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**HIERARCHICAL LINEAR REGRESSION OF SECOND GRADE ACADEMIC
ACHIEVEMENT ON PREKINDERGARTEN LATENT PROFILES OF SELF-
REGULATION AND EMOTION SKILLS**

A Dissertation in

School Psychology

by

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ABSTRACT

Research has shown that social, emotional, and behavioral school readiness is a critical factor in the early and continued success of students, but little research has taken a person-oriented approach to explaining the effect these aspects of development have upon later academic achievement. Limited studies have taken a person-oriented approach to social, emotional, and behavioral school readiness in relation to academic performance (e.g., Bulotsky-Shearer, Fantuzzo, & McDermott, 2010; Bulotsky-Shearer, Bell, & Dominguez, 2012; Denham et al., 2012). However, these studies typically show that different profiles of children perform differently on indirect measures of academic achievement. The current study clustered homogeneous groups of children into profiles based on measures of self-regulation and emotion skills, then used those profiles to examine whether profile membership predicted later academic achievement as measured by nationally normed, standardized measures. Three profiles of children emerged from the data. It was found that profile membership, that while coming close to statistical significance, did not significantly predict later academic achievement after controlling for kindergarten achievement. However, post-hoc follow-up tests found that the most competent group of children performed significantly better on three of four measures of academic achievement than did the least competent profile of children.

Keywords: preschool, readiness, self-regulation, emotion skills, LPA

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Chapter 1

Introduction

For over a decade, researchers and practitioners have been placing more emphasis upon children possessing school readiness skills before entering formal schooling. To determine if children attain such skills, kindergarten screening can benefit from a multimodal method of assessment, wherein school psychologists are best able to measure school readiness skills. Within such a multimodal assessment method, preacademic skills receive the most emphasis, however, social-emotional skills have not garnered equal attention (La Paro & Pianta, 2000) even though research has shown that social-emotional skills are fundamental to school success (e.g., Arnold, 1997; Bulotsky-Shearer & Fantuzzo, 2010; McClelland, Morrison, & Holmes, 2000). Inclusion of social-emotional data would allow for school personnel to better understand profiles of social-emotional risk and how such profiles may predict later school achievement. Although it is generally agreed that social-emotional skills are critical, little is known about how various profiles of social-emotional and pre-academic skills may have an impact on later academic functioning.

School Readiness and Later Achievement

The National Research Council's Committee on the Prevention of Reading Difficulties in Young Children stresses the importance of environments promoting preliteracy skills for all preschool children (Snow, Burns, & Griffin, 1998). In addition, the National Association for the Education of Young Children and the National Council of Teachers of Mathematics (2002) urged high-quality math instruction for preschool-aged children. With such pressure being placed on teachers and parents, much attention has been dedicated to the relationship between preschool skill acquisition and future reading and math outcomes (Duncan et al., 2007; Justice, Mashburn,

Hamre, & Pianta, 2008). Attainment of basic literacy and math skills is positively related to achievement (Stevenson & Newman, 1986). However, since such a relationship has been discovered, another area of school readiness has appeared: social-emotional readiness.

Some studies have shown that between 8 and 22% of children entering kindergarten exhibit elevated levels of emotional or behavioral difficulties (Brauner & Stephens, 2006; Lavigne et al., 1996). With such a high prevalence rate, while not even accounting for the children with problems that do not reach a clinically significant level of impairment, many feel that children are entering kindergarten not yet ready to learn due to a lack of social and emotional skills needed to succeed in a structured setting (Raver & Knitzer, 2002; Rimm-Kaufman, Pianta, & Cox, 2000). These subclinical and clinical-level issues are not only potentially disruptive to the classroom, but also may compound learning difficulties for children who have concomitant risk for learning difficulties due to lower preacademic skills.

Prior research has come to a general consensus, showing that children showing higher levels of behavior problems tend to do more poorly in school from early elementary school through high school (Arnold, 1997; Bulotsky-Shearer & Fantuzzo, 2010; McClelland, Morrison, & Holmes, 2000; McLeod & Kaiser, 2004). One particularly poignant study was conducted by Harvard University researchers regarding early problem behaviors and academic achievement scores in first grade (Bub, McCartney, & Willett, 2007). Using data from the National Institute of Child Health and Development Study of Early Child Care and Youth Development, the researchers found that children with higher levels of internalizing and externalizing behavior at 24-months-of-age had lower first grade achievement scores compared to their peers.

Social-Emotional Readiness

As ever-increasing pressure mounts against researchers, practitioners, parents, and students for students to possess school readiness skills before entering formal education situations (Snow, Burns, & Griffin, 1998), social-emotional readiness has become more salient than in the past. Many children come to school with emotional or behavioral issues (Brauner & Stephens, 2006), and may not yet be ready to succeed in a structured setting as evidenced by research supporting the idea that such problems may predict lower academic success later. For example, Curby, Brown, Bassett, and Denham (2015) found that social-emotional competence predicted preliteracy skills over and above gender, age, maternal education, attentional abilities, and classroom emotional support. More specifically, Bulotsky-Shearer and Fantuzzo (2010) investigated the relationship between problem behaviors in preschool and later literacy outcomes in a sample of four-year-old children enrolled in a Head Start program ($n = 2682$). The researchers found that preschool problem behaviors in structured classroom settings predicted lower literacy outcomes across kindergarten and first grade using a multiple method, multiple informant approach, while controlling for age, gender, race, and cognitive skills.

In addition, Arnold (1997) examined a sample of 74 boys ranging in age from 3 to 6 years old attending day care. He found that externalizing behaviors significantly predicted emergent academic skills; however, emergent academic skills also significantly predicted externalizing behaviors. Moreover, attention mediated the relationship wherein emergent academic skills predicted externalizing behaviors. The results highlight that a reciprocal relationship may occur between emergent academic skills and externalizing behavior, such that if children do not have the skills to perform in the classroom, they may not pay attention and instead act out resulting in less positive attention and skill development. Due to these

relationships, it may be that attention, or a larger concept including self-regulation, may help explain difficulties with behavior, emotion, and academic skills.

Brauner & Stephens (2006) highlight the fact that many children struggle with problems related to emotion and behavior, which may be regulated to reduce duration, intensity, or frequency of such problems. Likewise, evidence has shown that attention and attention problems play a role in academic outcomes of young children (Arnold, 1997). Taken together, emotion, behavior, and attention skills comprise an expanse of the skills children are expected to possess or quickly obtain in order to proactively participate in school activities. Children must be able to attend to teachers, attend to individual tasks, stay seated, cooperate, and positively express themselves. The basic social and emotional tasks of early schooling require that children be able to behave appropriately for the situation. A deficit in these skills can lead children to engage in inappropriate behavior, which can be disruptive and lead to less engagement in classroom activities.

The current study focused on three constructs subsumed under self-regulation including attention, behavior, and emotion skills as they relate to school readiness skills and academic outcomes. Broadly, self-regulation skills allow children to replace a less desirable outward expression with a more appropriate behavior. Applied use of self-regulation skills allow children to behave more appropriately, properly attend to tasks, and control their emotions.

Self-Regulation

Multiple definitions of self-regulation have been posited and researched (e.g., Karoly, 1993; Baumeister, Vohs, & Tice, 2007; Duckworth & Seligman, 2005) with varying degrees of popularity. One common thread running through most definitions of self-regulation is the idea that it involves overriding an impulse with a more socially acceptable behavior. Much research

has also been devoted to identifying the domains encompassed within self-regulation, while also trying to link those domains to school outcomes. Research has shown that a child's skills in controlling behavior (McClelland, Cameron, Conner, et al., 2007; Bohlman & Downer, 2016), attention (Welsh, Nix, Blair, et al., 2010; Sawyer, Chittleborough, Mittinty, et al., 2014; McClelland, Acock, Piccinin, et al., 2013), and emotion (Howse, Calkins, Anastopoulos, et al., 2003; Hill & Craft, 2003; Trentacosta & Izard, 2007) are significantly related to academic outcomes. Thus many have posited that self-regulation encompasses aspects of behavior, attention, and emotion skills (e.g., Blair & Peters, 2003; Smith-Donald, Raver, Hayes, & Richardson, 2007), therefore in the current study, self-regulation will refer to a construct encompassing behavior regulation, attention, and emotion.

Behavior Regulation

Research has shown that various measures of different forms of self-regulation are related to later academic success even beginning at the preschool level (e.g., McClelland et al., 2007; Sawyer et al., 2014). For example, it was found that a direct measure of behavioral regulation addressing inhibitory control, attention, and working memory was significantly and positively related to emergent literacy in both the fall and spring of the preschool year (McClelland, Cameron, Connor, et al., 2007). A more recent study has found similar results regarding the relationship between behavior regulation and academic achievement (Bohlman & Downer, 2016). Utilizing direct measures of children's behavior regulation, emergent literacy, and vocabulary skills, the researchers found that behavior regulation was significantly and positively related to both academic outcomes. Although the results show promise, the sample size was limited, and data were only collected in the prekindergarten year.

Attention

There are developmental considerations in self-regulation that cannot be ignored. Preschool and early kindergarten may be critical times for the development of these skills. Specifically, Sawyer and colleagues (2014) found that improvements in task attentiveness between ages 2 to 3 and ages 6 to 7 were related to higher teacher-rated literacy and math achievement. Furthermore, the researchers found that gains in emotion regulation during the same time period were also associated with teacher-rated literacy skills. Another study examining a similar relationship was conducted by McClelland, Acock, Piccinin, Rhea, and Stallings (2013) that investigated the academic outcomes predicted by preschool attention span. Researchers found that ratings of children's attention in preschool was significantly and positively related to math skill at age 21. In addition, the higher children were rated on attention span in preschool, the more likely they were to graduate college by age 25.

Emotion Skills

Skills related to intra- and interpersonal regulation include emotion regulation and emotion knowledge. Both constructs have been shown to have an impact on academic achievement for young children. Results of a study by Howse and colleagues (Howse, Calkins, Anastopoulos, et al., 2003) indicated that parent-rated assessments of emotion regulation significantly predicted early math and listening comprehension skills. Hill and Craft (2003) studied a congruent relationship indicating that emotion regulation was significantly and positively related to reading and math outcomes for all children. Similarly, Trentacosta and Izard (2007) found that teacher-rated emotion regulation was directly and positively related to academic competence. Although research has supported a relationship between self-regulation and academic functioning, other related variables must be examined, as well. Emotion

knowledge may be related to self-regulation in that being able to correctly interpret emotions may better allow for more socially acceptable behavior.

Emotion knowledge is characterized by the ability to recognize and identify emotions as they occur intrapersonally and interpersonally. There is much research indicating that emotion knowledge is vital to children's success across domains of functioning (Denham, et al., 2003). In fact, some feel that children possessing social-emotional skills should be prioritized over entering school with preacademic skills. If children enter a structured school environment without the skills to recognize and identify emotion, adjustment to the situation may be difficult and result in at-risk functioning in other areas. More specifically, emotion knowledge has been shown to have direct and indirect relationships regarding school achievement.

Given the critical role that emotion knowledge plays in the development of children, it has been widely studied in young children to include its relation to academic achievement and school adjustment. Izard and colleagues (2001) found a direct relationship between emotion knowledge and school achievement. Specifically, a direct assessment of emotion knowledge with emotion labeling and emotion recognition tasks (Izard, 1971), were significant predictors of third grade teacher-ratings of academic competence. Results indicated that emotion knowledge mediated the relationship between verbal ability and academic competence. The authors noted that a lack of emotion knowledge may interfere with student-teacher rapport, which may reduce the opportunities of the child to participate in education activities. In addition, it was posited that a lack of emotion knowledge could result in poorer peer social interactions which could inhibit academic motivation.

In addition to studying social-emotional competence, the aforementioned research conducted by Curby and colleagues (2015) examined the relationship between emotion

knowledge and preliteracy skills. Researchers found that emotion knowledge was a significant predictor of directly measured preliteracy skills. Furthermore, Denham, Bassett, Zinsser, and Wyatt (2014) have also demonstrated that emotion knowledge indirectly effects school achievement. Results indicated that emotion knowledge significantly predicted emotionally regulated and prosocial behavior, which then significantly predicted teacher-rated kindergarten classroom adjustment, as measured by the Preschool Learning Behavior Scale (PLBS; Fantuzzo, Perry, & McDermott, 2004), which assesses children in the areas of approaches-to-learning, attention, and attitude toward learning. Kindergarten classroom adjustment then predicted teacher-rated kindergarten academic readiness, which was measured by the Early Childhood Longitudinal Study – Kindergarten Academic Rating Scale (ECLS-K ARS; U.S. Department of Education, National Center for Education Statistics, 2002-2005) that measures children’s teacher-rated language and literacy, general knowledge, and mathematical thinking.

Person-Centered Approaches

Previous research has shown direct and indirect links between behavior regulation, attention, emotion skills, and academic achievement, but these approaches, while meaningful, do not provide a holistic picture of students. The studies utilize a variable-centered approach in examining relationships. It has been purported that examining participants as organized wholes through person-centered approaches is more appropriate (Bauer & Shanahan, 2007). Many definitions of person-oriented approaches have been theorized in the literature base, but the exact definition is evolving (Bergman & Trost, 2006). Many have reduced it to pure methodology, but two main tenets exist: using a pattern-based method and focusing on individuals as an organized whole (Bergman & Magnusson, 1997). Person-oriented approaches allow researchers to examine the sample in such a way that distinct subgroups emerge. Bergman and Trost (2006) note that

allowing individuals to cluster based on one set of variables and examining how those individuals change over time regarding another variable is one example of utilizing a person-oriented approach.

By allowing subgroups of the sample to emerge, researchers can identify the patterns by which children cluster. Once homogenous clusters are formed further examination of the clusters can yield relevant information about the specific clusters (Konold & Pianta, 2007). Examining children clustered around school readiness variables may allow practitioners and teachers to not only identify children who may struggle in the future, but also be ready to intervene with at-risk students. Bulotsky-Shearer and colleagues' (2010; 2012) and Denham and colleagues' (2012) work was the beginning of investigating the clustering of children around social-emotional variables and relating the clusters to academic performance.

