ABSTRACT

Title of Dissertation: WHAT DOES IT MEAN TO BE READY FOR SCHOOL? ANALYSIS OF THE MEASUREMENT OF SCHOOL READINESS.

Blakely Elizabeth Mulder, Doctor of Philosophy, 2020

Dissertation directed by: Dr. Hedwig Teglasi, Professor of School Psychology, Department of Counseling, Higher Education, and Special Education

Recent research has found that school readiness is a multi-faceted construct associated with academic ability as well as social-emotional skills, executive functioning, demographic, environmental, and other variables. However, most research assesses school readiness through children's performance on discrete, typically standardized tasks, which may not be representative of the skills and behaviors children display at school day-to-day. The present study utilized a new measure, the Teacher School Readiness Scale (TSRS), to examine teachers' perceptions of kindergartners' school readiness. Drawing from a sample of 70 kindergarten students attending private schools in a semi-urban area, this study used

exploratory factor analysis, bivariate correlation, and multiple linear regression to analyze how students' demonstrated classroom skills and behaviors relate to one another as well as to students' global school readiness. The study then used multiple linear regression to examine how teacher-rated school readiness relates to children's performance on standardized performance tasks and rating scales representative of those typically used in school readiness literature. Factor analysis separated items on the TSRS into factors of Academic Understanding and Social Interactions, which correlated significantly with one another and predicted global readiness ratings. TSRS factor scores were not significantly correlated with performance measures of the same constructs. From five composite variables representing children's academic, social-emotional, and executive functioning skills, only teacher-completed rating scales of executive functioning skills significantly predicted children's overall school readiness. Results suggest poor ecological validity of traditional school readiness research methods and indicate need for inclusion of teacher-report measures in future school readiness studies.

WHAT DOES IT MEAN TO BE READY FOR SCHOOL? ANALYSIS OF THE MEASUREMENT OF SCHOOL READINESS.

By

Blakely Elizabeth Mulder

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Advisory Committee:
Professor Hedwig Teglasi, Chair
Professor Andres De Los Reyes
Professor Kelly Lee
Professor William Strein
Professor Cixin Wang

Dedication

It takes a village. This work represents the culmination of 22 years of formal learning. It is dedicated first and foremost to all the teachers who challenged me and fostered my curiosity, especially Mr. James Cross, Mr. Michael Maurer, Dr. Andrew Lutz, Mrs. Barbara Ripton, Mrs. Cynthia Orr, Dr. Janice Zeman, Dr. Hedy Teglasi, and Dr. Joshua Kefer. I aim to become the mentor that they were for me. Second, to my parents and brother, whose sacrifices allowed me to attend the schools where I experienced such exceptional mentors. Because of them my time as a student may be at an end, but my love of learning will never be. Third, to my husband, Michael, and the entire Gropper family, who have provided encouragement and consultation throughout my graduate studies. I could not have completed this journey without them.

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Chapter 1: Introduction

In 1957, the Soviet Union launched Sputnick 1, demonstrating on a global scale its superiority over the United States of America in rocket technology (Powell, 2007). The defeat drew government attention to one of America's shortcomings: too few citizens had the education and scientific skill needed to dominate on a global scale (Powell, 2007). In response, America turned to its public education system as a means to improve its position in the world. Kindergarten, which for nearly a century had served to cultivate American children's play and creativity, became focused on academic preparedness (de Cos, 1997; Repko-Erwin, 2017). Despite increased regulation regarding school attendance, curriculum, and educational assessment, American educational performance has remained stagnant in comparison to other nations (Madsen, 2013). Today, America's 15-year-old students rank 29th out of 35 countries in math and 13th of 34 countries in reading compared to students from other countries in the Organization for Economic Cooperation and Development (OECD, 2016). Government officials continue to emphasize the improvements in scientific ability needed for America to remain internationally competitive (Powell, 2007). Explanations for low performance include America's less rigorous and decentralized educational curriculum, lower teacher quality, along with cultural and demographic variables such as a high number of immigrants and children in poverty (Merry, 2013); however, data shows that American children's educational weaknesses begin before children even enter kindergarten. According to teachers, one-third to one-half of incoming kindergartners are unprepared for formal schooling (see Graziano et al., 2016; Miller & Goldsmith, 2017). These findings, and

continued efforts to improve America's position in the world, have resulted in an explosion of research analyzing what makes children ready for school.

School readiness is a common topic of discussion in government education standards as well as educational science, yet it lacks a concrete definition. In a general sense, school readiness refers to whether a student is prepared to engage in and learn from formally taught material when he or she enters a classroom (Abenavoli et al., 2017; Graue, 1993; Quirk et al., 2015). Many factors may interfere with a child being school ready, including lack of foundational academic skills needed for the curriculum, difficulties with executive functioning skills (e.g. attention, memory, inhibition), social-emotional challenges (e.g. anxiety, aggression, poor peer relationships), poor motor coordination, and disruptive environmental factors such as being hungry or having an unstable home life. Children who have deficits in one or more of these factors may have difficulty focusing and learning. They may also detract from others' learning in the classroom by compelling the teacher to spend a disproportionate amount of time instructing, redirecting, or managing their behavior. Therefore, measures and studies of school readiness typically assess a combination of academic, executive functioning, social-emotional, physical/motor, demographic, and environmental factors.

Table 1

Core Aspects and Related Constructs of School Readiness

Aspect	Definition	Examples of aspect as included on school readiness measures
Academic achievement	The ability to demonstrate understanding of age- appropriate educational materials (Kaufman & Kaufman, 2014)	Knowledge of math facts, reading level
Executive functioning	The ability to pay selective attention, regulate and inhibit behavior, remember recently presented information, delay gratification, persist on difficult or undesired tasks, and quickly adjust to new situations or demands; executive functioning includes self-regulation (Fitzpatrick et al., 2014; Barkley, 2001; Blair, 2002)	Waiting one's turn, completing assigned work, following directions
Motor coordination	The movement, orientation, coordination, and balance of the trunk and limbs, movement and coordination of small muscles, and strength and agility (Cameron et al., 2016; Ferreira et al., 2018)	Letter formation, walking in a straight line
Social-emotional functioning	The internal experience, internal or external regulation, and external expression of emotions, as well as the ability to relate positively to others (Cohen et al., 2005)	Making friends, calming down when upset
Related Construct	**Definition**	**Examples of construct as included on school readiness measures**
Demographic factors	An individual's identity classifications	Gender, socioeconomic status, ethnicity
Aspect	Definition	Examples of construct as included on school readiness measures
Environmental factors	An individual's experiences and interactions with other	Preschool quality, child hunger, parent stress

	individuals, society, and the physical environment	
Learning engagement	Interest in and enthusiasm for learning (Abenavoli et al., 2017; Denham et al., 2014; Linder et al., 2013)	Participation in class, going "above and beyond" on assignments
Self-regulation	The effortful control of one's attention, emotion, and behavior in order to function adaptively and achieve goals; a prerequisite for executive and social-emotional functioning (Denham et al., 2012; Graziano & Hart, 2016)	Sitting still, maintaining calm during unfamiliar situations

The following review of literature explores the research on often-studied aspects of school readiness (including academic, executive functioning, social-emotional, physical/motor, demographic, and environmental factors), and the table above (Table 1) offers definitions of these aspects culled from the literature review. An overarching trend in school readiness research points to the influence of social-emotional and executive functioning abilities in children's academic development and teachers' views of readiness. The importance of social-emotional and executive functioning skills is found in studies using a variety of methodologies, including rating scales and performance measures, as well as both short-term and longitudinal studies. Teachers state that if social-emotional and executive functioning skills are well-developed, children can make advances through academic instruction and intervention. However, if social-emotional or executive functioning skills are under-developed, children will be unable to benefit from instruction and will distract others (Lin et al., 2003; Miller & Goldsmith, 2017). The aim of the present study is to examine the skills kindergarten teachers find most important for

school readiness and how teacher ratings of children's skills at the end of kindergarten relate to known predictors of school readiness.

The Present Study

The present study aims to lend clarity to the discussion of school readiness by using a new teacher-rated measure of school readiness to examine the skills teachers find important for school readiness as well as the relation of teacher-rated school readiness to known aspects of readiness, specifically academic achievement, social skills, and executive functioning. The measure, the Teacher School Readiness Scale (TSRS), is unique in that it primarily measures the social-emotional and executive functioning skills teachers say are essential for school readiness. Additionally, though the scale is used in the present study to measure kindergartners' readiness for first grade, it was developed with input from elementary educators across grade levels and may be used to measure readiness for other elementary grades. Through this study, researchers may learn more about teacher judgments of school readiness, including what broad skill sets teachers find important to school readiness, how these skill sets relate to overall school readiness, and how teachers' views of children's school readiness relate to children's performance on standardized measures of the constructs that predict school readiness (i.e. executive functioning skills). This study is uniquely comprehensive in school readiness research in its use of rating scales and multiple performance measures to study social-emotional and executive functioning skills.

In order to accomplish these goals, the present study first defines where research currently stands on school readiness through a review of relevant literature. A comprehensive overview of all aspects of school readiness has not been found. Though

the present literature review places emphasis on the aspects of school readiness addressed through the present study, namely executive functioning and social-emotional skills, a brief overview of other aspects of school readiness, such as motor skills and physical development, is important in demonstrating the complexity of school readiness and the number of elements that must coalesce for children to be prepared for a formal learning environment.

After reviewing the relevant literature, three sets of analyses were conducted to lend insight into teacher judgments of school readiness. The first set of analyses used exploratory factor analysis to examine the factor structure and internal consistency of the Teacher School Readiness Scale (Sanders et al., 2013). The TSRS is a teacher-completed rating scale, developed based on teachers' reports of what skills are most important for school readiness. Therefore, exploratory factor analysis yields information about the broad skill sets teachers perceive as important to school readiness. The TSRS contributes to school readiness research through its measurement of teachers' views of students' school readiness, which are not typically accounted for in school readiness research. The second set of analyses used multiple regression to examine the predictive value of these skill sets (factors) toward teacher ratings of students' overall school readiness. These analyses assist in determining the extent to which teachers' impressions of readiness are captured by the factors of the TSRS. The third set of analyses used multiple regression to: 1) examine the correlations between teachers' ratings of overall school readiness and standardized measures of the constructs that predict school readiness, specifically measures of academic achievement, executive functioning, and social-emotional skills and 2) examine the additive predictive value of all measures toward teacher ratings of

overall readiness. These analyses help determine the extent to which measures of the constructs that predict school readiness, according to the literature reviewed below, predict teachers' impressions of readiness as measured by ratings on the TSRS. Analyses relating the TSRS to measures of predictive constructs offer insight into the ecological validity of rating scales and performance measures used in school readiness research.

Chapter 2: Review of the Literature

In order to lend clarity to the factors involved in school readiness, one must first have a developed understanding of school readiness and how it is assessed. The present chapter reviews available research on the academic, social-emotional, executive functioning, and physical domains of school readiness with attention paid to how these domains are typically assessed. The present chapter also discusses the rationale for the development and study of the Teacher School Readiness Scale (TSRS), and touches upon demographic and environmental influences on school readiness. Studies included in this literature review were found on EBSCO Host databases between January 2017 and August 2018 using combinations of the following search terms: school readiness, review, gender, environment, executive functioning, emotion regulation, emotion*, theory of mind, emotion understanding, prosocial skills, social competence, and Head Start. The chapter concludes with the questions and intended contributions of the present study as well as the hypotheses.

An Overview of Measurement of School Readiness

Each section of this literature review discusses both the findings of school readiness research and the measures used to reach those findings. School readiness is typically assessed through two means: rating scales and performance tasks. The following review demonstrates that there are often differences in results depending on whether rating scales or performance tasks are used. This section addresses the strengths and weaknesses of each methodology. The present study compared teacher ratings of school readiness to both rating scales and performance measures of related constructs in order to best assess how choice of measure may impact apparent results. Few studies in school

readiness literature have compared results using performance measures to those using rating scales.

Rating scales. Rating scales allow someone who knows an individual well (such as a teacher, parent, or self) to select the degree to which a statement describes the individual. For example, one question from the TSRS asks teachers to rate how true the statement "can attend to a task/activity as required" is of a student on a seven-point scale from "extremely untrue" to "extremely true" (Sanders et al., 2013). The benefit of rating scales is that they are easy to administer and rely on assessments of the individual's behavior in everyday circumstances. In the case of school readiness, teachers have the most comprehensive information on how students behave in their classrooms, what skills they demonstrate on a daily basis, how they compare to other students in the class, and how they grow over the course of the school year; therefore, teacher-completed rating scales lend a unique perspective on children's demonstrated school readiness. However, teacher rating scales are not without their weaknesses. Teacher rating scales can be subject to biases due to teacher and student demographics. In a review of literature on ethnic and cultural biases in teacher ratings, Mason, Gunersel, and Ney (2014) found biases in 10 of 13 reviewed studies. For example, two of the reviewed studies found that teachers under-reported Caucasian students' hyperactive behavior compared to ethnic minority students (Mason et al., 2014). Other reviewed research found that American and westernized teachers are more lenient in behavior ratings than Thai, Chinese, and Hispanic teachers (Mason et al., 2014). These biases were discovered by comparing teacher-completed rating scales to direct observations of the same behavior (Mason et al.,

2014). Teacher temperament, children's likability, and children's gender may also impact teacher ratings and should be explored in future research.

In most instances where rating scales are used in school readiness research, the rating scales measure correlates of school readiness but do not measure school readiness itself. For example, researchers may use the Behavior Rating Inventory of Executive Functioning (BRIEF; Gioia et al., 2000) to assess the role of executive functioning in school readiness. The BRIEF is not designed to measure skills needed for school readiness, but rather to measure the broader construct of executive functioning. Therefore, though scores on the BRIEF may be predictive of school readiness, they likely incorporate other skills which are not essential for children to succeed in school. Additionally, the scales used have typically been normed and standardized based on a national sample of children, and therefore do not account for differences in children's educational opportunities or classroom expectations. A child who is functioning better than most of their peers in a classroom with low expectations may be rated by a teacher as well behaved and ready for school yet may have low scores on a standardized measure of executive functioning. A primary goal of the present study is to address how teachers' ratings of children's behavior in the classroom compare to students' performance on these standardized measures.

The Early Development Inventory. There is one commonly used rating scale which comprehensively measures school readiness. This measure, the Early Development Inventory (EDI), was developed based on a combination of interviews and focus groups with researchers and teachers, literature on school readiness, and items from the National Longitudinal Study of Children and Youth (Janus & Offord, 2007). The EDI was

developed in 2000 because existing measures of school readiness focused exclusively on academic skills and demonstrated poor predictive ability of school success (Janus & Offord, 2007). The final EDI scale assesses four domains: 1) physical well-being (including motor skills), 2) language and cognitive skills, and 3) social and emotional development, 4) special concerns (i.e. disabilities, emotional or behavior problems). It also requests demographic information and allows teachers to indicate additional concerns (Janus & Offord, 2007; Janus & Offord, 2000). Questions on the EDI are answered on a five-point scale (from never to always, or excellent to very poor), a three-point scale (often or very true to never or not true), or two-point scale (yes or no; Janus & Offord, 2007). It is unclear how it was determined whether each question would be a five-point scale, three-point scale, or yes/no response. The EDI appears to be a comprehensive and reliable measure of school readiness. It has high internal consistency reliability and interrater reliability. The EDI's questions on language and cognitive development, social competence and emotional maturity are moderately to significantly correlated with performance measures and parent ratings of the same constructs (Janus & Offord, 2007). All but one item related to physical health and well-being are *not* significantly correlated with parent ratings of the same construct, demonstrating less parent-teacher agreement on this domain (Janus & Offord, 2007). Item scores can be averaged to yield scores for each of the five core domains (e.g. emotional maturity; see full list above); however, there is no total score on the EDI nor a rating of overall school readiness.

Performance tasks. Performance tasks measure individuals' behavior under standardized conditions, with scores assigned by an examiner based on the individual's

accuracy or response time (Koplak et al., 2013). Performance tasks allow children to demonstrate their knowledge or skill in a given domain, such as vocabulary or continuous auditory attention, through structured activities. The benefit of performance tasks is that they typically aim to assess isolated skills. For example, rather than assessing all of executive functioning as the BRIEF or another rating scale might do, a performance task aims to assess one specific executive functioning skill, such as the ability to inhibit impulses under structured, standardized conditions. This allows researchers to draw specific conclusions that have more concrete implications than results from rating scale studies might. For example, results demonstrating that theory of mind predicts literacy and math scores in early education (Cavadel & Frye, 2017) are more meaningful than conclusions that social-emotional skills predict academic achievement in early education (Davies et al., 2016) because they allow researchers, practitioners, and policy makers to focus on development of theory of mind—a specific skill— in order to increase school readiness. However, in isolating skills and creating a standardized structure, performance measures require such inorganic conditions that critics claim their results can provide little insight into children's real-life behavior. Because performance tasks require skill isolation, there is no performance task that measures overall school readiness; however, a variety of performance measures are used to assess individual domains of school readiness, particularly academic achievement and executive functioning.

Development of the Teacher School Readiness Scale (TSRS). The TSRS was developed in response to the poor alignment between the way school readiness is typically measured and the qualities teachers value in school readiness. Throughout the twentieth century, measures of school readiness primarily or exclusively assessed

children's academic skills (Janus & Offord, 2007). Contemporary school readiness measures' emphasis on academic skills could be why research has found many such measures to have low predictive ability, correctly predicting 50% or less of student outcomes (Carlton & Winsler, 1999; Meisels, 1999). The focus on academic skills in predicting school readiness remains despite growing evidence that social-emotional and executive functioning skills are critical for children's school success (see Davies et al., 2016; Lin et al., 2003; Sabol & Pianta, 2012). The present study emphasizes the role of social-emotional and executive functioning skills in teacher-rated school readiness.

The Early Development Instrument (EDI; Janus & Offord, 2007) was introduced as a comprehensive measure of school readiness. Similar to the TSRS, its development was based on teacher input and was driven by contemporary metrics' emphasis on academic skills and poor predictive ability of school success (Janus & Offord, 2007). However, the EDI is lengthy with over 100 questions, and it breaks down indices in an unusual manner that does not align well with contemporary literature (both social-emotional and academic skills are split into two factors, and there is no factor devoted to executive functioning). In a review of the EDI, Hymel, LeMare, and McKee (2011) conclude that it is suited to analyze aggregate data for research but would not be suited to give teachers or practitioners useful information about an individual student. Contrarily, though the TSRS was developed as a research measure, its brevity and simplicity of administration and scoring suggest that with future validation it could be possible to use the TSRS in applied settings.

The TSRS was developed to represent qualities teachers believe are important in school readiness and to be feasible for both research and applied purposes. Though

school readiness is typically measured as preschoolers' readiness for kindergarten or kindergartners' readiness for first grade, the skills and qualities measured by the TSRS were reported by teachers to be important for school readiness throughout early elementary school (kindergarten through third grade). This may be valuable in longitudinal research, as repeated administrations of the TSRS may allow researchers to compare children's initial readiness for formal education to their readiness for later grades. The present study examines only kindergarteners' readiness for first grade, with acknowledgement that future research should aim to expand use of the measure to include older children. Measure development and pilot testing of the TSRS comprised four phases, including identification of the qualities of school-ready children, rankings of which qualities are most important, and refinement of the measure. Measure development and pilot testing was completed with eight educators in a diverse semi-urban school district in the metropolitan DC area. Respondents included one kindergarten teacher, three first grade teachers, a third grade teacher, special education teacher, occupational therapist, and principal The educators were diverse in race and gender and six of the eight had advanced degrees in their fields; all had been working in elementary schools for at least a decade. This cross-section of educators provided diverse viewpoints of readiness. For example, the occupational therapist may note some essential skills that classroom teachers overlook; while principals or upper-level teachers may consider skills needed long-term rather than simply those needed for first grade success. All teachers taught at the same school, which devoted an estimated 25 minutes a week to social-emotional learning. Their views of school readiness may therefore emphasize social-emotional skills more than typical and may not be representative of the greater population.

For the first phase of measure development, a sub-group of teachers were asked free response questions on the qualities and skills children needed to be ready for their grade. They were given five domains which had been identified by the National School Readiness Indicators Initiative as common targets of state school readiness policies and research (Rhode Island, 2005) and asked how much they focused classroom efforts on the characteristics associated with each domain and why. The domains included: 1) physical well-being and motor development, 2) social and emotional development, 3) approaches to learning, 4) language development, and 5) cognition and general knowledge. This first phase also included open ended questions about how teachers would generally describe a child who is "ready" for their class and grade, what characteristics they appreciate children having in their classroom, and whether characteristics associated with children's judgment and reasoning merited attention separate from the other domains.

In the second phase of measure development, a second group of teachers were asked to sort 19 skills into three groups: those that were "essential," "very important," or "somewhat important" for school readiness. To guard against rating all skills as essential, each group was required to have between two and eight of the 19 skills. Third, teachers were asked to respond to an open-ended question regarding whether a single child was ready for the next grade and what rationale informed their judgment. They then rated whether the child was "definitely [ready]," "probably [ready]," or "not ready" for the next grade based on their level of development of 19 skills. For example, they may indicate whether the child's ability to "interact[ ] well with other children" was sufficient for them to succeed in the next grade level using the "definitely," "probably," and "not ready" scale points.

Results of phases one through three found all teachers indicated school-ready children follow rules/directions and cooperate with others. Though most mentioned that school-ready children should have basic competencies in communication, reading, and math, others explicitly stated that these skills were not as important as children's willingness to learn and do their best. Teachers indicated that while all domains from the School Readiness Indicators Initiative (i.e. physical well-being and motor development, social and emotional development) are important for school readiness, they focus most on social and emotional development within their classroom. The teachers described social and emotional development as "crucial" and indicated many children are unprepared in the goal orientation and task persistence required for adequate learning. TSRS items were developed based on teachers' open-ended responses and rankings of the relative importance of school readiness related domains and skills. In the fourth phase of measure development, researchers honed the number and wording of TSRS items. Based on teachers' responses, 33 skill items were developed. A team of researchers then removed three of the skill items due to redundancy and added a 31st global item, which inquired about students' overall readiness.

Thus the final TSRS was created in 2013 and has 31 items, with a substantial portion of items devoted to assessing social-emotional and executive functioning skills. One item asks for teachers' perspectives of the student's overall readiness (later referred to as a global rating). The present study was the first analysis of the factor structure and internal consistency reliability of the measure. Additionally, the present study tested the relation between overall school readiness on the TSRS and measures of known predictors

of school readiness, including vocabulary (a proxy for academic achievement), social skills, and executive functioning.

Conclusion of the overview. School readiness research utilizes both rating scales and performance measures, often with conflicting results. While rating scales are easy to administer and consider children's demonstrated skills or behavior under everyday circumstances, they are subject to rater bias. Performance measures reduce measurement error and potential biases in results by standardizing the conditions under which children demonstrate their skills; however, this creates inorganic conditions that do not resemble the child's daily environment. The TSRS was developed as a new rating scale of school readiness in response to poor alignment between the aspects of school readiness that are typically emphasized in research and policy (specifically academic achievement) and the skills teachers believe are most important to school success (social-emotional and executive functioning skills). Methodology must be carefully considered in analysis of study results; the present study compares teacher ratings of school readiness to both rating scales and performance measures of related constructs in order to examine how choice of measure may impact apparent research results. Oftentimes, rating scales and performance measures have weak associations (as measured by bivariate correlations), even when measuring the same construct (Toplak et al., 2013). Researchers Toplak and colleagues (2013) propose that this may be because performance measures and rating scales often measure slightly different constructs or abilities. However, numerous studies included in this review only examine relations between rating scales and performance measures rather than relations between two sets of rating scales (see Abenavoli et al., 2017; Panlilio et al., 2018). The following sections review the academic, social-

emotional, executive functioning, and physical/motor domains of school readiness as well as demographic and environmental influences on school readiness. Measurement of each construct is addressed.

Academic Achievement, Cognition, and Language

Academic achievement is a student's ability to demonstrate understanding of age-appropriate educational material (Kaufman & Kaufman, 2014). It is emphasized by research and policy as a central aspect of school readiness. Students who lag behind in early literacy and math skills often fail to catch up to grade-level expectations in later grades (McLoyd & Purtell, 2008). This phenomenon particularly impacts students in poverty, racial and ethnic minorities, and students who speak English as a second or other language (Caughy & Owen, 2015; Linder et al., 2013; Stormont et al., 2017; Quirk et al., 2015).

Major educational legislation of the twenty-first century has brought new emphasis to early mastery of academic skills, often by sacrificing time for play-based learning and social-emotional development. Since 2002, federal policy has required students in kindergarten to twelfth grade to be regularly assessed in language arts and mathematics, encouraged states to adopt rigorous literacy and math standards for children as young as three, and penalized schools whose students failed to meet national achievement benchmarks (Repko-Erwin, 2017; Yell, 2012). As social-emotional, executive functioning, and motor skills have not until recently been required or rewarded by federal policy and are rarely addressed in state policy, curriculum developers and school administrators have little incentive to cultivate students' development of these skills (Daily et al., 2010).

In a 10-year longitudinal study, Bassok, Latham, and Rorem (2016) found that today kindergarten had less play-based and exploratory learning and more direct instruction and skill acquisition than kindergarten in the early 2000s. For example, before No Child Left Behind was implemented in 2002, children were expected to leave kindergarten ready to read, with recognition of letters and understanding of basic letter sounds. Presently, most state standards require graduating kindergarteners to be able to read a number of short words (Repko-Erwin, 2017). The current emphasis on academic achievement in educational policy is backed by several studies (Davies et al., 2016; Sabol & Pianta, 2012) showing the relation between early childhood academic achievement and school success in later years yet neglects other research findings that play-based and active learning is best practice for young children (Repko-Erwin, 2017) and necessary for development of confidence, resilience, and academic achievement (Grimmer, 2018). This section of the literature review demonstrates that academic achievement is important in school readiness but is itself highly influenced by and related to the social-emotional and executive functioning skills that educational practices often neglect. Therefore, though the present study considers teacher school readiness ratings' relation with a measure of student academic achievement, it does not emphasize academic achievement as *the* central factor in students' school success.

Measures of academic achievement. Most measures of academic achievement focus on reading, writing, and mathematical skill because these are the skills stressed by the education system as foundational to all other academics. The academic achievement measure used most frequently in the reviewed studies is the Woodcock-Johnson Test of Achievement—Third Edition (WJ-Ach III; Woodcock, McGrew, & Mather, 2001a), a

performance measure which includes 14 subtests related to reading, writing, and math and was normed on a national sample of individuals ages two to 90. Other measures used in the reviewed studies include the Woodcock-Johnson Test of Achievement—Revised (WJ-Ach R; Woodcock & Johnson, 1989), Woodcock-Johnson Test of Cognitive Abilities—Third Edition (WJ-Cog III; Woodcock, McGrew, & Mather, 2001b), Bracken School Readiness Assessment (Bracken, 2002), Peabody Picture Vocabulary Test (Dunn & Dunn, 1997), Expressive One-Word Picture Vocabulary Test (Brownell, 2000), state standardized achievement tests, foreign measures of achievement and cognition (such as the WPPSI Korean), and teacher-completed rating scales. It should be noted that vocabulary is often used by school readiness studies as a proxy for academic achievement despite the fact that comprehensive measures of children's skills and abilities typically include it on cognitive rather than achievement test batteries (Schrank et al., 2014). Research has shown that early elementary vocabulary is highly predictive of overall academic achievement on both short- and long-term scales (Kaplan, 1993; Kastner et al., 2001; Traxler, 1945), and therefore vocabulary tests are often used in lieu of full academic achievement batteries. In the present study, the Wechsler Preschool and Primary Scale of Intelligence—Third Edition (WPPSI-III; Wechsler, 2002) Vocabulary subtest is used as a proxy for academic achievement. The lack of specific information about children's math and reading abilities is noted as a limitation.

Research findings on academic achievement. Academic achievement in preschool and kindergarten has demonstrated impact on children's school success in later years according to both teacher-completed rating scales and performance measures (Davies et al., 2016; Saobl & Pianta, 2012). Research has found that higher teacher

ratings of language, cognitive development, and general knowledge on the Early Development Instrument predicts higher academic achievement in third grade (Davies et al., 2016). Similarly, higher verbal performance on the Preschool Language Scale-3 (PLS-3; Zimmerman et al., 1992) in pre-kindergarten predicts higher social emotional skills on the Social Skills Rating System (teacher report; SSRS; Gresham & Elliott, 1990) as well as higher reading and math achievement on the WJ-Ach R in fifth grade, demonstrating that academic and social-emotional skills are linked (Sabol & Pianta, 2012). However, teachers report that academic skill mastery is not as important for student success as are social-emotional and executive functioning skills. In one study of 3,305 kindergarten teachers, teachers rated 13 skills from not important to essential for general school readiness, including nine social skills and four skills addressing academics and fine motor ability. The two skills rated as *least* important by the overall sample were "knows most of the alphabet" and "counts to 20 or more." Less than 25% of teachers found these academic skills to be very important or essential (Lin et al., 2003). The most important skill item was "tells needs/thoughts," which 83.9% of teachers rated as very important or essential (Lin et al., 2003). As reviewed next, analysis of social-emotional and executive functioning skills may prove more fruitful in assessing teacher-perceived school readiness than would analysis of academic achievement.

Social-Emotional Functioning

The definition of social-emotional functioning is a person's experience, regulation, and expression of emotions as well as their ability to relate positively to others (Cohen et al., 2005). Social-emotional functioning as defined in the context of school readiness can be roughly divided into social skills and emotional skills. Social skills

include friendliness, relationships with peers, relationships with teachers, the ability to give and receive help, social problem solving, and social understanding or theory of mind (Boyd et al., 2005; Graziano & Hart, 2016; Heller et al., 2012). Emotional skills include the ability to regulate emotions, express emotions in a constructive manner, and understand the emotions of others (Boyd et al., 2005; Cohen et al., 2005).

Measures of social-emotional functioning. Due to the variety of behaviors and skills that encompass social-emotional functioning, there is no single measure that is used in the preponderance of studies. The Child Behavior Checklist (CBCL; Achenbach, 1991), Social Skills Rating System (SSRS), Teacher Observation of Classroom Adaptation—Revised (TOCA-R; Werthamer-Larsson et al., 1991), and Behavior Assessment System for Children—Second Edition (BASC-2; Reynolds & Kamphaus, 2004) were used in two or more studies reviewed; all of these measures are rating scales. Other studies included in this review used peer ratings of liking, a performance task of social problem solving, task of emotion identification, and a variety of parent- and teacher-completed rating scales. None of these measures are specialized assessments of social-emotional school readiness and it is unknown to what extent wide-range behavior scales match up with the social-emotional skills teachers expect of school-ready children.

Research findings on social-emotional functioning. Even though social-emotional skills are not emphasized as part of policy efforts to improve school readiness, teachers report that social and emotional skills are critical to academic functioning and overall school readiness. In a survey of 3,305 kindergarten teachers, over 70% rated social-emotional skills including “tells needs/thoughts” and “takes turns/shares” as very important or essential to school readiness (Lin et al., 2003). A study of 893

kindergarteners found that teacher ratings of students' overall school readiness (one item on a 10-point scale) were moderately correlated with several social-emotional behaviors measured by the Teacher Observation of Child Adaptation—Revised (TOCA-R), including the student's ability to work well alone, work well with others, solve problems on their own, and help others (Stormont et al., 2017). Students who were rated as "not ready" for school were fifteen times more likely to be at social-emotional risk than those rated as "ready" based on a composite of TOCA-R item results, a large effect (Stormont et al., 2017). The present study is similar to Stormont and colleagues' (2017) work in that it relates individual social-emotional skills to overall school readiness; however, this study does so within one focused measure whereas the Stormont et al. (2017) study utilizes two measures, comparing the results of selected items from one measure to an overall rating from another measure.

The impact of social-emotional functioning on academics is apparent. Research has found that academic achievement is impacted by social and externalizing problems, prosocial skills, emotion knowledge, theory of mind, and emotion regulation (Blair et al., 2004; Cavadel & Frye, 2017; Denham et al., 2014; Sabol & Pianta, 2012). Social-emotional skills such as social problem solving can also mediate the relations between predictive variables such as temperament and academic outcomes (Walker & Henderson, 2012). Graziano and Hart (2016) studied the impact of a school readiness-targeted curriculum on the academic and social abilities of pre-kindergartners with at-risk or clinically significant externalizing behavior. They found that students who attended a class which taught both academics and social-emotional skills (including communication, cooperation, and emotional awareness) grew more over eight weeks in performance on

standardized measures of academic achievement, emotion knowledge, and automated working memory than students who attended a class which taught only academics or students who did not attend any classes but whose parents attended training sessions (Graziano & Hart, 2016). These students also showed larger effect sizes in academic achievement growth at a six-month follow up than children in the other groups.

Theory of mind, a sub-aspect of social functioning which describes one's ability to understand desires, beliefs, and intentions in oneself and others, was found by Cavadel and Frye (2017) to predict short-term literacy and math achievement. In a study of 111 low-income preschoolers, scores on performance tasks of theory of mind were highly correlated with children's teacher-rated learning behaviors, including motivation, attitudes toward learning, attention and persistence. Together, age, theory of mind, students' understanding of teaching, learning behaviors, and numeracy in the fall of preschool accounted for 84% of variance in literacy scores in the fall of kindergarten (Cavadel & Frye, 2017). Alone, theory of mind predicted students' literacy and math scores in both preschool and kindergarten.

Emotion regulation. Emotion regulation, a sub-aspect of self-regulation, is defined as the ability to control and modify one's emotional reactions using cognitive, behavioral, and emotional means in order to cope with unexpected or stressful situations, recover quickly from emotional arousal, and achieve goals (Djambazova-Popordanoska, 2016; Panlilio et al., 2017). Emotional regulation relates to both social-emotional and executive functioning because understanding of emotions and social cues (part of social-emotional functioning) is required in order to inhibit impulses and respond appropriately to situations (part of executive functioning), which in turn impacts an individuals' ability

to relate positively with those around them (social-emotional functioning). For example, if a child feels angry and is unable to calm down (dysregulated emotion), they may display dysregulated behaviors, such as yelling, throwing objects, or hitting others. These dysregulated behaviors may scare peers and teachers, distract others from learning, and result in disciplinary action. While emotionally and behaviorally dysregulated, the child will be unable to regulate their attention sufficiently to focus on instruction, resulting in lower learning engagement, less benefit from academic instruction, and ultimately lower school readiness (Djambazova-Popordanoska, 2016).

Emotion regulation is learned beginning in early childhood. It is critical to social functioning and positive peer relationships (Blair et al., 2004) as well as cognition and academic achievement (Djambazova-Popordanoska, 2016). Children with poor emotion regulation have increased difficulty with working memory and learning because the intense emotional states preoccupy their attention (Djambazova-Popordanoska, 2016). In a comprehensive study of social-emotional skills and school readiness, teacher-observed emotion regulation and social problem-solving skills among 101 preschoolers predicted teacher-rated learning engagement and academic readiness in kindergarten (Denham et al., 2014).

Research has found kindergarteners' emotion regulation predicts academic achievement years later. Research conducted with 834 children found that children's emotional regulation as assessed by the parent-rated CBCL when they were six to eight years old predicted their academic achievement on a performance measure three years later (Panlilio et al., 2017). This same study found children's emotion regulation to be relatively stable: only 25% of children classified as emotionally dysregulated at ages six

to eight were classified as regulated three years later (at ages nine to eleven), and 14% of those classified as regulated at six to eight were classified as dysregulated three years later (Panlilio et al., 2017). Therefore, children who are identified by their kindergarten teachers as struggling with emotional regulation are likely to continue having difficulty unless delivered intervention. As children advance in school and encounter more challenging material, their need for emotion regulation becomes more pressing and renders school readiness more difficult. This may be why several studies have found that emotion regulation difficulties in early childhood predict poor academic outcomes in secondary school such as early school dropout (Djambazova-Popordanoska, 2016).

Long-term predictor of academic performance. Research has found social-emotional skills to predict school readiness and academic outcomes throughout elementary school, based on both teacher ratings and performance measures. A study by Davies et al. (2016) of 45,509 Canadian children found that items pertaining to children's social-emotional school readiness on the Early Development Instrument were a significant predictor of academic achievement on a state-wide standardized achievement test in third grade. Izard and colleagues (2001) found that 72 Head Start children's performance on a task of emotion identification, one of many social-emotional skills, predicted their teacher-rated academic competence in third grade. This was true even after controlling for verbal ability, gender, and temperament (Izard et al., 2001).

Sabol and Pianta (2012) found that early childhood social-emotional skills can predict academic performance even beyond third grade. They studied 944 children at age four and a half and again in fifth grade using parent and teacher-rated measures of externalizing behavior, social skills, and school engagement as well as performance

measures of cognitive functioning and academic achievement. Children with social and externalizing problems (according to composite scores derived from parent- and teacher-rated measures) at four and a half years of age had significantly lower reading and math achievement, lower school engagement, and more disruptive behavior in fifth grade than did most children without social and externalizing problems (Sabol & Pianta, 2012). The one exception to this was children with notable working memory deficits, who exhibited similar academic and social-emotional weaknesses (Sabol & Pianta, 2012).

Conclusion of social-emotional findings. These findings demonstrate that social-emotional skills have both short- and long-term impact on academic outcomes and play a critical role in students' overall school readiness. Efforts to improve school readiness may find success in emphasizing social-emotional functioning and development rather than academic skills alone, as seen in the Graziano and Hart (2016) study reviewed above. The present study appropriately focuses on social-emotional functioning, which is emphasized in the TSRS teacher-completed rating scale. Scores on the TSRS will be compared to performance measures of emotion identification and theory of mind as well as a rating scale of social skills.

Executive Functioning

The American educational model relies on many children quietly attending a teacher's instruction, following instructions, and regulating their behavior so that they may benefit from instruction and avoid distracting peers (Heller et al., 2012). A child's ability to meet classroom behavior expectations depends in part on executive functioning, defined as the cognitive and behavioral abilities to: pay selective attention, regulate and inhibit behavior, remember recently presented information, delay gratification, persist on

difficult or undesired tasks, and quickly adjust to new situations or demands (Fitzpatrick et al., 2014; Barkley, 2001; Blair, 2002). Behavior regulation, a sub-aspect of self-regulation, is central to executive functioning and is often the only aspect of executive functioning examined by school readiness studies (see Gestsdottir et al., 2014; Son et al., 2013). Behavioral regulation is defined as the ability to control and modify one's behavioral reactions in order to function adaptively and achieve goals (Denham et al., 2012; Graziano & Hart, 2016); it is necessary for behavioral inhibition, delay of gratification, and task persistence. Based on the importance of executive functioning and self-regulation in maintaining school-appropriate behavior, some researchers have suggested that early childhood instruction would be more beneficial to school readiness if it focused on teaching executive functioning rather than basic academic skills (see Lonigan et al., 2017).

Measures of executive functioning. In the context of school readiness, executive functioning is typically assessed using performance tasks or parent- and teacher-rating scales. The rating scales used in school readiness studies typically combine executive functioning and social-emotional skills, rather than examining them as separate constructs (see Denham et al., 2012; Gobel et al., 2016). One exception to this is the Behavior Rating Inventory of Executive Functioning (BRIEF), a comprehensive rating scale of executive functioning, versions of which were used by Graziano et al. (2016) and in the present study. Other measures of executive functioning seen in this literature review include a parent-completed emotion regulation checklist and performance tasks of children's persistence in frustrating tasks, continuous attention, compliance with directions, task switching, and others.

The studies included in this review most frequently assessed executive functioning using a performance task, Head-Toes-Knees-Shoulders (HTKS; Ponitz et al., 2009), which requires children to follow directions, inhibit their natural response, remember a series of rules, and adjust to changing rules. In the first portion of HTKS, children follow directions by copying the motions of the experimenter (i.e. touch your toes). Next, they are asked to inhibit their natural response and do the opposite of what the experimenter asks them to do (i.e. touch their head when the experimenter says to touch their toes). Third, additional rules are added such that children have four rules to keep track of (head, shoulders, knees and toes). Finally, the rules are changed such that children must touch a different body part than the one they have been touching for the previous two rounds (i.e. touch their shoulders when the experimenter says to touch their toes). HTKS has not been normed or standardized; therefore, researchers using the measure can only compare children's performance to that of other study participants or the child's own scores at other time points (Ponitz et al., 2009).

It is important to note that few studies comprehensively assess the wide variety of skills encompassed by executive functioning. Studies using only HTKS fail to assess selective attention, delay of gratification, and task persistence (see Matthews et al., 2009; Son et al., 2013). Findings on the importance of executive functioning in school readiness have demonstrated mixed results, often within individual studies. Inconsistent results regarding the importance of executive functioning in school readiness are likely due to the range of aspects of executive functioning that are assessed and ways in which they are assessed; some components of executive functioning may be more important to school readiness than others.

Research findings on executive functioning. Teachers consider executive functioning skills to be among the most important factors in school readiness because they facilitate learning in a classroom setting (see Boyd et al., 2005; Denham et al., 2014). In a survey of 3,305 kindergarten teachers, over 70% rated executive functioning behaviors including "is not disruptive" and "follows directions" as very important or essential to school readiness (Lin et al., 2003). Because executive functioning is critical to classroom learning, considerable attention has been paid to this construct in the literature. Numerous studies have found executive functioning to predict social-emotional functioning, learning behaviors, and academic school readiness as assessed by rating scales and performance tasks (Denham et al., 2012; Denham et al., 2014; Fitzpatrick et al., 2014; Gestsdottir et al., 2014; Graziano et al., 2016; Matthews et al., 2009).

Findings using performance measures. Most studies of executive functioning's role in school readiness utilize performance measures, the most commonly used of which is HTKS, a measure of behavior regulation and working memory. HTKS, reviewed above, measures children's ability to inhibit the automatic response (i.e. touching their head when the examiner says, "touch your head") and instead produce the response indicated in the task rules (i.e. touching their toes when the examiner says, "touch your head"). Though the test developers have found HTKS to predict kindergartners' same-year achievement scores (see Lonigan et al., 2017), most independent research has found HTKS to be a poor predictor of academic achievement and general school readiness. In an assessment of 229 Korean three to six-year-olds, behavior regulation as assessed by HTKS did not predict same-year math, reading, work skills, or social skills (Son et al., 2013). Likewise, Matthews and colleagues (2009) conducted research with 268

kindergarten students and found that HTKS scores did not significantly predict same-year achievement in reading, vocabulary, or general knowledge on the WJ-Cog III. Though those with higher scores on HTKS gained more ground in math and phonics over the course of the school year than average, Cohen's d effect sizes were small (Matthews et al., 2009). Lonigan and colleagues (2017) had contrasting results: children with higher scores on HTKS demonstrated stronger reading achievement, expressive and receptive language skills, and cognitive ability at the beginning of the year but grew *more slowly* in their academic skills over the course of the year than those who had lower HTKS scores. HTKS also does not predict long-term academic growth. In a study of 79 French children, assessed first in preschool and again in early elementary school, HTKS scores in preschool did not significantly predict math or literacy outcomes in elementary school (Gestsdottir et al., 2014). These results demonstrate that though HTKS scores may be associated with higher academic abilities initially, they are a poor predictor of school readiness in both the short- and long-term.

Other performance measures of executive functioning have demonstrated stronger ability than HTKS to predict school readiness. Specifically, performance measures of task persistence, working memory, and attention have been found to predict same-year academic achievement and school readiness. Berhenke, Miller, Brown, Seifer, and Dickstein (2011) found in a study of 131 kindergarten children that persistence on difficult puzzles predicted greater teacher-rated social competence and lower teacher-rated negative emotionality, help-seeking, and student-teacher conflict in the same year. Though only 54% of teachers believe task persistence is very important or essential to school readiness (Lin et al., 2003), it may be that task persistence is strongly related to

other indicators of school readiness, such as learning engagement (see Abenavoli et al., 2017) and attention (see Lonigan et al., 2017; Sims & Lonigan, 2013). Graziano et al. (2016) found that performance on a working memory task predicted academic achievement and school readiness on both the Kindergarten Behavior and Academic Competency Scale (a teacher-completed rating scale) and Bracken School Readiness Assessment (a performance measure). Similar to task persistence, working memory is heavily impacted by attention (see Sabol & Pianta, 2012). Attention itself has been found to predict academic achievement, but no studies on the relation between performance measures of attention and school readiness were found during this literature review. In regard to academic achievement, Sims and Lonigan (2013) found that in a sample of 204 children, kindergartners' scores on a task of continuous attention were significantly correlated with same-year literacy achievement and vocabulary on three performance measures. Results of these performance measure studies (Berhenke et al., 2011; Graziano et al., 2016; Sims & Lonigan, 2013) demonstrate that attention likely plays a significant role in school readiness through its impact on academic achievement, task persistence, and working memory.

Findings using rating scales. Rating scales have demonstrated that school readiness is related to behavior regulation, attention, and overall executive functioning. In research by Gestsdottir et al. (2014), teacher ratings of behavior regulation were collected in France, (79 children), Germany (70 children), and Iceland (111 children). Teacher ratings on the Questionnaire pour l'École Maternelle (France only) and Child Behavior Rating Scale (Bronson et al., 1995) were significantly related to all performance-based academic outcomes in France as well as Germany, but not Iceland, where curriculum-

based measures (rather than standardized measures) of academic achievement were used. Research by Matthews et al. (2009) found that teacher-rated behavioral regulation on the Child Behavior Rating Scale significantly predicted students' achievement in math and phonics on the WJ-Cog III, though it did not significantly predict achievement in reading, vocabulary, or general knowledge. Teacher ratings of behavior regulation may be more predictive of school readiness than performance measures such as HTKS because teachers see students in a variety of conditions that challenge their self-regulation, such as after receiving a social consequence or when required to inhibit their impulses and attend to instruction for extended periods of time.

Studies by Lonigan and colleagues (Lonigan et al., 2017; Sims & Lonigan, 2013) have found teacher-rated inattention to be an important predictor of academic achievement and growth throughout kindergarten. Sims and Lonigan (2013) found in a study of 204 children from 16 different preschools and kindergartens that children who had significantly higher teacher ratings of inattention on the Conners Teacher Rating Scale (Conners, 1990) and Strengths and Weaknesses of ADHD- Symptoms and Normal Behaviors Rating Scale (SWAN; Swanson et al., 2001) performed significantly worse on same-year performance measures of early literacy than those with low teacher-rated inattention. Teacher-rated hyperactivity on the SWAN was also significantly negatively correlated with same-year literacy (Swanson et al., 2001). Lonigan et al. (2017) found teacher-rated inattention to be an important predictor of academic skill growth over the course of kindergarten. In a study of 1,082 children, half of whom attended Title 1 preschools and half of whom attended private preschools in the same area, high scores on the Conners' Teacher Rating Scale—Inattention subscale were significantly negatively

correlated with children's cognitive abilities, expressive and receptive language, and literacy skills at the start of kindergarten. Children with higher levels of teacher-rated inattention also demonstrated slower growth in their literacy skills throughout the year than children with low levels of inattention. Though these findings do not relate to school readiness specifically, it is likely that children who have lower literacy skills and lower rates of academic growth are less school ready than those with greater academic achievement, implying an indirect relationship between inattention and school readiness.

Graziano et al. (2016) studied overall executive functioning using the teacher-rated BRIEF-preschool version and found overall executive functioning predicted student-teacher relationships, academic impairment, and school readiness on teacher-completed rating scales. Student-teacher relationship moderated the relation between teacher-rated executive functioning and teacher-rated school readiness such that executive functioning weaknesses were only predictive of lower school readiness for students with poor student-teacher relationships (Graziano et al., 2016). This could be because ratings were colored by teachers' opinions of their students, such that they saw students with whom they had poorer relationships as having lower skills in all domains. Bias introduced by teacher opinion is one drawback of using teacher-rated scales as measures of student skill.

Overall, results of these rating scale studies show that teacher ratings of executive functioning can provide a unique perspective on children's academic skills and school readiness but should be interpreted with caution given that student-teacher relationships may impact the understanding and tolerance of student behavior.

Confluence of emotion and behavior regulation. Though the present literature

review separates self-regulation into emotional and behavioral types, other research has separated it into cool and hot types of executive control. Cool executive control is the non-emotional regulation of attention and behavior and involves working memory, shifting tasks, and organizing (Denham et al., 2012). Hot executive control is affective and motivational; it incorporates both behavior and emotion regulation, enabling children to inhibit acting out when they are emotional, resist temptation, and stay focused in the face of boredom. Comprehensive research on executive functioning demonstrates that hot but not cool executive control predicts teacher-rated learning behaviors and social competence.

Denham et al. (2012) assessed the relationship between children's executive functioning, learning behaviors, and social/emotional competence among 323 children ages two to four. Children's executive functioning skills were tested using the Preschool Self-Regulation Assessment, a battery of 10 structured tasks that measure students' ability to delay gratification by waiting to open a present and acquire candy (hot executive functioning; 4 tasks); regulate their behavior through taking turns, walking slowly, and inhibiting the intuitive response (cool executive functioning; 3 tasks); and comply with instructions to sort and clean up toys (3 tasks). Researchers found that hot executive functioning significantly predicted teacher-rated learning behaviors and social competence, while the tasks requiring cool executive functioning and compliance predicted neither measure (Denham et al., 2012). This demonstrates that emotion regulation may be a critical component to the relationship between executive functioning and school readiness. Given this relation, the present study includes emotion regulation as an executive functioning variable rather than social-emotional variable, while

acknowledging its impact on both skill sets.

Conclusion of executive functioning findings. Teachers and researchers both indicate texecutive functioning skills are essential to school readiness and likely more important than academic achievement (Lin et al., 2003; Lonigan et al., 2017). Literature review findings support this, demonstrating that executive functioning skills are strongly related to school readiness according to both performance measures and rating scales; behavior regulation and attention are particularly important. Many recent studies have used a single measure of behavior regulation, HTKS, to assess the relation between executive functioning and school readiness but have often found negative results. Based on other studies' findings that rating scales of behavior regulation (Gestsdottir et al., 2014; Matthews et al., 2009) and performance measures of related constructs, such as task persistence (Berhenke et al., 2011) are positively correlated with school readiness, it is believed that HTKS is a sub-optimal measure of behavior regulation. The present study examines the relation between executive functioning and school readiness using both performance tasks and rating scales. The measures selected examine both overall executive functioning and individual aspects of executive functioning that the literature review suggests are most important to school readiness, namely attention and behavior regulation. In particular, the present study uses performance measures of behavior regulation that assess similar skills to HTKS but permit greater isolation of skills and production of standardized scores, allowing clearer conclusions to be drawn.

Physical Readiness

Though the present study does not assess physical school readiness or motor development, it is considered by many to be a central component of school readiness (La

Paro & Pianta, 2000; Quirk et al., 2015). Therefore, the present study offers a brief review of the school readiness literature pertaining to motor development and physical readiness in order to lend context to academic, social-emotional, and executive functioning domains. The discussion of physical school readiness is unusual in that researchers define it in two ways, one of which involves elements that cannot be shaped through formal education of the child. In one definition, physical school readiness refers to the development of an individual's motor skills and coordination. Motor skill development includes movement, orientation, coordination, and balance of the trunk and limbs (known as gross motor skills), movement and coordination of small muscles (fine motor skills), and strength and agility (Cameron et al., 2016; Ferreira et al., 2018). These skills can be strengthened through physical activity and practice of fine motor movements through activities such as cutting paper, coloring, and tracing letters.

The second definition of physical school readiness includes all motor skills but also includes aspects of a child's physical state which are largely out of the control of a typical kindergarten student, such as hunger, sleepiness, toilet training, and suitability of clothing (Janus & Offord, 2000). Though a kindergarten student may be expected to communicate when they have physical needs and may be expected to display some adaptive skills that maintain their physical being, they are unable to provide for themselves the basic goods and environmental factors that address these physical needs. For example, a kindergarten child may be expected to communicate to an adult when they are hungry and to eat food independently, but cannot be expected to purchase the groceries or prepare the meal that allows for them to be fed. In the context of school readiness, the child's communication of their physical needs and development of adaptive

functioning skills are aspects of school readiness and can be formally taught; however, provision of basic needs (e.g. availability of food) is impacted by socioeconomic status and home environment, which are also considered to be essential precursors to school readiness. Socioeconomic status, home environment, and other factors that influence children's school readiness are discussed in the next section of this literature review. Factors influencing students' physical school readiness must first be discussed here, however, because several studies examine motor skills and aspects of a child's physical well-being as a single combined predictor of school readiness.

Measures of physical readiness. Most studies examining physical school readiness do so using the teacher-completed rating scale, the Early Development Inventory (EDI). The factor of the EDI that addresses physical school readiness incorporates items on gross motor skill, fine motor skill, and the child's physical well-being (e.g. hunger, toilet training, suitability of clothing; Janus & Offord, 2000). Though motor skills and physical well-being emerged as distinct factors in the authors' analysis of the EDI's factor structure, they were combined into a single domain based on the authors' theoretical framework in order to simplify the measure (Janus & Offord, 2007). Other measures consider only students' motor development. The Kindergarten Student Entrance Profile, used by Quirk and colleagues (2015), assesses beginning kindergarteners' fine motor skills, gross motor skills, and general body awareness based on teachers' observations. Two studies of physical readiness included in the present literature review assess general motor development but were not developed specifically to assess school readiness, and therefore may assess some skills which are less central to school readiness than others. Ferreira and colleagues (2017) utilized the Bruiniks-

Oseretsky Test of Motor Proficiency—Second Edition (Bruiniks & Bruiniks, 2005), an individually-administered and standardized performance measure of motor development, which assesses fine motor control, gross motor control, body coordination, and strength/agility. Similarly, the Eurofit fitness performance test (Council of Europe Committee for Development of Sport, 1988) was used by Oja and Jürumäe (2002) and assesses balance, handgrip strength, upper body strength, flexibility, running, jumping, and hand-eye coordination. It should be noted that the Eurofit test does not include a measure of fine motor skills.

Research findings on physical readiness. Given physical readiness' inclusion in popularly-used measures of school readiness such as the EDI and the role of fine motor skills in particular on school activities such as writing, the literature examining the relation between physical and overall school readiness, as well as between physical readiness and later academic outcomes, is notably sparse and gives little evidence that physical readiness is an important consideration in overall school readiness. Two studies using global measures of school readiness (EDI and Kindergarten Student Entrance Profile) have failed to find differences in physical readiness between students who are high in social-emotional, academic, and/or cognitive school readiness and students who are low in these readiness domains (Guhn et al., 2015; Quirk et al., 2015). In a study of 294 six-year-olds in Estonia, Oja and Jürumäe (2002) found that gross motor skills were less predictive of school readiness than the amount of time children spent engaged in physical activity. Though Davies and colleagues (2016) found physical readiness as assessed by the EDI was a significant predictor of third grade reading achievement, even when controlling for cognitive ability and demographics; it is unknown whether this

relation was driven by the EDI's motor skill questions or those pertaining to physical well-being. Research has found that variables impacting physical well-being, such as socioeconomic status and home environment, are critical predictors not only of motor development (Cameron et al., 2016) but of school readiness as a whole (Linder et al., 2013; Son & Peterson, 2017; Stormont et al., 2017). The following sections offer a brief overview of the manner in which home environment, socioeconomic status, and other environmental and demographic variables influence children's developing school readiness.

Home and School Environment

So far, the present study's review of literature has examined aspects of school readiness that can be formally taught and strengthened through practice and exposure. However, not all children develop academic, social-emotional, executive functioning, and motor skills at the same rate and not all children enter kindergarten with the same baseline skills. Teachers indicate that one out of every three children are unprepared for entry *into* kindergarten (see Miller & Goldsmith, 2017). Aspects of children's environments at home and school influence their skill development and overall school readiness both before and during their formal education. In the present study, all participants attended high-quality private kindergartens in wealthy suburbs of Washington, DC and had highly educated parents (i.e. bachelor's degree or greater). Therefore, they benefitted from enriching home and school environments. It is expected that the children in the present sample are school ready according to both teacher ratings and performance measures of related constructs in part because they have had enriching learning opportunities at school and home. Present day efforts to improve school

readiness through increased academic instruction can have limited effect without ensuring children have exposure to stimulating home learning environments and high-quality schooling. This section discusses the role home and school environment play in shaping children's school readiness to lend insight into the importance of considering these contexts when assessing children's school readiness.

Home Environment. Children's social and academic outcomes are predicted by their interactions with parents or caregivers. Children raised in nurturing social environments have better parent-rated social skills than those raised in less nurturing social environments (Son & Peterson, 2017). Parents can provide nurturing social environments by being responsive to their children, modeling desired behaviors, and engaging in positive, proportional, and appropriate discipline. Home environment is particularly important for the development of reading skills. A review of literature on predictors of school readiness has found that children's reading performance is positively associated with the quality of parental involvement in their education as well as teacher's perceptions of how much parents value their children's education (Linder et al., 2013). Reading achievement is also influenced by how much time children spend reading with their parents, how often they see their parents reading, and how much time they spend watching non-educational television (Burgess et al., 2002; Clarke & Kurtz-Costes, 1997; Wright et al., 2001).

School Environment. How ready a child is for first grade depends largely on their acquisition of skills during kindergarten, while preparedness for kindergarten depends on their learning opportunities during early childhood. Children who attend high-quality preschools or childcare centers have higher language skills, social skills,

independence, and concentration than those attending lower-quality preschool and childcare settings (NICHD, 2002; Sammons et al., 2003). High-quality preschools work closely with parents; have teachers who are well-paid and engage in ongoing professional development; address children's social, emotional, physical, and academic growth in their curricula; and have small class sizes (Frede, 1998; NICHD, 2002). Research also suggests high-quality preschools have more student-teacher interaction, which leads to better school readiness (Goble et al., 2016).

Attending high-quality preschool is particularly impactful for low-socioeconomic status (SES) children, who may not encounter the same enriching learning opportunities at home as their high-SES peers. Several longitudinal studies have found that low-SES children who attend preschools that balance child- and teacher-directed learning, emphasize learning engagement and social-emotional learning, maintain low student-to-teacher ratios, and employ highly qualified teachers have strong academic and social outcomes (Schweinhart et al., 1993; Weikart, 1998). Low-SES children attending high-quality preschools have higher performance on achievement tests; like school more; have fewer disciplinary violations and behavior incidents; are more likely to graduate from high school, vote, maintain employment, own homes, and participate in volunteer work; stay married longer; and have significantly fewer arrests than those who do not attend preschool or attend low-quality preschools (Schweinhart et al., 1993; Weikart, 1998). These results demonstrate that providing preschool to low-SES children can not only have significant benefit for the children, but also has an estimated a 17-fold benefit to the economy due to decreased prison and welfare costs (Schweinhart, 2004).

Conclusion of Home and School Findings. Altogether, home environment and

quality of early childhood education are influential in development of children's academic, executive functioning, and social-emotional school readiness in both the short- and long-term. In the present study, home and school environment are largely controlled for by virtue of all children attending high-quality private kindergartens in a wealthy area. Therefore, it is expected that home and school environment will not be a confounding factor in this study. However, the TSRS and measures of constructs relating to school readiness do not account for child-level differences in home and school environment. Future research should take into account potential differences in children's home and school environments when interpreting results of both teacher-rated school readiness and performance measures of related constructs.

Demographics

Like home and school environment, demographic characteristics such as gender, SES, and race/ethnicity impact children's school readiness but are outside of children's and teachers' control. The present study considered gender and race/ethnicity as covariates in a multiple regression model of teacher-rated school readiness. Similar to students' home and school environments, SES was believed to be held constant across participants due to children's attendance of private kindergartens in a wealthy suburban area. This section offers an overview of the roles gender, SES, and race/ethnicity play in children's school readiness to demonstrate why school readiness researchers must attend closely to children's demographics when interpreting results.

Gender. School readiness research demonstrates that girls are more school ready than boys in their academic, social-emotional, and executive functioning skills and are

more likely to be classified as school ready overall than boys are (Quirk et al., 2015; Stormont et al., 2017).

Multiple studies have found girls in kindergarten to have superior verbal, reading skills, and overall cognitive ability than boys (Cooper et al., 2011; Davies et al., 2016; Son et al., 2013); however, girls and boys typically have equally strong math skills (Davies et al., 2016; Guhn et al., 2015; Son et al., 2013). In keeping with their stronger verbal and cognitive skills, girls have superior long-term academic outcomes to boys, including better grades (see Matthews et al., 2009), and lower rates of retention, special education referrals, and suspensions (see Linder et al., 2013).

Girls' social-emotional and executive functioning skills are generally stronger than boys'. According to rating scales, kindergarten-aged girls have better pro-social skills (Else-Quest et al., 2006; Guhn et al., 2015; Son et al., 2013), attention (Cooper et al., 2011; Guhn et al., 2015), organization and concentration (Son et al., 2013) than boys as well as lower externalizing behavior (Copper et al., 2011; Graziano & Hart, 2016; Guhn et al., 2015). However, girls typically have higher rates of anxiety than boys (Else-Quest et al., 2006; Guhn et al., 2015). Anxiety is marked by difficulty with emotion regulation (Beauchaine & Hinshaw, 2013), which can hinder school readiness (Djambazova-Popordanoska, 2016).

It is important to note that findings of gender differences in academic outcomes and teacher-rated school readiness may be impacted by teacher biases and expectations. Girls typically have better relationships with their teachers than boys do (Guhn et al., 2015; Quirk et al., 2015), which could result in favorable impressions of their school readiness and related skills on teacher-rated measures.

Socioeconomic Status. Research exploring the role of SES in school readiness has found that low-income children and children in poverty exhibit lower academic and behavioral school readiness than high-SES children (Stormont et al., 2017) and that early SES differences in school readiness are typically sustained or exacerbated over time (see Linder et al., 2013). SES-based differences in school readiness are often attributed to differences in school quality: low-income students often lack the benefits of high-quality instruction, including well-paid teachers and small class sizes (Frede, 1998; NICHD, 2002), which impact student outcomes.

Much effort has been directed toward improving outcomes for low-SES children, such as the federally-funded Head Start program and similar state-funded programs. Research has shown that these programs are not universally successful, particularly in increasing academic preparedness, but do show promise for improving social skills and grade retention rates. In a review of nine early education programs for minority and low-SES students, 83% of programs demonstrated that enrolled children showed significant improvement in social skills while only 25% of programs demonstrated significantly improved math skills and 37.5% demonstrated significantly improved language and literacy skills (Brown & Scott-Little, 2003). Other research has found that low-SES children lag behind high-SES peers in executive functioning and social-emotional skills (Cavadel and Frye; 2017; Fitzpatrick et al., 2014), and that differences in these skills accounts for differential performance on cognitive assessments (Fitzpatrick et al., 2014). Given teachers' views that social-emotional skills are a necessary precursor to formal learning (Lin et al., 2003), these findings suggest exposure to early childhood education such as Head Start is particularly important to the development of low-SES children's

social-emotional and executive functioning skills; therefore, low-SES children who do not have access to early childhood education may show under-developed school readiness in kindergarten. Low-SES children are thus likely to have both lower teacher-rated school readiness and lower performance on measures of school readiness-related constructs than high-SES children; SES-based differences in school readiness are likely to exacerbate over time.

Race. Research has found that children of most minority races and ethnicities are less ready for school than White children (Caughy & Owen, 2015; Son et al., 2013; Stormont et al., 2017). According to the Department of Education's early childhood longitudinal survey, Black and Latino children entering kindergarten are more likely to be in the bottom quartile of reading and math skills than any other demographic group aside from American Indians (West et al., 2000). A study by Fryer, List, and Levitt (2015) suggests that student race is a defining characteristic in whether early childhood programming is effective. Fryer and colleagues (2015) conducted a randomized controlled trial to assess the impact of an early childhood education program with an accompanying parent program that rewarded parents for working with children on academic content and executive functioning skills and ensuring children competed and turned in their homework. The study demonstrated that parent involvement significantly improved children's executive functioning (assessed through a battery of performance tasks) and cognitive skills (assessed through the WJ-Ach III) for Latino and White children but did not impact either executive functioning or cognitive skills for Black children. These effects persisted after controlling for maternal age, income, number of siblings, and pre-treatment scores (Fryer et al., 2015). Though these controls may impact

school readiness, other demographic factors which are highly correlated with minority race may be more critical and may explain why the education and parent programs improved outcomes for Latino but not Black children. Specifically, in addition to the lower SES and parental educational attainment experienced by both Black and Latino American families, Black families experience high rates of single-parent households, high rates of maternal relationship transitions, and less enriching early childhood educational environments, all of which have been found to be predictive of lower school readiness (Cooper et al., 2011; NICHD, 2002; Sammons et al., 2003; Son & Peterson, 2017); these factors may have weakened Black children's ability to benefit from the intervention.

In the present study, a minority of children are Black or Latino. The relation between race and school readiness was examined using correlations and race was used as a covariate in a multiple regression model of school readiness scores. Future research should take into account potential differences in children's race when interpreting results of both teacher-rated school readiness and children's scores on measures of related constructs. It is likely that SES, home environment, and school environment serve as mediators of the relationship between children's race and school readiness. In future studies where the SES and home and school environments of participants vary widely, these aspects should be taken into consideration.

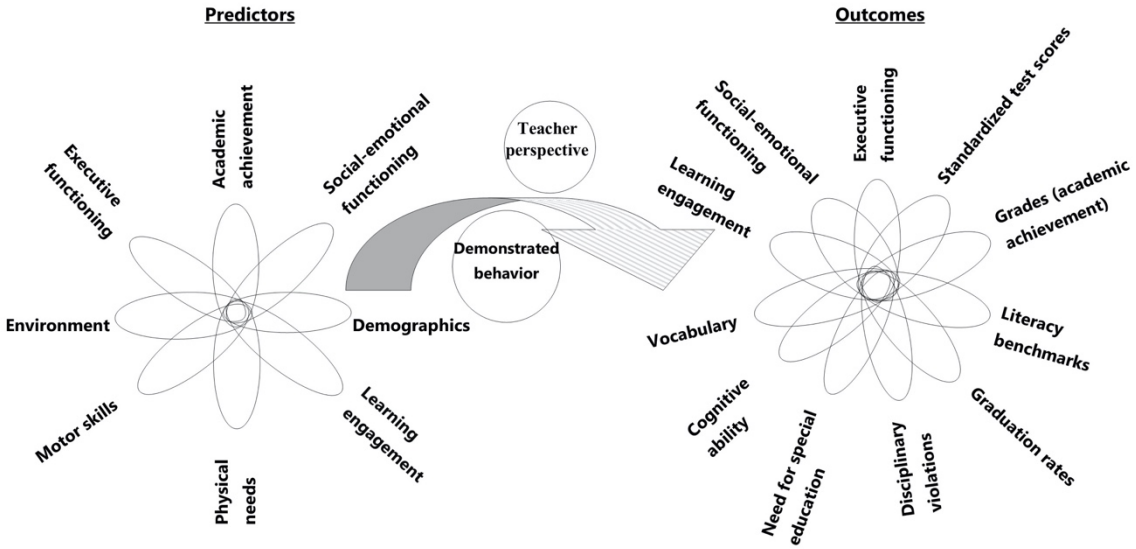
Literature in Conclusion

School readiness is a term used in educational research, policy, and practice to describe the extent to which a child possesses the skills necessary to engage in and benefit from the formal educational opportunities available to them (Abenavoli et al.,

2017; Graue, 1993; