again, you can unfreeze and start walking around in a circle again."

Researcher directions:

5. Label all children with stickers, and record which child gets which sticker.
6. Point both cameras at the circle, hit record.
7. Control the music, letting it play for 7-15 seconds at a time.

Freeze Prime Game:

During the Freeze Prime game, teachers instruct children to march in a circle without music. When the music starts, children must freeze into a certain pose. Children can only unfreeze themselves when the teacher says "unfreeze" or when the music stops again. An experimenter controls the marching music and starts it at random intervals of less than 15 seconds. The task repeated for three trials and is videotaped.

Teacher directions:

14. Get the children in a circle again.
15. Say, "We are going to play a little differently. We will play the opposite of the game **Freeze.** You are going to walk in a circle when the music is **not** playing. When the music **starts playing**, freeze like a statue. Then when the music **stops** again, you can unfreeze and start walking around in a circle again."

Researcher directions:

8. Make sure both cameras are still recording.
9. Control the music, letting children march for 7-15 seconds at a time and then starting the music.

Jumping Game:

During the Jumping game, children also march in a circle to music, but prior to marching, teachers instruct students to "jump three times" (one-step instruction) when they hear the music stop. So, as children march, they have to monitor the music and remember the instructions, processing two pieces of information in working memory at once. After the one-step instruction trial, the teacher gives the two-step instruction ("jump three times and clap twice") and three-step instruction ("jump three times, clap twice, and go one step backwards") respectively.

Teacher directions:

16. Get the children in a circle again
17. Say, "Show me what it means to clap three times" and model it correctly.
18. Say, "Show me what it means to jump once" and model it correctly.
19. Say, "We are going to play another game. You are going to walk in a circle when the music is playing. When the music stops, **jump three times** and then stop."
20. After the children do that, say, "Good job! Now let's try it another way. This time, when the music stops, **jump three times and clap your hands twice**, then stop."
21. After the children do that, say, "Great! Now let's try one more thing. This time, when the music stops, **jump three times, clap your hands twice, and take one step backwards**, then stop."

Note: try to make sure that the one-, two-, or three-step instructions are the last thing the children hear before the music starts.

Researcher directions:

10. Make sure both cameras are still recording.
11. Control the music, letting it play for 7-15 seconds at a time.

Appendix G

Freeze and Jumping Games Coding Manual

Classroom Challenge Tasks Coding
(Freeze, Freeze Prime and Working Memory)

For All Trials

Attention

2 – Full Attention (body and face are directed at the experimenter, attentive expression, no disruptive actions or verbalizations

1 – Partial Attention (some time of full attention, some occurrences of distraction or disruptive disruptive actions or verbalizations)

0 – No Attention

-Attention will be coded for while the experimenter is stating the line of instruction (see below) that must be remembered.

- "You are going to walk in a circle when the music is playing. When the music stops, freeze like a statue."
- "You are going to walk in a circle when the music is not playing. When the music starts playing, freeze like a statue."
- "You are going to walk in a circle when the music is playing. When the music stops, jump three times and then stop."
- "When the music stops, jump three times and clap your hands twice, then stop."
- "When the music stops, jump three times, clap your hands twice, and take one step backwards, then stop."

Freeze and Freeze Prime Game

Freeze Steps

4 – Immediate stop (full points for an immediate stop when the music stops)

3 – Delayed – 1 step (given for a delayed stop with one more step)

2 – Delayed – 2 steps (given for a delayed stop with two more steps)

1 – Delayed – 3 or more steps (given for a delayed stop with three or more steps)

0 – Forced stop (given, for example, to a child that only stops to avoid running into another)

Freeze Time

3 – Stop and stay (given to a child that stops and stays frozen and does not move for at least five seconds)
2 – Stop and Pose (given to a child that freezes but then strikes a pose that they then attempt to hold for at least five seconds)
1 – Stop (given to a child that initially stops but does not remain frozen for at least five seconds
0 – No Stop (given to a child that does not stop when the music stops)

Jumping Game

Working Memory
6 – Perfect Recall (given to a child that performs the actions correctly)
5 – Miscount (given to a child that performs the actions an incorrect number of times, i.e. claps once)
4 – Bananas (given to a child that performs the action without an attempt to count, "goes bananas")
3 – Cued Perfect (given to a child that performs the actions correctly after learning (visually, verbally) from a peer; there will be a delay in performing the actions)
2 – Cued Miscount (given to a child that performs the actions an incorrect number of times after learning (visually, verbally) from a peer, there will be a delay in performing the actions)
1 – Cued Bananas (given to a child that performs the actions without an attempt to count but only after learning the action from a peer; there will be a delay in performing the actions)
0 – No Response (given to a child that does not respond or produces an irrelevant or completely incorrect response)

Appendix H

Teacher Interview Protocol

1. Tell me about your classroom this year.
    a. Was it a typical year?
    b. Was it consistent with your expectations?
2. What kinds of challenges have you faced when working with the children in your classroom this year?
    a. What three issues would you say are the most challenging?
    b. What three skills or attitudes would you say are most important for children to have going into kindergarten?
3. How important is motivation for learning in preschool?
    a. Why?
4. How important is self-regulation for learning in preschool?
    a. Why?
5. Think of an example of a kid who you would say is high in motivation and a one who is low in motivation.
    a. How did you come up with these kids? What behaviors came to mind?
    b. How do you know when someone is motivated?
6. Think of an example of a kid who you would say is high in self-regulation and a one who is low in self-regulation.
    a. How did you come up with these kids? What behaviors came to mind?
    b. How do you know when someone is self-regulated?
7. Do you know any children who are high in motivation and low in self-regulation? X
    a. How did you come up with this kid? (*give example from teacher's data if needed)*
    b. What behaviors come to mind when you think about this child?
8. Do you know any children who are high in self-regulation and low in motivation? Y
    a. How did you come up with this kid? (*give example from teacher's data if needed)*
    b. What behaviors come to mind when you think about this child?
9. When you see children doing well at an academic task, can you tell if they're doing well because of high motivation or good self-regulation, or both? How?
10. When you see children struggling at an academic task, can you tell if it's because they have low motivation, poor self-regulation, or both? How?
11. When I ask you about the following behaviors (hand list to teacher), do you see them primarily as issues of motivation, self-regulation, or both?
    a. Persistence
    b. Attention/focus
    c. Effort
    d. Sadness
    e. Anger
    f. Frustration

   g. Perseverance in the face of frustration
   h. Perfectionism
   i. Enthusiasm
   j. Calling out in class without raising one's hand
   k. Starting lots of activities without finishing them
   l. Energy level
   m. High initial engagement, low later engagement
   n. Keeping one's body to one's self
12. In this list, what do you see as the three biggest problems in your classroom?
   a. Why?
13. Then what do you do about them?
   a. What works?
   b. What doesn't work?
14. Are there any differences between boys and girls in motivation?
15. Are there any differences between boys and girls in self-regulation?
16. What things do you do in your classroom specifically in an effort to foster motivation?
   a. What things do you do in your classroom specifically to foster self-regulation?
   b. What things do you do in your classroom to foster both?
17. When you think about your training, what were you taught about how to foster motivation in your class as a whole?
   a. How were you taught to intervene with individual children who were struggling with motivation?
18. When you think about your training, what were you taught about how to foster self-regulation in your class as a whole?
   a. How were you taught to intervene with individual children who were struggling with self-regulation?
19. So now in your own practice, what sources do you draw on for teaching strategies?
20. How have you seen children's motivation develop this year?
   a. How about X and Y?
21. How have you seen children's self-regulation develop this year?
   a. How about X and Y?
22. Is there anything else you can think about with regards to motivation or self-regulation that we haven't had time to talk about?
23. What else should I know about your classroom this year?

Teacher	Focus Child	Name	X or Y	SR Score (out of 7)	Mot Score (out of 5)	Zscore Discrepancy
Brittany/Ede	105		Y	5.82	3.45	0.79
Brittany/Ede	113		X	4.06	4.55	-2.08
Brittany/Ede	117		X	3.82	4.36	-2.01
Megan/Marie	210		Y	6.35	4.09	0.31
Megan/Marie	203		X	1.41	4.18	-3.60
Harmony	302		Y	6.29	3.18	1.52
Harmony	315		Y	5.41	2.64	1.61
Harmony	391		X	3.53	4.09	-1.85
Harmony	309		X	3.12	3.82	-1.79

Laurie/Whitney	406		Y	6.82	3.00	2.18
Laurie/Whitney	410		Y	6.94	2.45	3.03
Laurie/Whitney	405		X	4.24	4.27	-1.57
Leanna	Missing					
Leanna	Missing					
Mrs. Mac	710		Y	6.29	3.00	1.78
Mrs. Mac	705		Y	4.18	1.64	2.05
Mrs. Mac	806		Y	5.59	2.45	1.99
Mrs. Mac	807		X	2.76	3.00	-0.93
Carol	905		Y	6.12	3.27	1.26
Carol	904		X	4.88	4.27	-0.93
Erin/Brad	1011		Y	6.06	3.55	0.84
Erin/Brad	1003		X	2.76	3.91	-2.19
Sara/Brett	1106		Y	6.65	3.36	1.54
Sara/Brett	1103		X	2.18	4.45	-3.39

Discrepancy calculation: SR and Mot scores were standardized across the sample, and I took the difference of Z scores to determine the children with the largest discrepancies in each class.

Appendix I

Family Background Questionnaire

Preschool Motivation and Self-Regulation Study
Family Background Questionnaire

Today's Date: _____

Who is completing this questionnaire?

□ Mother □ Father □ Guardian □ Caregiver □ Other (specify)_____

CHILD INFORMATION

NAME: _____ □ Male □ Female

HOME ADDRESS Street _____ Apt. _____

City _____ State _____ Zip _____

Phone Number (___)_____

Race/Ethnicity: _____ Native Language: _____

School: _____ English Proficiency: □ None □ Fair □ Good □ Excellent

Teacher: _____ Date of Birth: _____

FAMILY INFORMATION

Mother

NAME: _____

a. Age _____ b. Native Language _____ c. Ethnicity/Race _____

d. What is your occupation? (be as specific as possible) _____

e. Are you currently employed? □ No □ Yes, full time □ Yes, part time ____ hours/week

f. What is your current yearly income? _____

g. What is your date of birth? _____

♦ What is the highest educational level you have attained? (Please check all that apply)

□ Some High School □ Graduated High School □ GED/Adult Education

□ Some College including Community College and Technical Training
□ Graduated Two-Year College (e.g., Associate's Degree, LPN) Degree Earned ____
□ Graduated Four-Year College (e.g., BA, BS) Degree Earned ____
□ Some Graduate School
□ Graduate School (e.g., MA, MS, MD, PhD, MSW, MBA) Degree Earned ____

♦ Name of the last school attended: _____

Father

NAME: _____

a. Age_____ b. Native Language_____ c. Ethnicity/Race_____

d. What is your occupation? (be as specific as possible) _____

e. Are you currently employed? □ No □ Yes, full time □ Yes, part time ____ hours/week

g. What is your current yearly income? _____

h. What is your date of birth? _____

♦What is the highest educational level you have attained? (Please check all that apply)

□ Some High School □ Graduated High School □ GED/Adult Education

□ Some College including Community College and Technical Training

□ Graduated Two-Year College (e.g., Associate's Degree, LPN) Degree Earned ____

□ Graduated Four-Year College (e.g., BA, BS) Degree Earned ____

□ Some Graduate School

□ Graduate School (e.g., MA, MS, MD, PhD, MSW, MBA) Degree Earned ____

♦ Name of the last school attended: _____

OTHER FAMILY INFORMATION

1. Who has the child lived with for most of the past year? (check all that apply)
   □ Mother □ Father □ Both □ Guardian □ Other (specify) _____

2. Other people living in the household:

Name	Sex	Age	Birth date	Relation to child:
a. _____	___	___	_____	_____
b. _____	___	___	_____	_____
c. _____	___	___	_____	_____
d. _____	___	___	_____	_____

3. What language (s) are spoken in the home? _____

PRESCHOOL/CHILD CARE HISTORY

1. At what age did your child begin receiving non-parental child care? _____
2. At what age did your child begin attending preschool? _____

Thank you for providing this important information!

Parent/guardian signature _____ Date _____

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