Bulotsky-Shearer and colleagues (2010) found that six subgroups of children emerged from their sample based on emotional and behavioral adjustment, and that two subgroups (well-adjusted and adjusted with some peer problems) performed academically better than the other four (mildly socially disengaged, mildly socially disruptive, extremely socially disruptive, and extremely socially and academically disengaged). However, the researchers only collected academic outcomes at the end of the preschool year. Such an abbreviated data collection method allows only a brief snapshot into the relationships between the measured variables. In addition, it does not allow for inferences about how children change and adapt over time.

A similar study was conducted two years later (Bulotsky-Shearer, Bell, & Dominguez, 2012), in which the same six subgroups as previously found emerged from the data. In addition, results indicated that the different clusters of children grew at varying rates over time in relation to academic outcomes. While the follow-up study extended the first, the sample was limited to

predominantly Black children in urban Head Start locations (Bulotsky-Shearer, Bell, & Dominguez, 2012). In addition, indirect, teacher-rated measures of literacy skills, math skills, emotional adjustment, and behavioral adjustment were utilized as opposed to direct measures of academic performance and social-emotional variables. Moreover, the authors noted potential concern regarding the content validity of the measure that assessed children's literacy and math skills.

Denham, Bassett, Mincic, Kalb, Way, Wyatt, and Segal (2012) investigated a similar question. The researchers found three emergent profiles of children based on emotion knowledge, emotional and social behaviors, social problem-solving, and self-regulation variables: SEL Risk, SEL Competent-Social/Expressive, and SEL Competent-Restrained. These three clusters of children differed on teacher-rated academic success measures. This study included limitations related to sample size and indirect measures of child academic achievement. Denham and colleagues' (2012) stated that the sample size gathered may have limited their ability to accurately describe the number of clusters into which children fall. Moreover, data were only collected through the end of the kindergarten year. As this study was somewhat exploratory, furthering data collection time points may allow better insight into how subgroups of children change and learn across longer periods of time. In addition, only indirect measures were used to collect academic data. Teachers rated children's abilities to perform certain school-based tasks. While this may be one way of expediting data collection, direct measures allow researchers to compile the most accurate picture of students, especially regarding academic functioning.

Current Study

A majority of the currently available research presents valuable information regarding relationships between components of self-regulation and academic outcomes. While beneficial, the literature base is not without its shortcomings. Many studies utilized indirect measures of academic outcomes (Denham et al., 2014; Izard et al., 2001; Sawyer et al., 2014) that, while useful, may not be the most indicative of children's academic functioning. In addition, the longitudinal scope examining the relationships has been limited to outcomes measured only through preschool or kindergarten (e.g., Bohlman & Downer, 2016; Bulotsky-Shearer & Fantuzzo, 2010; McClelland et al., 2007). Furthermore, a limited amount of studies has been conducted examining these constructs in children using a person-centered approach, which may allow for a more global understanding of children. The current study aimed to attend to these gaps in the literature base.

The present study was guided by two primary research aims. The first research aim was to examine profiles of self-regulation and emotion skills in prekindergarten children at the close of the prekindergarten year. In addition, comparisons were drawn between previous person-oriented approaches (Denham et al., 2012; Bulotsky-Shearer et al., 2010; 2012). While the present study's variables are like Denham and colleagues' (2012), the measures of school achievement were multiple and direct, while measures of emotion skill were multiple, direct, and indirect. In addition, the present study utilized a multiple informant method to assess self-regulatory behaviors. Using multiple and direct measures of children's skills allowed the present study to examine more complete representations of the measured domains. Data were analyzed through the use of latent profile analysis, which clustered children based upon their scores of the self-regulation and emotion skills measures. Based on Denham and colleagues' research (2012),

it was expected that three clusters would emerge from the data: *Competent*, *At-Risk – Aggressive*, *At-Risk – Withdrawn*.

The second aim included extension of previous research through investigation into how children's cluster membership affects academic achievement in second grade. Previous research has examined the relationship across two years using two data collection points, while examining the data based on difference in measures across time (Denham et al., 2012). The present study used hierarchical linear regression across a longer time span, while also controlling academic achievement in kindergarten, to investigate whether profile membership in prekindergarten predicted second grade performance. Based on previous research (Denham et al., 2012), it was hypothesized that children who emerge within the *Competent* cluster would have the highest levels of academic achievement in second grade.

Chapter 2

Literature Review

Although many children enter formal education settings with foundational skills that are helpful in securing their future academic success and functioning, many arrive without such basic skills. In thinking about foundational skills, the first to come to mind are typically preacademic skills, such as counting and letter naming, while social-emotional skills are given less attention in relation to later academic functioning. However, if children enter school without these social and emotional skills, they may not yet be able to thrive in a traditional kindergarten setting (Raver & Knitzer, 2002; Rimm-Kaufman, Pianta, & Cox, 2000). In addition, teachers and other school personnel may be hard-pressed to differentiate between those students who may be at later academic risk due to a lack of social and emotional skills as opposed to those children who may demonstrate some immaturity but will likely adjust readily to the school environment. Consequently, the present chapter will review the literature regarding school readiness and components therein in relation to academic functioning. Second, the concept of self-regulation and reflective components will be reviewed in relation to academic success. Finally, a less utilized approach to data analysis that may further the understanding of specific types of children entering school settings will be examined.

School Readiness and Achievement

Many traditional views and measures of school readiness focus mostly, if not wholly, on the domains of academics and cognitive skills (Foulks & Morrow, 1989; La Paro & Pianta, 2000; Tramonta, Hooper, & Selzer, 1988). For example, Harriman and Harriman (1950) used the Bender-Gestalt (Bender, 1938) as a measure to provide evidence for or against a child's readiness to enter schooling by making estimations of whether a child could read. The study

showed that readers were more cognizant of correct reproduction of symbols on the Bender-Gestalt. The idea that preacademic skills are the foundation children need when entering school has not ceased, but has slowed (Magnuson, Meyers, Ruhm, & Waldfogel, 2004). Although preacademic skills do predict later success, they are not the only factors that require attention in relation to children's academic functioning (e.g., Fantuzzo et al., 2007; Fiorentino & Howe, 2004). In support of the idea that school readiness is more than just preacademic skills, Blair (2002) posited a developmental neurobiological model of children's school readiness. In his model, Blair states that young children who exhibit high levels of negative emotionality may be at risk for poor school readiness, highlighting the importance of emotion control. Furthermore, the author notes that preschool education should aim to reduce stress and promote emotional competence leading to attention control and self-regulation, which then allows children to engage in higher-order thought.

As the conceptualization of school readiness has evolved, parents and professionals have come to recognize its importance. Wesley and Buysse (2003) conducted interviews with 93 school-based professionals and 25 parents to discover what people thought school readiness encompassed. Results of thematic analysis indicated that both parents and school-based professionals placed the most emphasis on social and emotional development, while de-emphasizing preacademic skills. Participants believed that if children could competently interact, follow rules and directions, and be partially independent then teachers could teach the children the academic skills needed in school. However, both parents and school-based professionals are seeing kindergarten shift from focusing on whole development of children to a primarily academic orientation.

To buttress the qualitative work of Wesley and Buysse (2003), more quantitative research has been completed. Fantuzzo and colleagues (2007) investigated what role emotional and behavioral adjustment play in relation to academic success in a sample of 1,764 children enrolled in Head Start programs. It was found that teacher-rated attention and persistence on the Preschool Learning Behaviors scale loaded onto a regulated behavior factor. Regulated behavior then went on to positively and significantly predict math performance (TEMA-2; Ginsberg & Baroody, 1990), providing evidence to the idea that school readiness is a larger concept than preacademic skills.

McClelland, Morrison, and Holmes (2000) similarly explored the idea of school readiness. The researchers investigated the role learning-related social skills may play in children's later academic success in a sample of 540 kindergarten children. Social skills were divided into two disparate concepts including *interpersonal* and *work-related skills*. Interpersonal skills included behaviors such as prosocial peer interactions and sharing, while work-related skills included behaviors such as staying on task, appropriate group participation, and listening. More generally, work-related skills encompassed independence, responsibility, self-regulation, and cooperation. Results indicated that teacher-rated work-related skills at school entry uniquely predicted children's reading and math skills at the start of school and the close of second grade over and above IQ, age, amount of preschool experience, ethnicity, parental education level, and home literacy environment. The study highlights that some skills that may not be readily identified as being related to academic success, such as social skills, may play a role in influencing children's academic functioning.

If children who possess lower learning-related social skills perform worse on measures of school performance through second grade compared to peers (McClelland, Morrison, & Holmes,

2000), questions remain about what may happen to similar children in later school years. McLeod and Kaiser (2004) investigated children in primary grades with social-emotional difficulties as they progressed through high school. Using data from the Children of the National Longitudinal Surveys of Youth data set, the researchers sampled 424 children in relation to behavior problems and academic success. Children who had internalizing and externalizing problems at ages six to eight years were significantly less likely to graduate high school than were their peers. Children not having skills related to the social-emotional side of school readiness may have long-lasting risk for academic failure.

Although preacademic skills are important for children's future academic success, research is clearly demonstrating that school readiness is a larger concept that encompasses pieces of social-emotional readiness as well. Evidence has indicated that social-emotional skills are related to academic functioning across time (e.g., Arnold, 1997; McClelland et al., 2000; McLeod & Kaiser, 2004). Moreover, social-emotional readiness is comprised of various skills that allow children to function within a school setting. Many of these skills relate to the ability to override impulses (e.g., attending, sitting still, regulating emotion; Blair, 2002; Fantuzzo et al., 2007) and interpret emotions correctly to appropriately respond to social situations. Consequently, the present study will focus on behaviors that comprise aspects of self-regulation including behavior, attention skills, and emotion-skills (including knowledge and regulation).

Models of Self-Regulation

The broader umbrella of self-regulatory behavior encompasses several conceptualizations, which Karoly (1993) notes have been used across many areas of psychology. One model that was put forth was Carver and Scheier's (1996) hierarchical model of self-regulation, which included acting certain ways to attain specified goals. Schunk and Zimmerman

(1997) posited a social cognitive perspective in which self-regulation begins externally and eventually becomes internalized. Baumeister, Vohs, and Tice (2007) put forth a highly recognized Strength Model of Self-Control, wherein the researchers state that self-control is the skill of overriding one response with another and that this skill is vulnerable to deterioration after repeated exertion, which was supported by a later meta-analysis (Hagger, Wood, & Chatzisarantis, 2010). Another model of self-regulation was theorized by Blair and Diamond (2008), which suggests that self-regulation is developed through an interaction of many levels of an individual: genes, neural functioning, and behavior. In addition, the researchers note that these interactions result in interrelations between emotion and cognition, which are the responsible for self-regulation across three main domains: emotion, attention, and behavior regulation.

Defining Self-Regulation

The research literature on self-regulation broadly spans a multitude of research ranging from theoretical to practical. Karoly (1993), Carver and Scheier (1996), Shunk and Zimmerman (1997), and Baumeister, Vohs, and Tice (2007), among others, all posit models of self-regulation. With regard to practical research, some have examined the effects of differential levels of self-regulation (e.g., Duckworth & Seligman, 2005; Duckworth, Tsukayama, & May, 2010; Eisenberg, Sadovsky, & Spinrad, 2005). Similar constructs have been closely associated with and considered interchangeable with self-regulation to include self-control (e.g., Duckworth, Tsukayama, & May, 2010; Mischel & Mischel, 1983; Muraven & Slessareva, 2003), self-discipline (Duckworth & Seligman, 2005), and inhibitory control (Blair & Razza, 2007), while also identified by its antithesis, impulsivity (e.g., Baumeister, Vohs, & Tice, 2007; Duckworth & Seligman, 2005). Despite the range of descriptions of self-regulation, most

definitions center on the idea that a person must override one inappropriate response with another more appropriate response.

When addressing self-regulation, the topic of executive functioning is necessary to mention. Executive functioning refers to a set of cognitive processes that are involved in higher-level processing that has been associated with academic success (McClelland & Cameron, 2011). One view of executive functioning is that it is comprised of multiple components (Best & Miller, 2010). Behavioral self-regulation, or behavior regulation, is noted as the behavioral manifestation of executive functioning (McClelland & Cameron, 2012). In addition, cognitive flexibility has been noted as a component of executive functioning (Best & Miller, 2010), which has also been described as attention shifting (Blair & Razza, 2007), or attention control (Welsh, Nix, Blair, et al., 2010). Others also note that an emotional component of executive functioning exists that has been examined through measures of emotion regulation (Brock, Rimm-Kaufman, Nathanson, & Grimm, 2009; Duncan et al., 2007). It appears self-regulation is a reflection of executive functioning, and thus allows possible measurement of self-regulation through executive functioning measures that assess behavior, attention, and emotional skills. For the purposes of the present study, self-regulation will be viewed as a broader construct under which emotion (knowledge and regulation), attention, and behavior regulation will be considered components.

Behavior Regulation and Achievement

Though different definitions of self-regulation exist, and all involve overriding one response with another, behavior regulation is the outward expression of that idea. An explicit example includes children exhibiting behavior regulation if they were to, as instructed, perform one action when told to perform another. They would purposefully act in one way when their

initial reaction would be to act in another. Measurement of this construct has included several methods including one study which utilized a direct measure, wherein children were asked to do the opposite of what the presenter called out: touching their head or toes. This task requires inhibitory skills, attention skills, and working memory skills; however, the main component of the measure is inhibitory control (Diamond, 2002; as cited in McClelland et al., 2007).

Concurrent validity was established using the Social Skills Rating System (SSRS; Gresham & Elliott, 1990) and the Child Behavior Rating Scale (CBRS; Bronson et al., 1995). Another study utilized the Pencil Tap test (Rueda et al., 2005; Smith-Donald et al., 2007), which exhibits good concurrent and construct validity (Smith-Donald et al., 2007) in order to examine inhibitory control. Measurement of behavior regulation allows for researchers to examine one aspect of the larger construct of school readiness as there is ample evidence that the use of such measures predicts later achievement.

McClelland and colleagues (McClelland, Cameron, Conner, et al., 2007) directly measured behavior regulation in a sample of 310 children throughout their preschool year. The Head-to-Toes Task was utilized as a direct measure of children's behavior regulation (Cameron Ponitz, McClelland, et al., 2008), while emergent literacy, early vocabulary, and early math skills were assessed using either the Woodcock Johnson III, Tests of Achievement (WJ-III; Woodcock & Mather, 2000) or the Bateria Woodcock-Muñoz – Revised (Woodcock & Muñoz-Sandozal, 1996). Skills were assessed using the letter-word identification subtest (emergent literacy), picture vocabulary subtest (early vocabulary skills), and applied problems subtest (early math skills). Reliability of the selected subtests ranged from 0.73 to 0.98. The researchers found that the scores on the Head-to-Toes Task significantly and positively predicted fall and spring early literacy, vocabulary, and math skills on the nationally normed and standardized achievement

measures. In addition, it was found that growth in behavioral regulation also predicted growth in emergent literacy, vocabulary, and math skills across the prekindergarten year. The results indicate that behavior regulation plays a significant role in children's early skill achievement.

Bohlman and Downer (2016) also investigated the role of behavior regulation in relation to emergent language and literacy skills in a sample of 603 preschool children. The researchers used the Pencil Tap test, (Rueda et al., 2005; Smith-Donald et al., 2007) in order to examine inhibitory control. In addition, the Test of Preschool Early Literacy (Lonigan, Wagner, Torgesen, & Rashotte, 2007) was used to assess emergent literacy while the Peabody Picture Vocabulary Test-III (Dunn & Dunn, 1997) assessed children's receptive vocabulary skills. In addition, the Picture Vocabulary subtest of the WJ-III (Woodcock, McGrew, and Mather, 2001) assessed expressive vocabulary. Results indicated that behavior regulation was significantly and positively related to all academic outcomes. Moreover, children with greater self-regulation were more engaged in classroom activities, which in turn lead to greater improvements in expressive vocabulary. While an association between behavior regulation and school success has been supported by empirical evidence, the attention and emotion components must be examined as well.

Attention Regulation and School Achievement

Children's capacity to succeed in school may include other skills that more directly affect their ability to engage in cognitive learning tasks. Another cognitive skill related to self-regulation includes the ability to modulate attention based on present information. Attention regulation refers to the skill of purposefully attending to relevant information, while also possessing the skill to shift attention (Welsh, Nix, Blair, et al., 2010). For example, if a child were to be independently working, then attending to a teacher who is providing further

instruction, then attending on the independent work again, the child would be exhibiting attention regulation. The child is able to attend to relevant information and change attention based upon the environment.

Research has shown that attention control is significantly related to growth in emergent literacy and numeracy skills in the prekindergarten year (Welsh et al., 2010). Welsh and colleagues found that direct measures of attention control and working memory both directly and indirectly predicted kindergarten reading and math achievement. Attention control and working memory measured at the start of the prekindergarten year significantly and positively predicted end-of-year attention control and working memory, emergent numeracy, and emergent literacy skills. End-of-year attention control and working memory then significantly and positively predicted kindergarten math and reading achievement, while emergent numeracy and emergent literacy predicted kindergarten math achievement and reading achievement, respectively.

Further research has expanded the examination of attention by studying task attentiveness in relation to academic achievement (Sawyer, Chittleborough, Mittinty, et al., 2014). Task engagement, or task attentiveness, was longitudinally measured in a group of students across ages 2 to 6 years ($n = 3,410$) through the use of parent questionnaires. The findings indicated that improvements in task attentiveness in early elementary school were associated with higher levels of teacher-rated literacy and math achievement. Some have posited that attention regulation is a relatively stable trait dependent upon central nervous system and brain characteristics (Kandel, Schwartz, & Jessell, 2000 as cited in Luszczynska, Diehl, Gutierrez-Dona, et al., 2003); however, measurement of the construct still provides information that may assist in identifying children who may be academically at-risk.

Implications for attention appear to have farther reaching consequences past the primary grades. McClelland, Acock, Piccinin, Rhea, and Stallings (2013) embarked on a broader investigation of the relation between preschool attention span and educational achievement at age 25. The researchers used data from the Colorado Adoption Project and included a sample of 430 participants. Using the Attention Span-Persistence subscale from the Colorado Child Temperament Inventory (CCTI; Rowe & Plomin, 1977) at age four, the authors found that attention span was significantly and positively related to math skill at age 21, as measured by the Arithmetic subscale of the Wechsler Adult Intelligence Scale-III (WAIS-III; Wechsler, 1981). In addition, this relationship was mediated by math skill at age seven, measured by the WISC-R Arithmetic subscale (Wechsler, 1974), such that children who exhibited higher attention span performed better in math at age seven, and subsequently better in math at age 21. Most outstanding was the finding that subjects were 14% more likely to graduate from college by age 25 for each one point higher a subject was rated on attention span-persistence at age four. This finding was evident while controlling for reading and math achievement at age seven and 21, sex, vocabulary skills at age four, adoption status, and maternal education level.

Indirect, but similar, effects of attention regulation have been supported in related research. Deater-Deckard, Petrill, Thompson, and DeThorne (2005) examined the relationship between task persistence, cognitive performance, and behavioral problems during the transition to middle childhood, but also found support for task persistence being related to later academic performance. Task persistence was gathered from three independent sources using three separate rating scales: teachers (Teacher Report Form, TRF; Achenbach, 1991b), in-home testers (Behavior Record; Bayley, 1969), and independent observers (Parent-Child Interaction System of global ratings; Deater-Deckard, Pylas, & Petrill, 1997). Results indicated that higher levels of

task persistence were related to higher cognitive performance (short form of the Stanford-Binet Intelligence Scale; Thorndike, Hagen, & Sattler, 1986), academic achievement (teacher report on the Teacher Report Form; Achenbach, 1991b), and fewer behavioral problems (parent report on the Child Behavior Checklist; Achenbach, 1991a; teacher report of the Teacher Report Form; Achenbach 1991). Children's abilities to regulate their attention to tasks, persistence, and behavior in a classroom environment consistently predicted academic achievement in a range of studies. In addition to attention and behavior regulation, research has shown a similar relationship has emerged regarding emotion skills.

Emotion Skills and Achievement

The capacity to manage, understand, and verbalize emotions is a critical component in self-regulatory behavior. Parsing out the various components in emotion skills can be complex; however, emotion regulation may generally be considered more behavioral, while emotion knowledge may be considered a more cognitive or knowledge-based process. The following sections will review these concepts in relation to school achievement in early learning.

Emotion Regulation

Being able to regulate attention relates to emotion regulation in that one must attend to internal states as well as external information (Luszczyńska et al., 2003). If individuals struggle with low emotion regulation, they are preoccupied with their current emotional state and may have difficulty shifting attention away from the current negative emotion. In opposition, if children can more readily identify internal information, they may be able to shift attention away from a negative emotion, consequently shortening the duration and intensity of negative states. In school, children will encounter situations that will require them to regulate their emotions to appropriately respond to the situation and to return to a state facilitating learning.

Emotion regulation is often described as a correlate or a subcomponent of self-regulation. Tice and Bratslavsky (2000) describe emotion regulation as a special subtype of self-regulation in that if one focuses too intently on regulating moods, one can lose self-control in other areas which has important implications for educational settings. An over emphasis in exercising self-control can result in negative moods, which predisposes people to fail at self-regulation causing a negative spiraling effect. For instance, if children have to expend a large amount of effort to control their mood, they may not be as able to control their behavior, as self-regulation is subject to exhaustion (Baumeister, Vohs, & Tice, 2007).

The research base provides some evidence to a link between emotion regulation and academic functioning. Howse, Calkins, Anastopoulos, Keane, and Shelton (2003) used a sample of 125 mother-child dyads to examine the impact of emotion regulation on academic functioning, while collecting data during the children's preschool and kindergarten years. Emotion regulation was directly assessed using two separate measures: attractive toy in a transparent box and impossibly perfect circles. First, experimenters asked children which of the available toys they liked best, then proceeded to lock the chosen toys in a transparent box with a pad lock. Children were given a ring of keys and told they could play with the toys when they opened the box. None of the given keys opened the box. Second, children were asked to draw a perfectly round circle, then were critiqued in a neutral voice and asked to draw another one for three and one half minutes, at which point the children received praise and were asked to draw a smiley face with the circle. The measures allowed the researchers to investigate children's latency to frustration, duration of frustration, and intensity of frustration. In addition, parents completed the Emotion Regulation Checklist (ER Checklist; Shields & Cicchetti, 1997). In order to account for cognitive variability, the Full Scale IQ score from the Wechsler Preschool and Primary Scale of

Intelligence – Revised (WPPSI-R; Wechsler, 1989) was used as the measurement of IQ, while five subtests from the Wechsler Individual Achievement Test (WIAT; Wechsler, 1992) examined early achievement: basic reading, mathematical reasoning, spelling, numerical operations, and listening comprehension. Behavior regulation was measured through the use of eight items from the Instrumental Competence Scale for Children (COMPSCALE; Adler & Lange, 1997). Results showed that parent-rated emotion regulation was a significant predictor for early math skills, and listening comprehension skills, while kindergarten behavior regulation was a significant mediator in this relationship. Specifically, preschoolers who struggle with emotion regulation may also struggle with learning regulation in kindergarten.

In addition, Hill and Craft (2003) investigated emotion regulation and early learning within the context of a larger study. The researchers used a sample of 103 kindergarten children in order to examine mediational pathways related to the role of parent involvement upon school performance. Emotion regulation was measured through the use of the Emotion Regulation scale of the Children’s Social Competence Scale (Gesten, 1976), while academic functioning was assessed via the Sound-Letter Correspondence scale (reading) and Quantitative Concepts scale (math) of the Metropolitan Readiness Test, Level 2 (Nurss & McGauvran, 1995). Results demonstrated that emotion regulation was significantly and positively related to reading and math variables for all children. When entered into a path model, emotion regulation was also a significant mediator between parental involvement with children at home and math performance, such that the more parents involved themselves with their children at home, children would exhibit higher levels of emotion regulation, which resulted in children performing better in math, but only for Euro-American children.

Teacher-based perspectives of emotion regulation upon academic functioning show similar patterns. Trentacosta and Izard (2007) studied a sample of 142 children assessed during preschool and kindergarten, and measured emotion regulation via teacher ratings on the Emotion Regulation Checklist (ERC; Shields & Cicchetti, 1997). Academic functioning was measured two distinct ways: teacher-rated academic competence (Academic Competence scale on the SSRS; Gresham & Elliott, 1990) and academic achievement (Word Reading, Numerical Operations and Spelling subtests of the Wechsler Individual Achievement Test-2nd Edition-Abbreviated, WIAT-II-A). Results indicated that emotion regulation was directly and positively related to teacher ratings of academic competence. Moreover, path analyses revealed that emotion regulation played an indirect role in predicting academic achievement and competence, such that verbal ability significantly predicted emotion regulation, which significantly predicted attention to academic tasks, which in turn significantly predicted academic competence. Children with higher verbal ability were also better able to regulate their emotions, which in turn lead them to better attend to academic tasks resulting in them not only performing better, but also being perceived as more academically competent.

Emotion Knowledge

Another core component of emotion skills, in addition to regulation, includes emotion knowledge. Emotion knowledge is fundamental to children's success in all aspects of life (Denham, et al., 2003). Emotion knowledge is a person's ability to recognize and properly label emotions within oneself and in others. This essential social skill allows one to navigate complex social situations in order to function appropriately. For instance, being able to recognize that a friend is upset may allow one to appropriately respond, by comforting the friend, rather than responding inappropriately by teasing the friend. More specifically, boys who struggle with

emotion knowledge skills are more likely than those who do not struggle to experience internalizing problems (Heinze, Miller, Seifer, et al., 2015). In addition, struggling with emotion knowledge was significantly related to loneliness, victimization and rejection, and parent-rated internalizing problems. (Heinze et al., 2015). Specifically, children who struggle with emotion knowledge may find themselves facing more difficult problems than only struggling with identification and recognition of emotions.

Although emotion knowledge is highly important for children to function appropriately in social situations, learning these skills is not an easy task. In order to recognize emotions, children must carry out three functions correctly: identify relevant emotional information, ignore irrelevant emotional information, and simultaneously deal with the relevant and irrelevant information (Denham & Burton, 2003). In relation to peer relationships and academic achievement, it has been posited that children who are better able to identify and recognize emotions are more successful than those who cannot do so (Denham et al., 2003).

Emotion knowledge relates to social-emotional outcomes, but it has also been theorized that it relates to school achievement. In fact, there is evidence to support the idea. In a meta-analysis, La Paro and Pianta (2000) compiled and analyzed over 60 studies regarding early school outcomes. The analyses were divided into their predictors and their outcomes. Studies that predicted academic or cognitive outcomes based on the same predictors had a stable, moderate effect size ($r = 0.51$). The researchers noted that far fewer studies were conducted using social or behavioral predictors and outcomes, and thus the small effect size was unstable ($r = 0.27$). Interestingly, the authors could not find an appropriate amount of studies that included social or behavioral predictors of academic or cognitive outcomes to find a stable estimate of

either preschool or kindergarten predictors. The dearth of research in the field regarding academic outcomes in relation to social variables evidences the need of investigation.

In recent years, however, more research has been conducted investigating how social-emotional variables relate to early academic outcomes. For example, Curby, Brown, Bassett, and Denham (2015) examined how well preschoolers' social-emotional competence predicted preliteracy skills. The researchers utilized the Social Competence and Behavior Evaluation (SCBE-30; LeFreniere & Dumas, 1996) to measure emotion expression and regulation, while using the Affect Knowledge Test (Denham, 1986) to assess emotion knowledge. Preliteracy skills were examined with letter recognition, letter sound, beginning sound awareness, print and word awareness, and rhyme awareness tasks of the PALS-PreK (Invernizzi et al., 2001). The researchers found that children's emotion knowledge was significantly and positively related to preliteracy performance over and above gender, age, maternal education, attentional abilities, and classroom emotional support.

In addition, Izard, Fine, Schultz, Mostow, Ackerman, and Youngstrom (2001) examined a similar topic, but explored prediction rather than association. In a sample of 72 families with children attending Head Start, the researchers studied emotion knowledge as a long-term predictor of academic functioning. To assess the construct of emotion knowledge, children were asked to label and recognize emotions (Izard, 1971), while academic competence was measured through the use of the Academic Competence scale of the Social Skills Rating System (SSRS; Gresham & Elliott, 1990). The results indicated that emotion knowledge was a significant predictor of teacher-rating third grade academic competence. Moreover, it was found that the ability to recognize and identify emotions significantly mediated the relationship between verbal ability and academic competence. Children who had a higher measured verbal ability scores

(Peabody Picture Vocabulary Test – Revised; Dunn & Dunn, 1981) also had higher emotion knowledge scores, which lead to higher academic competence ratings.

In examining the predictive role of emotion knowledge upon academic functioning, Trentacosta and Izard (2007) bolster the argument further. In a sample of 142 children assessed during preschool and kindergarten, the researchers measured emotion knowledge via the Assessment of Children’s Emotion Skills (ACES; Schultz & Izard, 1998). First, it was found that emotion knowledge was significantly and positively related to both academic competence and academic achievement. More specifically, results from path modeling indicated that emotion knowledge positively and significantly predicted both academic competence and achievement, while mediating the roles of test session attention, age, and verbal ability upon academic achievement and competence.

Measurement Considerations

A considerable amount of research has been collected and analyzed in the areas of behavior regulation, attention, and emotion skills as they relate to academic outcomes. These constructs have been measured using different terms, while utilizing both direct and indirect measures. Regarding measurement, behavior regulation is frequently measured directly, while attention is often measured via rating scales (Deater-Deckard et al., 2005; McClelland et al., 2013; Sawyer et al., 2014). For details, see Table 1. In addition, the measurement of emotion regulation is frequently captured by rating scales, while emotion knowledge is generally measured directly. Specifically, the Emotion Regulation Checklist (Howse, Calkins, Anastopoulos, et al., 2003; Trentacosta & Izard, 2007) is often used to measure the construct. Utilizing rating scales when measuring emotion regulation allows for quick and cost-effective measurement of the construct, without having to intentionally upset each child involved with

data collection. Direct measurement of attention regulation may provide more resolution into the picture of the construct, in contrast to many of the indirect measures previously used.

Table 1

Summary of Measures in Literature Base

Study	Measure	Type	Area
McClelland et al., 2007	Head-to-Toes Task	D	Behavior Regulation
Bohlman & Downer, 2016	Pencil Tap Test	D	Behavior Regulation
Welsh et al., 2010	DCCS	D	Attention Regulation
Sawyer et al., 2014	LSAC	PRF	Attention Regulation
McClelland et al., 2013	CCTI	PRF	Attention Regulation
Deater-Deckard et al., 2005	TRF, BR, P-CIS	TRF, OR	Attention Regulation
Howse et al., 2003	ER tasks, ER Checklist	D, PRF	Emotion Regulation
Hill & Craft, 2003	CSCS	PRF	Emotion Regulation
Trentacosta & Izard, 2007	ER Checklist	PRF	Emotion Regulation
Curby et al., 2015	AKT	D	Emotion Knowledge
Izard et al., 2001	Recognize Emotion	D	Emotion Knowledge
Trentacosta & Izard, 2007	ACES	D	Emotion Knowledge
Chronaki et al., 2013	Emotion Recognition	D	Emotion Recognition
Denham, 1986	Affective Labeling	D	Emotion Recognition
Denham et al., 2012	AKT	D	Emotion Knowledge
Denham et al., 2014	AKT	D	Emotion Knowledge
Garner & Waajid, 2008	Emotion Identification	D	Emotion Identification
Heinze et al., 2015	AKT, EMT, KAI	D	Emotion Knowledge

**Note:* DCCS = Dimensional Change Card Sort Task, LSAC = Longitudinal Study of Australian Children questionnaire, CCTI = Colorado Child Temperament Inventory, TRF = Teacher Report Form, BR = Behavior Record, P-CIS = Parent-Child Interaction System of global ratings, ER Checklist = Emotion Regulation Checklist, CSCS = Children's Social Competence Scale AKT = Affect Knowledge Test, ACES = Assessment of Children's Emotion Skills, EMT = Emotion Matching Test, Knowledge Assessment Interview, D = Direct measure, TRF = Teacher rating form, PRF = Parent rating form, OR = Observer report.

In examining the techniques used to measure different components of self-regulation, it becomes evident that a standard practice or battery does not emerge in the literature. In addition, although much data has been gathered in a variable-centered approach, not much research has been conducted examining self-regulation through a person-centered lens (Denham et al., 2012). More specifically, it may benefit school personnel to examine how subgroups of children academically change over time. More data needs to be gathered to accurately describe these subgroups of children, while also examining how they academically perform across time.

Person-Centered Approaches to School Readiness

Numerous studies within the research base show clear connections between behavior regulation, attention, emotion skills, and academic functioning as variables. Much of the research has been analyzed via regression or structural equation modeling, falling under the general linear model. Using such approaches commonly means estimating effects of independent variables upon dependent variables while holding constant other independent variables. Some believe that this may not be the most appropriate way to examine individual people, in that, that no variables uniquely contribute to outcomes while being totally separated from other variables (Bauer & Shanahan, 2007).

For instance, Bergman and Magnusson (1997) take a holistic-dynamic system view. It is stated under this view that individuals are viewed as an organized whole and function as such. Each of the individual's structures and processes work together as the person wholly develops. Bergman and Magnusson also state that such a methodological view can be taken no matter what level of focus is of current interest (e.g., behavior, cognition), if patterns are being identified across variables. In this view, the effects of variables are not able to be parsed out and all

involved contribute to the outcomes of the individual. This would mean that all variables need to be examined together, in an analysis such as cluster analysis.

Bergman and Magnusson (1997) opined that techniques that identify variable organization, such as cluster analysis, are better able to describe high levels of interactions and nonlinear relationships. Others have argued that making continuous variables discrete by placing individuals into subgroups can alter the nonlinear effects (MacCallum, Zhang, Preacher, & Rucker, 2002). In fact, MacCallum and colleagues go on to state that even for complex and simple models alike, there are no benefits to utilizing a person-centered approach. However, Bauer and Shanahan (2007) provide an empirical example of the differences between using the general linear model and a person-centered approach.

The model compares a logistic regression model against a latent profile analysis model. Bergman and Magnusson (1997) note that even when using the highest amount of interactions possible within the regression model based upon available variables, the lower- and higher-order interactions must be described separately, which limits the degree to which results can be interpreted holistically. The authors then turn to interpreting the results of the latent profile analysis model by stating that two concessions must be made before interpreting results: the distribution of true scores may be continuous, not discrete and the latent classes may not directly represent actual groups within the population. Bergman and Magnusson (1997) state that latent profile analysis can still be beneficial because the discrete categories can be conceptually organized as points along the continuum.

Bergman and Magnusson (1997) conclude the comparison with two key advantages of person-centered approaches over variable-centered approaches. First, person-centered analyses, particularly latent profile analysis, do not make any assumptions about the shape of the

predictive relationships between variables. Thus, these types of analyses allow for changes outside the representative capabilities of the general linear model while not increasing the complexity of the model by adding quadratic or higher order relationships. Second, latent profile analysis allows one to immediately bring attention to the patterns that are most characteristic of the data rather than focusing on a small representation of the sample. Furthermore, von Eye (2010) states that instead of focusing on the entire sample of individuals, restricting statements to only reflect individuals or groups of individuals the proportion of variance explained within the groups can be dramatically increased.

To apply a person-centered approach to school-readiness would mean that one is not restricted to the assumption of linearly related variables, while not needing to make changes to theory regarding the involved variables. In addition, one could attend to the most salient patterns of the data while focusing on a large part of the sample and possibly providing more accurate descriptions of the subgroups of participants involved. Moreover, one would be able witness complex interactions while examining difference between and within participants.

Profiles of School Readiness and Risk in Children

Evidence has shown that behavior regulation (e.g., Bohlman & Downer, 2016; McClelland et al., 2007), attention (e.g., McClelland et al., 2013; Welsh et al., 2010) and emotion skills (e.g., Curby et al., 2015, Trentacosta & Izard, 2007) are related to academic functioning, but that little research has been conducted viewing these variables under a person-centered approach (Denham et al., 2012). Bergman and Magnusson (1997), suggest that using a person-centered approach may provide a unique and holistic view of children. Others have begun such a route of research, but the data are still limited.

One less examined relationship involves specific subtypes of children and how their academic achievement changes and grows over time (Bulotsky-Shearer, Bell, & Dominguez, 2012). Bulotsky-Shearer, Fantuzzo, and McDermott (2010) began this line of research when they investigated subgroups of children regarding emotional and behavioral adjustment in a sample of 829 children enrolled in a large urban Head Start program in the northeast. The researchers used the Adjustment Scales for Preschool Intervention (ASPI; Fantuzzo, Bulotsky, McDermott, et al., 2003) to measure teacher-rated preschool emotional and behavioral adjustment. To assess academic outcomes, the researchers employed the use of three measures. First, the Child Observation Record (COR; High Scope Educational Research Association, 1992), which measures teacher-rated emergent literacy, numeracy, social and emotional competencies. Second, the Peabody Picture Vocabulary Test-Third Edition (PPVT-III; Dunn & Dunn, 1997) was used to measure students' receptive vocabulary, while the Expressive One-Word Picture Vocabulary Test-Revised (EOWPVT-R; Gardner, 1990) was used to assess expressive vocabulary. Through the use of multistage hierarchical person-profile cluster analysis, the researchers were able to reach a solution that included six clusters of children based upon the ASPI rating scales: Well adjusted, adjusted with some peer problems, mildly socially disengaged, mildly socially disruptive, extremely socially disruptive, and extremely socially and academically disengaged. Results generally indicated that children in the first two subgroups (well-adjusted and adjusted with some peer problems) performed the highest on academic tasks and social tasks. However, no significant differences were noted regarding expressive and receptive vocabulary. In addition, the results from the COR are divided into sections of social engagement, cognitive skills, and coordinated movement. It would seem that the indirect measure of achievement, the COR, either places more emphasis upon the listed skills or

considers emergent literacy and numeracy cognitive skills. Furthermore, data were only collected during the preschool year, not allowing one to see how children change over time or investigate whether differences exist between groups later.

Bulotsky-Shearer conducted a similar study with colleagues (Bulotsky-Shearer, Bell, & Dominguez, 2012) two years later to extend the previous study, which focused on identifying subgroups of children at risk for academic problems based upon latent profiles of problem behavior. In a sample of 4,417 preschool children, the researchers measured teacher-rated preschool emotional and behavioral adjustment with the ASPI, while the COR was used to measure teacher-rated literacy and mathematics skills during three data collection points throughout the preschool year. Through the use of latent profile analysis six subgroups of children emerged within the data, similar to Bulotsky-Shearer, Fantuzzo, and McDermott (2010): well-adjusted (Type 1), adjusted with mild disengagement (Type 2), moderately socially and academically disengaged (Type 3), disruptive with peers (Type 4), extremely socially and academically disruptive (Type 5), and extremely socially and academically disengaged (Type 6).

Results of latent growth curve modeling indicated that all subgroups of children began the year with lower initial literacy and math skills, compared to the well-adjusted children (Bulotsky-Shearer et al., 2012). Surprisingly, children within Type 3 and Type 5 grew significantly more regarding literacy skills across the preschool year compared to well-adjusted children, and children within Type 2 and Type 3 grew significantly more than well-adjusted children in relation to math skills. However, at the close of the preschool year, well-adjusted children still maintained higher literacy and math ratings. Although this study may have furthered previous research using more sophisticated methods, it still retained inherent problems. The sample was not representative of the population, while also only using indirect measures of

students' skills. The researchers noted concerns about the COR's content validity, in that a limited amount of questions were asked of teachers regarding literacy and math skills. In addition, when teachers are asked to assume the role of assessor, teachers themselves can account for a considerable amount of the variance (Waterman, McDermott, Fantuzzo, & Gadsden, 2012). Furthermore, data were only collected across the preschool year. More direct measures of not only children's literacy and math skills, but also children's social-emotional competencies, across longer periods of time, may yield different results from what has previously been found.

One key study conducted by Denham, Bassett, Mincic, Kalb, Way, Wyatt, and Segal (2012) took a person-oriented approach in examining social-emotional variables in relation to academic outcomes. Like similar studies (Bulotsky-Shearer, Bell, & Dominguez, 2012; Bulotsky-Shearer, Fantuzzo, & McDermott, 2010), the examiners aimed to cluster children around four aspects of social-emotional learning (emotion knowledge, emotional and social behaviors, social problem-solving, and self-regulation) in order to examine how the subtypes of children differ in relation to their motivation to learn, participation in the classroom, academic adjustment, and academic success. The main goals of the study were to use a person-oriented approach to examine social-emotional learning (SEL) profiles, to examine demographic differences, and to find how the profiles relate to teacher reports of school-related success in kindergarten. In a sample of 275 students the researchers directly measured emotion knowledge through the use of the Affect Knowledge Test (AKT; Denham, 1986), while self-regulation was directly measured via the Preschool Self-Regulation Assessment (PSRA; Smith-Donald et al., 2007). The PSRA includes tasks that involve overriding responses, delaying responses, and latency of responses. To measure academic functioning teachers completed the ECLS-K

Academic Rating Scale (ARS; U.S. Department of Education, National Center for Education Statistics, 2002), which includes ratings of kindergarteners' language and literacy, general knowledge, and mathematical thinking. The researchers first found a solution wherein three clusters of children emerged: SEL Risk, SEL Competent-Social/Expressive, and SEL Competent-Restrained. Second, they discovered that kindergarten children in the SEL Competent-Restrained cluster were rated the highest by their teachers in terms of academic success followed by children in the SEL Competent-Social/Expressive cluster than children in the SEL Risk cluster, respectively. While limitations were present, the study extended previous research in that the data were collected across longer time points, and a different number of clusters emerged.

Current Study

As pressure mounts to have children entering formalized school settings ready to learn, preacademic skills are no longer the only skills children must have. Some attention has diverged, and evidence now shows that preacademic skills are still vital, but that proficient functioning also depends upon self-regulatory and social-emotional competencies (e.g., McClelland, Morrison, & Holmes, 2000; McLeod & Kaiser, 2004). The many forms of self-regulation allow children to appropriately respond to situations through better control of their behavior (McClelland et al., 2007; Bohlman & Downer, 2016), attention (Welsh et al., 2010; McClelland et al., 2013; Deater-Deckard et al., 2005), and emotions (Howse et al., 2003; Hill & Craft, 2003; Trentacosta & Izard, 2007), which have positive effects upon both social and academic outcomes. Possessing the skills of labeling and recognizing emotions affords children the opportunity to better navigate social situations which directly (Curby et al., 2015; Izard et al., 2001) and indirectly (Izard et al., 2001; Trentacosta & Izard, 2007) impacts academic

functioning. Research has also shown that these skills are able to be appropriately measured and intervened upon (Bierman et al., 2008; Graziano, Slavec, Hart, et al., 2014; Tominey & McClelland, 2011) to create more positive outcomes for young students that may last the entirety of their academic careers (McClelland, Acock, Piccinin, et al., 2013).

In addition to variable-centered approaches, research has recently begun to examine children through a person-centered lens. This approach allows researchers to be less limited in analyses (Bergman & Magnusson, 1997), while taking a more holistic look at students (Bauer & Shanahan, 2007). Such research has shown that different social-emotional subgroups of children perform and grow differently regarding academic functioning (Bulotsky et al., 2010; 2012; Denham et al., 2012). However, much of this person-centered research has utilized indirect measures and been somewhat short-sighted by only assessing change and growth through the kindergarten year (Bulotsky-Shearer et al., 2010; 2012; Denham et al., 2012). Furthermore, underrepresentation of subgroups, possibly due to sample size, was a cause for concern in one study, leaving researchers thinking that a shy group of children should have emerged in the data (Denham et al., 2012). In addition, dissimilar subgroups of children have emerged across the current literature, with Bulotsky-Shearer and colleagues (2010; 2012) having six emergent profiles of children, while Denham and colleagues had three emergent profiles of children. Moreover, previous research (Bulotsky-Shearer et al., 2010; 2012; Denham et al., 2012) utilized indirect measures of academic functioning that may result in less valid measurement of the construct.

The current study sought to extend the literature base through two main research aims. The current study first aimed to examine profiles of self-regulation and emotion skills at the start of the preschool year using direct and indirect measures while implementing a multiple method,

multiple informant approach. Current research is limited and discrepant regarding this topic in a person-centered approach but based upon previous work by Denham and colleagues (2012), it was expected that three subgroups of children would emerge from the data: *Competent*, *At-Risk – Aggressive*, and *At-Risk – Withdrawn*. Denham and colleagues found three clusters of children that surfaced from the data, comprised of one risk group and two competent groups. While this was plausible, the two competent groups of children only differed regarding one observational measure and did not significantly differ in terms of academic outcomes. Thus, it was thought that in the current study, only one cluster of children would emerge as being socially and emotionally competent, in addition to two at-risk subgroups of children differing based upon either aggressive behaviors or withdrawn behaviors. Data was analyzed via latent profile analysis. Children were clustered based upon their scores on the ACES, ERQ, CBQ subscales, Interviewer Checklist, Peg tapping task, Walk-a-Line-Slowly task, and the DCCS. In addition, the following variables were controlled for as covariates: a dummy coded sex variable, two dummy coded ethnicity variables, maternal education level, maternal marital status, maternal age at childbirth, family SES, the EOWPVT, and the Block Design subtest.

The second aim of the current study was to expand upon previous research regarding how children's subgroup membership affects later academic achievement. Current research has seen data collected through the kindergarten year but tracking children across longer periods of time will provide more insight into how powerful group membership may be. More importantly, this may give teachers and other school personnel the skill in identifying children that may be at academic risk that are usually not identified as such. To do so, the profiles of children, based on modal assignment, were entered into four distinct hierarchical regression models for four direct, standardized measures of academic achievement: Letter-Word Identification, Sight Word

Efficiency, Phonemic Decoding Efficiency, and Applied Problems. In addition, post-hoc analyses were conducted to examine any group differences between profiles in second grade. It was expected that socially and emotionally competent children possessed the highest levels of achievement in comparison to the other two hypothesized clusters of children.

Chapter 3

Method

Participants

Participants were drawn from a longitudinal, extant data set comprised of 356 children, which was initially collected in order to examine the effectiveness of the Head Start – Research-based, Developmentally Informed (REDI) program (Bierman et al., 2008). Participants were drawn from 44 Head Start classrooms in three counties in Pennsylvania. Half of the participating classrooms were in a densely populated county in the southeastern area of the state, which is comprised of an urban community surrounded by smaller communities. The other half of the classrooms were drawn from two counties in the central region of the state, mainly comprised of small towns and rural areas. Classrooms were stratified based upon three conditions: rural/urban location, percentage of minority students served, and full-day/half-day program. Within each condition, centers were randomly assigned to either the intervention or control condition resulting in an even distribution of children’s ethnicities. Children were recruited across two years and followed longitudinally through fifth grade. Participant retention was high across the sample with some data being collected for 84% of participants through third grade. Collected academic achievement outcomes were used from kindergarten and second grade, while covariates in the latent profile analysis were used from the end-of-year prekindergarten post-test. Because around half of the children in the sample participated in an intervention during the preschool year targeting social-emotional and academic skills, data for the current study began at the post-test to control for intervention effects.

Recruitment Procedures

Recruitment occurred via brochure distribution to parents of all four-year-old children in the participating classrooms; only 14 eligible families declined to participate. However, an additional 21 primary caregivers were difficult to reach and failed to complete a pre-assessment. In addition, two children were dropped from data collection because they had a sibling in the study, while 19 families withdrew early from the Head Start program. This resulted in a total of 356 children across all classrooms and conditions. However, after missing cases were removed listwise, there were 345 participants remaining. Demographic data is summarized in Table 2. Because it was shown that the Head Start REDI program significantly increased aspects of students' school readiness (Bierman et al., 2008), data for the current study began at the post-test assessment to control for intervention effects.

Table 2

Demographic Characteristics of Participants (N= 345)

Characteristic	<i>N</i>	%
Sex		
Female	186	53.9
Ethnicity		
Black	80	23.2
Latinx	66	19.1
Caucasian	199	57.7

Data Collection Procedures

Preschool child assessments occurred during two separate 30- to 45-minute sessions, wherein children were pulled from the classroom. The assessments were administered by trained research assistants and were coordinated with the teacher. Assessments occurred at the close of

the prekindergarten year and were conducted in available spaces that provided limited distractions. For their participation, children earned stickers. In addition, all contacted Head Start teachers agreed to participation and provided information about children through rating forms. The child behavior ratings were gathered from both lead teachers and an assistant teacher, which were highly correlated ($r = .60, p < .001$ for prosocial; $r = 0.76, p < .001$ for aggression) and averaged together. Teachers were compensated for their time and participation. Parent interviews also occurred near the end of the prekindergarten year during home visits. Some interviews were conducted in Spanish based on parent request. Similarly, parents were compensated for their time and participation. Research assistants visited schools annually through the participants' third grade year to administer measures to children and collect information from teachers.

Measures

Throughout the Head Start – REDI project, a multi-method assessment battery was used comprised of a variety of measures: language skills, emergent literacy skills, emotional understanding, social-cognitive skills, social behaviors, learning engagement at home, learning engagement at school, classroom participation, intellectual ability, and executive functioning skills. The current study focused on the areas of behavior regulation, attention, emotion skills, and academic achievement. The following sections are organized by analysis type including those variables that comprise the LPA input variables and academic outcome variables. Table 3 summarizes utilized measures.

Table 3***Summary of Current Measures***

Measure	Respondent	Administration Time Points
Academic Achievement		
Letter-Word Identification (WJ-III)	D	K, 2
Applied Problems (WJ-III)	D	K, 2
Sight Word Efficiency (TOWRE)	D	K, 2
Phonemic Decoding Efficiency (TOWRE)	D	K, 2
Broadband Self-Regulation		
Social Competence Scale (CBQ)	T	Pre-K Spring
Aggression Scale (CBQ)	T	Pre-K Spring
Withdrawn Scale (CBQ)	T	Pre-K Spring
Behavior Regulation		
Peg Tapping	D	Pre-K Spring
Walk-a-Line-Slowly	D	Pre-K Spring
Attention		
DCCS	D	Pre-K Spring
Interviewer Checklist	I	Pre-K Spring
Emotion Skills		
ACES	D	Pre-K Spring
ERQ	D	Pre-K Spring

**Note:* WJ-III = Woodcock Johnson Tests of Achievement – Third Edition, TOWRE = Test of Word Reading Efficiency, DCCS = dimensional change card sort, ACES = the Assessment of Children’s Emotion Skills, ERQ = Emotion Recognition Questionnaire, CBQ = Child Behavior Questionnaire, D = Direct Child Measure, T = Teacher Rating, I = Interviewer Rating.

Latent Profile Analysis Input Variable Measures

Throughout the Head Start – REDI data collection many variables were collected that assess self-regulation, four of which were used in the present study. Although some direct measures of self-regulation may include variance attributable to other skills (e.g., working

memory), the measures all assess skills consistent with other studies of self-regulatory behavior including behavior regulation (Bohman & Downer, 2016), attention (Welsh et al., 2010), and emotion skills (e.g., Trentacosta & Izard, 2007; Denham et al., 2012).

Broadband self-regulation

Child behavior questionnaire. Social-emotional behavior was measured through the use of three teacher-rated subscales (Social Competence, Aggressive, and Withdrawn) from the Child Behavior Questionnaire (Conduct Problems Prevention Research Group [CPPRG], 1995) to provide more insight into children's observable behavior. Items related to prosocial behavior included behaviors such as sharing, helping, and cooperating. Items corresponding to aggressive behaviors included breaking things, yelling, and hitting, while items related to the withdrawn scale were items such as having low energy, keeping to oneself, and avoiding play with other children. All items were rated on a six-point Likert scale (*never to almost always*). As this measure provides a more objective and third-party measurement approach to self-regulation, it is a more overall picture of how children behave in a group setting.

Behavior regulation

Two tasks were used to directly measure children's behavior regulation. Each task required children to replace one response with another.

Peg tapping task. The peg tapping task (Diamond & Taylor, 1996) required children to tap their peg once when the interviewer tapped twice and vice versa. Scores represent the correct number of trials out of 16 ($\alpha = 0.87$ and 0.84 in the fall and spring, respectively). This task required children to inhibit one response by replacing it with another, one representation of behavior regulation.

Walk-a-Line Slowly. As a second direct measure, the Walk-a-Line Slowly task (Kochanska, Murray, Jaques, et al., 1996) asked children to, first, help the interviewer tape a six-foot piece of string to the ground then walk along it while the interviewer timed them. The children were then asked to walk along the string as slowly as they could, twice. The scores represent the average percentage by which the children were able to increase their times across the successive trials. Scores for this task were log transformed to better fit a normal distribution.

Attention

One direct and one indirect measure were used to assess children's attention levels as it relates to self-regulatory behavior. The first involves attention set shifting via attending to different sets of rules, while the second was a rating of attention and engagement.

Dimensional change card sort task (DCCS). As a direct measure of attention set shifting, the dimensional change card sort task (Frye, Zelazo, & Palfai, 1995) asked children to sort target cards according to one characteristic. After learning to sort the cards according to a certain characteristic, children were then asked to learn another way to sort the cards and then finally switch between ways of sorting the target cards. The scores on the measure represent the correct number of trials of six during which the child correctly sorted the target cards.

Interviewer checklist. Another measure of self-regulation that was included in the current study was a 13-item rating scale completed by the interviewer after testing sessions that focused on the task orientation of the child during the session (Smith-Donald, et al., 2007). Items included children's capacity to sustain attention, demonstrate self-regulation, and engage actively to achieve a goal. Each item was rated on a four-point scale using operationally defined behavioral descriptors ($\alpha = 0.93$). Scores across the two assessment sessions were averaged ($r = .57, p < 0.001$, and $r = 0.62, p < 0.001$, for fall and spring, respectively).

Emotion skills

The emotion skills component of self-regulation was measured using three measures, two direct and one indirect. Emotion knowledge was measured through two direct assessments, while social-emotional behavior was measured through a rating scale.

Emotion knowledge. Two measures comprised what was used as the emotion knowledge variables in the current study. First, on the Assessment of Children's Emotion Skills (ACES; Schultz, Izard, & Bear, 2004), children chose one of five options to associate with 12 photographs of facial expressions: happy, mad, sad, scared, or no feelings. The total number of correctly identified photographs was used as the score ($\alpha = 0.57$). Second, on the Emotion Recognition Questionnaire (ERQ; Ribordy, Camras, Stafani, & Spacarelli, 1988) children listened to 16 stories that placed characters in situations which would elicit emotion. Children were asked to identify the character's feeling by pointing to pictures of happy, mad, sad, or scared faces ($\alpha = 0.63$).

Academic Outcome Measures

Several measures of academic achievement were directly collected from children. Data collected included information from three conceptual domains: language skills, emergent literacy skills, and numeracy skills.

Emergent Literacy and Language Skills

Three tests were administered to children to directly assess language skills. First, the raw scores ($\alpha = 0.90$) of the Letter-Word Identification subtest of the WJ-III measured children's letter recognition and basic sight word knowledge. In addition, two subtests from the Test of Word Reading Efficiency (TOWRE, test-retest reliability ranges = 0.85-0.90; Torgesen, Wagner, & Rashotte, 1999) required children to correctly read as many words as possible within 45

seconds (Sight Word Efficiency) and sound out as many non-words as possible in 45 seconds (Phonemic Decoding Efficiency).

Numeracy Skills

In addition to language and emergent literacy skills, data reflecting children's conceptual knowledge of numeracy were also collected. The Applied Problems subtest of the Woodcock-Johnson (Woodcock, McGrew, & Mather, 2001; $r = 0.93$) assessed a range of mathematical skills increasing in difficulty. Tasks asked of children included, but were not limited to, showing a certain number of fingers, counting items, and basic addition and subtraction.

Current Analyses

The analyses for the current study were twofold. First, latent profile analysis (LPA) was conducted to sort the sample of children into distinct profiles based on self-regulation and emotion skills. Second, the profiles of students were analyzed using hierarchical linear regression to discover if the profiles of children predicted academic performance in second grade, while controlling for kindergarten academic performance on those same tasks.

Research Aim One

To cluster children into subgroups within the sample, the present study utilized LPA, which is a person-centered approach wherein the sample is considered to consist of k latent groups, the number of which is assigned a priori. This approach is commonly used in the behavioral sciences to classify groups of individuals who are like one another, but dissimilar to other groups (Mun, von Eye, Bates, and Vaschillo, 2008). The current study grouped children into homogenous profiles based upon their scores in the general domains of self-regulation and emotion skills. Three scales of the CBQ provided information into observable student behavior in social settings. The peg tapping task and the Walk-a-Line-Slowly task informed profile

formation regarding behavior regulation, while the DCCS and interviewer checklist assisted in forming profiles through measurement of attention. In addition, the ACES and the ERQ were used to measure the construct of emotion skills and inform profile membership. In addition, covariates controlled for external factors including sex, ethnicity, maternal age at birth of child, maternal level of education, family socioeconomic status, parental marital status, and corollary measures of intelligence: the Expressive One-Word Picture Vocabulary Test (EOWPVT; Brownell, 2000) and the Block Design subtest from the Wechsler Preschool and Primary Scale of Intelligence, Third Edition (WPPSI-III; Wechsler, 2002).

One possible problem exists with LPA, which is that clustering will always occur even if the clusters are not based on data. Thus, researchers must have theory on which to base the number of clusters. Utilizing information from prior research (Denham et al., 2012), it was hypothesized that three homogenous clusters of children will emerge from the data based upon emotion knowledge and self-regulation: *Competent, At-Risk – Aggressive, At-Risk – Withdrawn*. See Table 4 for a summary of hypothesized clusters. Denham and colleagues (2012)

Table 4

Hypothesized Profile Membership Characteristics

	Measures					
	Emotion Skills	Behavior Regulation	Attention	Prosocial Behavior	Withdrawal	Aggression
<i>Competent</i>	High	Moderate/H	Moderate/H	High	Low	Moderate/L
<i>At-Risk –A</i>	Moderate/L	Moderate/L	Moderate/L	Moderate/L	Low	High
<i>At-Risk –W</i>	Moderate/L	Moderate/L	Moderate/L	Low	High	Low

found three emergent clusters, but differentiation of two (*SEL Competent-Social/Expressive* and *SEL Competent-Restrained*) of these clusters was largely based on one observer-rated measure,

while the groups did not significantly differ on later academic outcomes. Because the two clusters that evidenced similarities were both socially and emotionally competent, it was hypothesized that only one competent group would emerge from the data of the present study. In addition, it was hypothesized that two risk groups would emerge with one group exhibiting aggressive behavior and another exhibiting withdrawn behavior. While Denham and colleagues noted that a shy cluster of children was possibly missing from the set of clusters, it may have been difficult to determine differences between shy children and those that were competent but restrained. For that reason, the current study expects to find one withdrawn group.

It was hypothesized that *Competent* children will have high performance on emotion skills tasks, moderate to high performances on the behavior regulation tasks, moderate to high scores of attention, high ratings of social competence, low ratings of withdrawal, and moderate to low ratings of aggressiveness. *At-Risk – Aggressive* children were expected to have moderate to low performance in the areas of emotion skills, behavior regulation, attention, and prosocial behavior while having low ratings of withdrawal and high ratings of aggression. *At-Risk – Withdrawn* children were hypothesized as having similar scores as aggressive children in the areas of emotion skills, behavior regulation, attention, and prosocial behavior, while having high ratings of withdrawn behavior and low ratings of aggression.

Research Aim Two

To examine possible prediction of later academic performance based on profile membership, the current study utilized hierarchical linear regression. Outcome variables included four measures of early academic skills (Letter-Word Identification, Sight Word Efficiency, Phonemic Decoding Efficiency, and Applied Problems) in second grade, while controlling for kindergarten performance in those skills. Profile membership was the predictor variable that was

dummy coded to represent each of the profiles. Included post-hoc comparisons from the regression analyses were conducted to examine any between profile differences on academic outcome measures.

Chapter 4

Results

Data Preparation

Bivariate Indicator Correlations

Bivariate correlations were examined between indicators to be used in the latent profile analysis in accordance with Cohen's (1988) standards for classifications of correlation coefficients. Only two relationships were noted to be both statistically significant and large ($r > .5$) as indicated in Table 5 below. These two significant and negative relationships were between the CBQ social competence scale and both the CBQ internalizing scale ($r = -.536$) and the CBQ aggressive scale ($r = -.782$). The two significant relationships were not surprising as children who are more socially competent would typically engage in less aggressive and

Table 5

Bivariate Correlations between LPA Indicators

	1	2	3	4	5	6	7	8
1. DCCS	-							
2. Peg Tapping	.280**	-						
3. WALs	.182**	.212**	-					
4. Interviewer Checklist	.257**	.489**	.178**	-				
5. CBQ Agg.	-.096	-.132*	-.060	-.151**	-			
6. CBQ Int.	-.168**	-.333**	-.100	-.265**	.315**	-		
7. CBQ Soc.	.171**	.276**	.111*	.278**	-.782**	-.536**	-	
8. ERQ	.308**	.451**	.211**	.330**	-.104	-.213**	.234**	-
9. ACES	.246**	.385**	.225**	.240**	-.049	-.056	.075	.418**

Note. DCCS = Dimensional Change Card Sort, WALs = Walk-a-Line-Slowly, CBQ = Child Behavior Questionnaire, Agg. = Aggressive scale, Int. = Internalizing scale, Soc. = Social Competence scale, ERQ = Emotion Recognition Questionnaire, ACES = Assessment of Children's Emotion Skills.

* Indicates significance at the .05 level (two-tailed). ** Indicates significance at the .01 level (two-tailed).

internalizing behavior. While the relationship between the social competence scale and the aggressive scale shows that there is overlap in the constructs measured, both variables remained in the analyses. As noted, while no other correlations were noted to be both significant and large, there were other interesting correlations. One existed between the interviewer checklist, measuring attention under the larger construct of self-regulation, and the peg tapping task, which measures behavioral regulation under the same larger construct (.489). Similarly, there was a significant relationship between the ACES and the ERQ (.418), which was also not surprising as the two both measure the construct of emotion skills. However, one other correlation existed between the ERQ and the interview checklist (.489) that was somewhat unexpected although moderate in size. While only two correlations were both significant and large, the analysis was able to proceed as expected with all variables able to be entered into the analyses.

Data Input Specifications

Mplus version 7.3 was utilized to conduct all data analyses related to the latent profile analyses that are described below. First, an input file was compiled, which specified the dataset to be used, included variable names, missing variable values, use variables, auxiliary variables, classes, and defined correlations between indicators. Use variables were noted to include a dummy coded sex variable, two dummy coded variables representing ethnicity, maternal education level, maternal marital status, maternal age at childbirth, family SES, the EOWPVT, the Block Design subtest, ACES, peg tapping task, WALs, ERQ, DCCS, the Interviewer checklist, CBQ aggressive scale, CBQ internalizing scale, and the CBQ social competence scale. In addition, to control for demographic variables, covariates were assigned using the “auxiliary” label and included the dummy coded sex variable, two dummy coded ethnicity variables, maternal education level, maternal marital status, maternal age at childbirth, family SES, the

EOWPVT, and the Block Design subtest. The covariates were entered into the mixture model with the “R3Step” command.

The model was then specified to include theoretical correlations. As two main constructs, emotion skills and self-regulation, were being used to conduct the LPA, indicators of the two constructs were specified to correlate within construct. For example, each indicator of emotion skills was correlated with all other emotion skills indicators, while each indicator of self-regulation was specified to correlate with all other measures of self-regulation. After each more complex class model was analyzed, nonsignificant correlations were removed from the model to decrease unneeded model complexity.

Research Aim One: Latent Profile Analysis

The first research aim of the current study is to cluster children into homogenous subgroups based on self-regulation and emotion skills using latent profile analysis (LPA). LPA was conducted in a stepwise fashion beginning with the least complex two-cluster model. The model controlled for variables that represented race, sex, maternal education level, maternal age at child’s birth, family socioeconomic status, maternal relationship status, and two corollary measures of cognitive ability (the EOWPVT and the Block Design subtest from the WPPSI). The model was constrained in that correlations occurred between the self-regulation variables and between the emotion skills variables. The resulting correlations are presented in Table 6. After initial investigation of statistically significant correlations, those that were not statistically significant were removed from the model to decrease unnecessary model complexity. Results indicated a statistically significant Lo-Mendell-Rubin likelihood ratio test (LMR-RT, $p < 0.001$). The resulting entropy value was high (0.936), while average latent class probabilities were high as well (0.957 and 0.986). In addition, the Akaike Information Criterion (AIC) value (6416.574),

Table 6***Correlations between SR and ES Variables in Two-Profile Solution***

	CBQ Agg.	CBQ Int.	CBQ Soc.	ERQ	DCCS	Peg Tapping	WALS
CBQ Agg.	-	-	-	-	-	-	-
CBQ Int.	0.191*	-	-	-	-	-	-
CBQ Soc.	-0.570*	-0.317*	-	-	-	-	-
ERQ	-0.016	-0.031*	0.039*	-	-	-	-
ACES	-0.082	-0.032	0.089	0.211*	-	-	-
Peg Tapping	-	-	-	-	0.038	-	-
WALS	-	-	-	-	-0.002	0.408*	-
Int. Checklist	-	-	-	-	0.015*	1.120*	0.033*

Note. * $p < 0.05$. Non-significant correlations were removed from the model.

Bayesian Information Criterion (BIC) value (6562.628), and Sample-Size Adjusted Bayesian Information Criterion (SA-BIC) values (6442.082) were noted. The resulting final profile counts were indicated as 111 and 234, as determined by modal assignment. Profile One represented 32.174% of the sample, while Profile Two represented 67.826% of the sample.

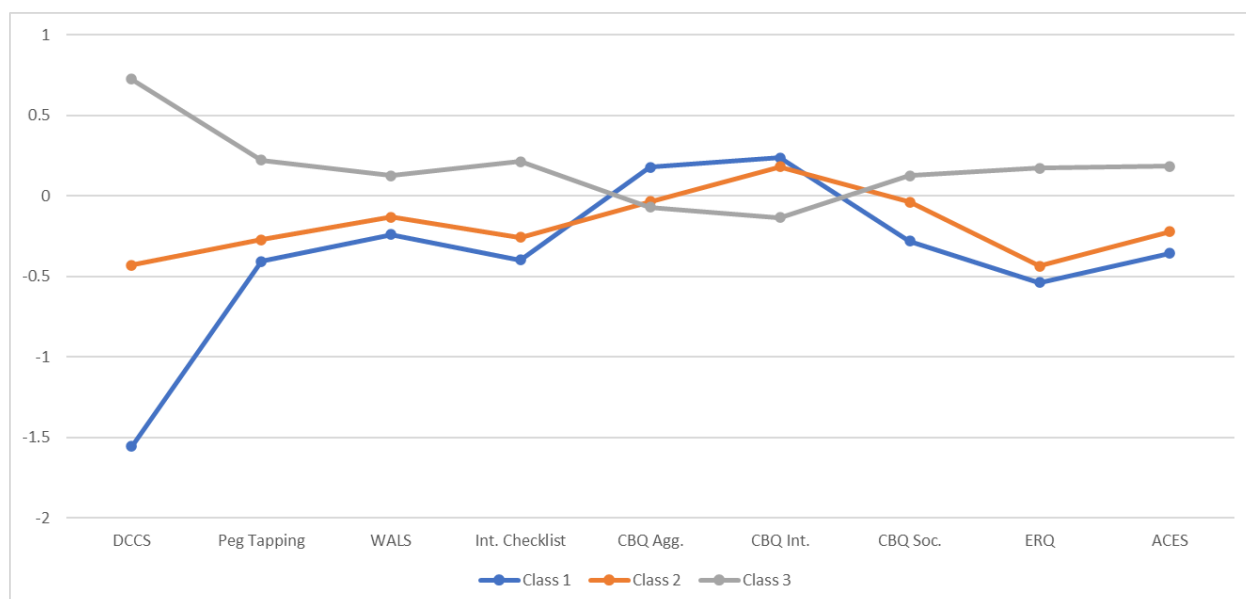
Next, a three-cluster model was analyzed to examine if a more complex model would better fit the data. As with the two-profile solution, correlations were examined between self-regulation variables and emotion skills variables, and those that were non-significant were removed from the model. Correlations are summarized in Table 7. Results indicated a statistically significant LMR-RT ($p < 0.001$). In addition, the entropy value was high (0.975), as were average latent class probabilities (0.973, 0.966, and 0.999). AIC (6188.379), BIC (6365.182), and SA-BIC (6219.257) values decreased somewhat compared to the two-profile solution. The final profile counts based on modal assignment were indicated as 87, 40, and 218. Profile One accounted for 25.217% of the sample. Profile Two consisted of 11.594% of the

Table 7***Correlations between SR and ES Variables in Three-Profile Solution***

	CBQ Agg.	CBQ Int.	CBQ Soc.	ERQ	DCCS	Peg Tapping	WALS
CBQ Agg.	-	-	-	-	-	-	-
CBQ Int.	0.179*	-	-	-	-	-	-
CBQ Soc.	-0.558*	-0.293*	-	-	-	-	-
ERQ	-0.007	-0.011	0.022*	-	-	-	-
ACES	-0.036	-0.070	-0.003	0.137*	-	-	-
Peg Tapping	-	-	-	-	-0.007	-	-
WALS	-	-	-	-	0.001	0.329*	-
Int. Checklist	-	-	-	-	0.009	0.580*	0.026

Note. * denotes $p < 0.05$. Non-significant correlations were removed from the model.

sample, while Profile Three account for 63.188% of the sample. Sample z-score plots of classes are shown in Figure 1. Plots revealed that Profile One and Profile Two performed similarly on

Figure 1***Z-Scores of Three Profile Solution***

the peg tapping task ($z = -0.405$ and -0.273 , respectively), Walk-a-Line-Slowly ($z = -0.24$ and -0.131), and were rated similarly on the interviewer checklist ($z = -0.398$ and -0.257). The groups also performed similarly on the ACES ($z = -0.356$ and -0.223) and the ERQ ($z = -0.537$ and -0.435) and were rated similarly on the CBQ internalizing scale ($z = 0.238$ and 0.182). Where Profile One and Profile Two differed most was the DCCS (Profile 1 $z = -1.554$; Profile 2 $z = -0.429$, respectively). In addition, while ratings on the CBQ aggressive (Profile One $z = 0.177$; Profile Two $z = -0.033$) and social (Profile One $z = -0.280$; Profile Two $z = -0.038$) scales did not largely differ, it should be noted that Profile One was rated as more aggressive and less social than Profile Two. Profile Three performed better than the other two classes on all measures of self-regulation (DCCS z -score = 0.725 ; peg tapping $z = 0.222$; WALS $z = 0.125$; Interviewer Checklist $z = 0.214$) and emotion knowledge (ERQ $z = 0.173$; ACES $z = 0.184$). In addition, Profile Three was rated as the most social (CBQ social scale $z = 0.125$) and lowest on the internalizing scale (CBQ internalizing scale $z = -0.135$).

A four-profile model was also analyzed. After non-statistically significant indicator correlations were removed, results indicated a statistically non-significant LMR-RT value ($p = 0.4293$), while entropy also decreased compared to the three-cluster model (0.952). Average latent class probabilities were moderately high (0.978 , 0.928 , 0.966 , and 1.000), while only minimal changes were noted in the AIC, BIC, and SA-BIC values as is summarized in Table 8. The BIC value increased when compared to the three-profile solution.

After examination of likelihood, LMR-RT, AIC, BIC, SA-BIC, and entropy values, the three-profile solution was chosen as the best fit for the data. While likelihood, AIC, BIC, and SA-BIC values decreased for the three-profile solution, entropy increased, while the model change remained statistically significant. Interestingly, likelihood, AIC, SA-BIC, and entropy

Table 8***Latent Profile Fit Statistics (N = 345)***

Fit Statistics	2-Profile Solution	3-Profile Solution	4-Profile Solution
LL	-3170.287	-3048.189	-3035.507
AIC	6416.574	6188.379	6179.014
BIC	6562.628	6365.182	6386.565
SA-BIC	6442.082	6219.257	6215.262
LMR H_0 LL Value	430.168	261.681	110.126
LMR p -value	0.000	0.000	0.429
Entropy	0.936	0.975	0.952

Note. LL = Log-Likelihood; AIC = Akaike's Information Criterion value; BIC = Bayesian Information Criterion value; SA-BIC = Sample-Size Adjusted Bayesian Information Criterion value; LMR – Lo-Mendell Rubin.

values only somewhat decreased when comparing the four-profile model to the three-profile model. In fact, the BIC value increased. However, the LMR-RT value indicated the model fit from the more complex four-profile solution was not statistically significantly better than the three-profile solution.

Descriptive statistics of the three profiles are summarized in Table 9. Profile 1 consisted of 25.2% of the sample (48.3% female; 21.8% Black; and 23% Latinx) and was characterized by lower performance on direct and indirect measures of self-regulation, as well as the highest levels of teacher-rated aggression, lowest levels of teacher-rated prosocial behavior, and lower scores on direct measures of emotion skills. Thus, Profile 1 is viewed as “At-Risk/Aggressive”. Profile 2 was comprised of 11.6% of the sample (52.5% female; 35% Black; and 25% Latinx) and was generally characterized with scores on self-regulation measures and direct measures of

Table 9***Profile Means, Standard Deviations, and Z-Scores for the Selected Solution***

Variables	Profile 1		Profile 2		Profile 3	
	M (SD)	Z	M (SD)	Z	M (SD)	Z
DCCS	0.019 (0.071)	-1.554	0.491 (0.071)	-0.429	0.975 (0.071)	0.724
Peg Tapping	9.123 (5.093)	-0.405	9.828 (5.093)	-0.272	12.459 (5.093)	0.222
WALS	0.334 (0.489)	-0.239	0.388 (0.489)	-0.131	0.515 (0.489)	0.125
Interviewer Checklist	2.472 (0.470)	-0.398	2.514 (0.470)	-0.257	2.772 (0.470)	0.214
CBQ Aggressive Scale	2.139 (0.863)	0.177	1.956 (0.863)	-0.033	1.925 (0.863)	-0.069
CBQ Internalizing Scale	2.294 (0.719)	0.238	2.253 (0.719)	0.182	2.021 (0.719)	-0.135
CBQ Social Scale	3.830 (0.832)	-0.280	4.037 (0.832)	-0.037	4.176 (0.832)	0.125
ERQ	1.449 (0.241)	-0.537	1.475 (0.241)	-0.435	1.630 (0.241)	0.172
ACES	6.469 (2.255)	-0.356	6.779 (2.255)	-0.222	7.723 (2.255)	0.183
Profile N (%)	87 (25.2)		40 (11.6)		218 (63.2)	
Female N (%)	42 (48.3)		21 (52.5)		123 (56.4)	
Male N (%)	45 (51.7)		19 (47.5)		95 (43.6)	
Black N (%)	19 (21.8)		14 (35)		47 (21.6)	
Latinx N (%)	20 (23)		10 (25)		36 (16.5)	
White N (%)	48 (55.2)		16 (40)		135 (61.9)	

emotion skills somewhat higher than Profile 1. In addition, teacher ratings of aggression were lower while teacher ratings of prosocial behavior were higher. However, levels of internalizing behavior remained similar with Profile 1. Thus, Profile 2 is viewed as “Internalizing”. Profile 3 (63.2%) was characterized by the highest scores on measures of self-regulation and emotion skills, while also being rated by teachers as the lowest on aggression and internalizing and the highest on prosocial behavior. Thus, Profile 3 is viewed as “Competent”. In addition, this profile was comprised of the highest percentage of females (56.4%), while the percentage of Latinx students in this group decreased somewhat compared to other profiles (16.5%).

Research Aim Two: Academic Performance Prediction

The second aim of the current study was to investigate whether profile membership in prekindergarten would significantly predict academic performance in second grade while controlling for academic performance in kindergarten. Measures of academic performance included the Letter-Word Identification subtest of the WJ-III, the Sight Word Efficiency subtest of the TOWRE, the Phonemic Decoding Efficiency subtest from the TOWRE, and the Applied Problems subtest of the WJ-III.

Hierarchical linear regression analyses were conducted using dummy coding for profile membership. Each second grade academic performance variable was regressed upon class membership independently. First, kindergarten performance was entered as the first predictor block, then class membership was added as the second predictor block. For instance, kindergarten Letter-Word Identification in kindergarten was entered as the first block when regressing class membership upon second grade performance on Letter-Word Identification.

Regarding performance on the Letter-Word Identification subtest, the analysis included 305 cases, as those with missing data were excluded listwise. The omnibus analysis indicated that Profile membership and kindergarten Letter-Word Identification performance significantly predicted second grade Letter-Word Identification performance ($F(3, 301) = 81.233, p < 0.000$). After examination of the omnibus model, the hierarchical model was reviewed. After controlling for kindergarten Letter-Word Identification performance, Profile membership did not statistically significantly predict second grade Letter-Word Identification performance ($F \text{ Change} = 3.016(2, 301); p = .050$). The R-square change was small (0.011) after controlling for kindergarten performance, and observed power for the change in R-square was calculated as 0.352. In addition, it was noted that the At-Risk/Aggressive children differed significantly from the

Competent children ($t = -2.365$; $p = 0.019$) on the second grade Letter-Word Identification subtest performance, but Internalizing and Competent children did not differ significantly ($t = -1.209$; $p = 0.228$). Specifically, the Competent children, on average, answered 1.733 more questions correctly on the subtest when compared to the At-Risk/Aggressive children. Results of both the hierarchical model and post-hoc comparisons are summarized in Table 10.

Table 10

Hierarchical Regression for Letter-Word ID and Profile Membership

Variable	β	Unstd. B	t	R	R^2	ΔR^2
Step 1				.661	.436	.436***
Kindergarten Performance	.661	.908	15.315***			
Step 2				.669	.447	.011
Kindergarten Performance	.641	.881	14.671***			
Profile 1 Membership	-.105	-1.733	-2.365*			
Profile 2 Membership	-.054	-1.189	-1.209			

Note. $N = 305$; * $p < .05$, ** $p < .01$, *** $p < .001$

On the Sight Word Efficiency subtest of the TOWRE, 304 cases were included in the analysis due to listwise missing data exclusion. The omnibus analysis indicated the Profile membership and kindergarten Sight Word Efficiency performance statistically significantly predicted second grade performance on the subtest ($F(3, 301) = 40.668$; $p < .000$). However, review of the hierarchical model indicated that while kindergarten performance significantly predicted second grade performance ($F \text{ Change}(1, 303) = 114.821$; $p < .000$), profile membership over and above kindergarten performance did not ($F \text{ Change}(2, 301) = 2.879$; $p = .058$). Observed power for the change in R-square was calculated as 0.436. Interestingly, At-Risk/Aggressive children and Competent children still significantly differed on this task ($t = -2.396$; $p = .017$). Specifically, Competent children answered, on average, 4.472 more questions correctly than did At-Risk/Aggressive children. The difference between Internalizing and

Competent children was not statistically significant ($t = -.447$; $p = 0.655$). Results from the hierarchical model and post-hoc profile comparisons are available in Table 11.

Table 11

Hierarchical Regression for Sight Word Efficiency and Profile Membership

Variable	β	Unstd. B	t	R	R^2	ΔR^2
Step 1				.524	.275	.275***
Kindergarten Performance	.524	1.098	10.715***			
Step 2				.537	.288	.014
Kindergarten Performance	.510	1.068	10.302***			
Profile 1 Membership	-.120	-4.472	-2.396*			
Profile 2 Membership	-.023	-1.131	-.447			

Note. $N = 305$; * $p < .05$, ** $p < .01$, *** $p < .001$

Three hundred three cases were included in the analysis conducted regarding the Phonemic Decoding Efficiency subtest from the TOWRE as data were excluded in listwise fashion. The omnibus model analysis indicated Profile membership and kindergarten Phonemic Decoding Efficiency statistically significantly predicted second grade performance on the subtest ($F(3, 300) = 28.252$; $p < .000$). Review of the hierarchical model indicated that while kindergarten Phonemic Decoding Efficiency statistically significantly predicted second grade performance on the subtest ($F \text{ Change}(1, 302) = 78.213$; $p < .000$), profile membership over and above kindergarten performance on the subtest did not ($F \text{ Change}(2, 300) = 2.804$; $p = .062$). Observed power for the change in R-square was calculated as 0.463. While Profile membership did not significantly contribute to this relationship, significant differences between profiles did exist, similar to previously noted relationships. Specifically, Competent children, on average, answered 3.109 more questions correctly than did children in the At-Risk/Aggressive profile ($t = -2.348$; $p = .020$). The difference between Internalizing and Competent children was not statistically significant ($t = -.861$; $p = .390$). Hierarchical model results and post-hoc profile comparisons are summarized in Table 12.

Table 12***Hierarchical Regression for Phonemic Decoding and Profile Membership***

Variable	β	Unstd. B	t	R	R^2	ΔR^2
Step 1				.454	.206	.206***
Kindergarten Performance	.454	1.526	8.844***			
Step 2				.469	.220	.015
Kindergarten Performance	.431	1.450	8.293***			
Profile 1 Membership	-.125	-3.109	-2.348*			
Profile 2 Membership	-.045	-1.520	-.861			

Note. $N = 305$; * $p < .05$, ** $p < .01$, *** $p < .001$

For the analysis regarding the Applied Problems subtest from the WJ-III, 305 cases were included in the analysis after listwise exclusion of missing data. The omnibus model revealed Profile membership and kindergarten Applied Problems performance statistically significantly predicted second grade performance on the subtest ($F(3, 304) = 63.065$; $p < .000$). Review of the hierarchical model indicated that kindergarten performance on the Applied Problems subtest statistically significantly predicted second grade performance on the subtest ($F \text{ Change}(1, 303) = 183.424$; $p < .000$), but Profile membership over and above kindergarten performance on the subtest did not ($F \text{ Change}(2, 301) = 2.175$; $p = .115$). Observed power for the change in R -square was calculated as 0.294. Unlike other analyses, there were not statistically significant differences between Profiles on the Applied Problems subtest in second grade. Hierarchical and post-hoc comparison results can be viewed in Table 13.

Table 13***Hierarchical Regression for Applied Problems and Profile Membership***

Variable	β	Unstd. B	t	R	R^2	ΔR^2
Step 1				.614	.377	.377***
Kindergarten Performance	.614	.656	13.543***			
Step 2				.621	.386	.009
Kindergarten Performance	.578	.618	11.944***			
Profile 1 Membership	-.089	-.843	-1.808			
Profile 2 Membership	-.071	-.899	-1.493			

Note. $N = 305$; * $p < .05$, ** $p < .01$, *** $p < .001$

Chapter 5

Discussion

The purpose of the present study was to examine how prekindergarten students clustered on variables of self-regulation and emotion skills, then to examine the relationship between cluster membership and later academic achievement. In addition, the current study aimed to utilize more direct measures of achievement than some work in the extant literature base. It was hypothesized that children would be clustered into three profiles: *Competent*, *At-Risk-Aggressive*, and *At-Risk Withdrawn*. Second, it was hypothesized that group membership would statistically significantly predict second grade academic achievement when controlling for kindergarten academic achievement.

Summary of Current Findings

Participants were clustered based on three direct measures and one indirect measure of self-regulation, in addition to two direct and three indirect measures of emotion skills collected at the end of the prekindergarten year. These profiles also controlled for race, sex, maternal education level, maternal age at child's birth, family socioeconomic status, maternal relationship status, and two corollary measures of cognitive ability.

Results of the latent profile analysis indicated that a three-profile solution best fit the data. Children in Profile 1 had the lowest scores on self-regulation tasks, highest ratings of aggressive behavior, and the lowest ratings of prosocial behavior, thus named "At-Risk/Aggressive". Children in Profile 2 had somewhat higher scores on self-regulation tasks, rated lower on aggression, rated higher on prosocial behavior, but rated similarly on internalizing behavior. This group was subsequently named "Internalizing". Profile 3 was characterized by the

highest performance on all measures of self-regulation and emotion skills, while being rated the lowest on aggressive and internalizing behavior. Profile three was named “Competent”.

Results of multiple hierarchical linear regression analyses indicated that after controlling for kindergarten academic achievement, profile membership did not statistically significantly predict second grade performance on the following tasks of academic achievement: Letter-Word Identification, Sight Word Efficiency, Phonemic Decoding, and Applied Problems. However, it should be noted that three hierarchical models approached statistical significance and that power presented as a problem. Power ranged from 0.294 to 0.463. In addition, on the Letter-Word Identification, Sight Word Efficiency, and Phonemic Decoding subtests, post-hoc analyses revealed some intriguing between group differences. Statistically significant differences existed between the At-Risk/Aggressive profile and Competent profile on all three tasks in that children in the Competent profile performed better on all three tasks.

While the number of discrete profiles found within the current data vary from some previous studies that assessed similar concepts (e.g., Bulotsky-Shearer, Fantuzzo, & McDermott 2010; Bulotsky-Shearer, Bell, & Dominguez, 2012), it was similar to others (Denham et al., 2012). One line of research that utilized consistent measures found six distinct profiles within their data: well-adjusted, mildly disengaged, moderately socially and academically disengaged, disruptive with peers, extremely socially and academically disruptive, and extremely socially and academically disengaged (Bulotsky-Shearer et al., 2010; 2012). These profiles were combinations of types of problem behaviors and situations in which problem behavior occurred. The previous research was able to identify more nuance within the data, being able to identify students who were competent, those who were slightly at-risk, and those who were more at-risk. In addition, the at-risk students were able to be separated by either social risk or academic risk.

The current study aimed to only identify those students who were at-risk based on social, emotional, and behavioral measures. Denham and colleagues' (2012) study found three emergent profiles within the data, similar to the current study, however the data collected differed from previous research methods. Direct measures of emotion knowledge, self-regulation, and social problem solving were collected in addition to one indirect, combined measure of affect and behavior. The current study found emergent profiles that align more closely with Denham and colleagues' (2012) work, in the number of profiles and the types of profiles. The previous researchers found three profiles that included students who were competent and social, competent and restrained, and at-risk.

While some results of the current study differed from previous research, some data aligned well. Regarding mean profile differences on measures of academic outcomes, Denham and colleagues (2012) found that children in a profile that usually performed less well on social-emotional competence tasks performed statistically significantly worse on an indirect measure of academic success in their kindergarten year than did a profile that was competent and expressive and a profile that was competent and restrained. These profiles were similar to those found in the current study in that one group typically performed best on measures of social, emotional, and behavioral functioning, while the other performed well on most measures, but was noted to be somewhat withdrawn. Similarly, Bulotsky-Shearer, Fantuzzo, and McDermott (2010) investigated whether profile types based on preschool behavioral and situational adjustment predicted preschool learning outcomes. The profile that demonstrated low levels of problem behavior performed statistically significantly better on academic outcome measures than did four of the other five profiles. In addition, profiles with some peer problems and some aggressive, oppositional, and inattentive/hyperactive behavior performed statistically significantly better

than two other groups with more problem behaviors. Bulotsky-Shearer, Bell, & Dominguez (2012) had comparable findings. A profile of children that exhibited the lowest levels of problem behavior at the start of the preschool year exhibited statistically significantly better outcomes on indirect measures of both literacy and math outcomes at the end of the preschool year. Although current results of hierarchical linear regression showed that profile membership did not statistically significantly predict later academic achievement over and above kindergarten academic achievement, in which power played a role, the present study found that profile mean differences were statistically significant between the Competent profile and the At-Risk/Aggressive profile on three direct measures of literacy in second grade.

Implications for Practice

While more demand for school readiness skills is placed upon families entering formal educational settings (Snow, Burns, & Griffin, 1998), it has been estimated that between 8 and 22% of children entering kindergarten exhibit elevated levels of emotional or behavioral problems (Brauner & Stephens, 2006; Lavigne et al., 1996). While some data has shown that risk factors for lower emotional and behavioral functioning include growing up in poverty (Kaiser et al., 2000; Reardon, 2011; Duncan & Magnuson, 2011) or being a part of an ethnic minority group (Reardon & Galindo, 2009; McKown & Weinstein, 2008), data have also shown that these types of problem behaviors can result in early achievement gaps that do not necessarily narrow over time (Reardon, 2011; Reardon & Galindo, 2009). In addition, early difficulty with self-regulation has been shown to reduce later peer relationships, which then is related to antisocial behavior in early adolescence (Trentacosta & Shaw, 2009).

While early problems with self-regulation and frequent problem behavior result in poor long-term outcomes for children, research has shown that intervention can increase positive

outcomes for these children, specifically those that target school readiness and social-emotional competence. Graziano and colleagues (2014) found that an intervention conducted between the preschool and kindergarten year that focused on academics, behavior, and self-regulation resulted in positive outcomes in academics and positive behavior at post-test and maintained through a six-month follow-up. Furthering the line of research, Graziano and Hart (2016) conducted a randomized control trial, which showed similar outcomes and added that including specific, intensive training focusing on social-emotional competence and self-regulation increased positive growth across academic achievement, emotion knowledge, emotion regulation, and executive functioning. Gold, Kopelman-Rubin, Mufson, and Klomek (2020) found similar results in a population of preschool students. In a randomized control trial that targeted social-emotional learning, it was found that only children in the intervention group significantly improved their executive functioning skills, emotion knowledge, and emergent literacy skills, while also showing a decrease in internalizing behavior. Interestingly, Hart, Maharaj, Andre and Graziano (2019) also found that while increasing dosage of intervention adds incremental benefit, children who received only school consultation, as compared to a four or eight week intensive intervention, caught up to other children in the intervention groups in most areas.

Kindergarten teachers frequently state that social, emotional, and behavioral functioning are the most important readiness skills students possess (Lin, Lawrence, & Gorrel, 2003). In addition, because data have shown that interventions are able to increase academic outcomes for children who exhibit some risk factors for, or behaviors of, early emotional and behavioral problems, the focus should then shift to early identification of these children. Hourri and Miller (2020) conducted a systematic review of social-emotional and behavioral screening measures to

find which measures can act as early universal screening measures for school based-personnel. Eleven screeners met criteria set forth by the researchers. The authors noted school-based staff members need to evaluate which of the 11 measures would be appropriate for each school based on outcomes sought. More specifically, it was stated that some rating scales identified intervention planning as a final outcome, while others noted the screener should be used to determine which student may require further, more in depth evaluations. The study is an excellent resource for practitioners in that it provides a concrete review of measures from which to choose.

With a thorough review of screening measures available to practitioners, another component of early identification of children with potential social, emotional, and behavioral problems includes the process by which they are screened. Researchers have posited that schools offer a sensible and efficient location for early screening, identification, and treatment of emotional and behavioral problems. Some research has shown that schools are the location in which children are most likely to receive emotional and behavioral interventions (Burns et al., 1995), while schools have also been shown as the most common entrance into intervention (Farmer et al., 2003). While schools are a sensible location to conduct universal screenings, the question of feasibility arises. Results of a recent survey conducted by Benson and colleagues (2019) identified three of the most frequently used universal screening measures that include scales of some portion of behavior. The teacher version of the Behavioral and Emotional Screening System (BESS; Kamphaus & Reynolds, 2015), the Social, Academic, and Emotional Behavior Risk Screener (SAEBRS; Kilgus et al., 2016), and the Student Risk Screening Scale (Drummond, 1994). Each are completed by teachers and vary regarding time required to complete the scales. While these scales range from approximately 60 minutes to 90 minutes to

complete for a classroom of 20 students, other scales have shown acceptable reliability and validity, while also taking less time to complete (Social Skills Improvement System Performance Screening Guide; Elliot and Gresham, 2008; Sullivan et al., 2020).

While universal screening of students for possible social, emotional, and behavioral problems would mean that schools would be expected to then intervene to remediate potential student difficulties, this aligns with conceptualizing education as encompassing the whole child. Within a multitiered systems of supports model, academic behavior is not the only lens through which children are viewed. Emphasis is also placed on the behavioral and social emotional growth and outcomes of children. Research also shows that even if one is solely concerned about the academic outcomes of students, these two areas overlap. Children at-risk for potential social, emotional, and behavioral problems are also at risk of poor academic outcomes (Arnold, 1997; McClelland et al., 2000; McLeod & Kaiser, 2004). If more students can be identified before problem behaviors have a large lasting impact, these children will benefit across domains of functioning.

Limitations of Current Study

Sample size was a limiting factor in the current study. After excluding data listwise, the current study used 345 participants. Two similar studies that identified profiles of students at risk for academic problems based upon problem behavior (Bulotsky-Shearer, Fantuzzo, & McDermott, 2010; Bulotsky-Shearer, Bell, & Dominguez, 2012) utilized substantially larger sample sizes of students, 829 and 3499 respectively. While larger sample sizes can impact significance values (Cohen, 1992), it is not required as was shown by Denham and colleagues (2012), who showed significant group differences with a sample size of 275. However, in conducting post-hoc achieved power analyses, observed power ranged from 0.294 to 0.463 after

accounting for kindergarten achievement for the conducted hierarchical regression analyses. It was also found that between 600 to 900 students would have resulted in power of around 0.8, for the reading measures, which may have increased the possibility of obtaining significant results. While the measure of mathematics would have required above 1,000 students to achieve power of 0.8. With current values of observed power, the possibility of making a Type 2 error, or failing to reject a false null hypothesis, increases. Given that many of the findings resulted in probability values that approached statistical significance ($p = .050, .058, .062, .115$), there is reason to suspect that power may have played a role in the current study.

Another limitation to the current study may have been the type of analyses that were conducted. While latent profile analysis with subsequent hierarchical regression groups students into homogeneous groups and then shows group differences, other types of analyses may be of more interest. Latent growth modeling would allow for examination of the growth of the clusters of students over time (Duncan & Duncan, 2004). Attending to the growth of students over time may show differences in growth outcomes for certain profiles of children compared to other profiles. Latent growth modeling may be particularly interesting when combined with interventions. Another type of analysis which may add more nuance is latent transition analysis. Latent transition analysis is a statistical method by which researchers can observe changes in latent profiles or classes over time (Muthén & Muthén, 1998-2018). If latent transition analysis were conducted over multiple time points, particularly with the combination of intervention, examiners may be able to see that certain sub-profiles of students may benefit from interventions enough that they may transition to a different latent profile.

Limitations of the current study also include the type of academic measures collected to measure achievement. While the measures provide robust, standardized, direct, and reliable

measures of the purported achievement concepts, they do not measure all aspects of children's academic behavior. More sensitive measures may have allowed the current study to see more change over time (Elliott & Fuchs, 1997; VanDerHeyden, Broussard, & Cooley, 2006), which may have allowed more discrepancy between profiles on outcome measures.

Possible Future Research Directions

There are many possible directions for future research for at-risk children upon entry to kindergarten. First, due to the limited sample size available, a larger and broader sample size may allow for more variation among the data, which then may show more nuance between profiles. If a large-scale study were to examine measures related to emotion skills and self-regulation, results may become clearer with a sample representative of the population. The current study examined children attending a Head Start program, which may not be totally representative of the population. Also, regarding the sample, as power was shown as a limitation in the current study, a larger sample size would allow for a decrease in the likelihood of a Type 2 error. In addition, including data related to settings in which behavior occurs may reveal different clustering results.

Related to sample size, it would be beneficial to track children along a longer period. While the current study tracked students across a four-year period, if examiners were able to follow students throughout elementary school, more nuanced differences in academic outcomes may emerge. This would provide the opportunity to examine whether the achievement gap changed as the students aged. This may be particularly interesting in the investigation of reading and literacy skills. While in the early elementary years student's efforts are placed mostly on decoding and decoding fluency, the later elementary years shift to focusing more on reading

comprehension skills. Because of the change, the data regarding academic outcomes may change during that time

If a larger, more longitudinal study were to take place, this would also allow future researchers to take two additional paths of inquiry. One path could include utilizing latent transition analysis. This method would allow examiners to observe if certain types of students may improve to the point of transitioning from an at-risk profile to a different profile. A second path could utilize latent growth modeling. This method would allow for researchers to observe possible changes in growth due to intervention across time.

In addition, measures of academic achievement that are more sensitive to change may allow for more growth to be observed. Curriculum-based measures would also allow for examiners to possibly examine measures more closely aligned to classroom-based tasks. In sum, a larger, broader sample size, utilizing different analyses, and more sensitive measures may yield differing, and possibly more interesting results.

Concluding Remarks

Practitioners and researchers alike have noted that school readiness is a critically important focus for young students. In fact, social, emotional, and behavioral readiness is often noted as more important to those children beginning their educational journey than preacademic skills. When these aspects of development are viewed through a person-oriented lens, profiles begin to emerge from the data. These profiles do not and should not serve to place children into lanes or tracks but allow for a holistic social emotional view of children. This type of approach may allow for practitioners to better identify, and thus serve, children who may be at-risk for future social and educational difficulties. Equipped with this type of thought, school psychologists may consider advocating for implementation of not only universal academic screening but also social, emotional, and behavioral screening. That knowledge could then well

align with the practice of a multi-tiered system of supports. Students would have the earliest opportunity to receive targeted interventions that would also include progress monitoring and could vary in the degree of frequency or intensity as needed to produce a positive outcome for young students.

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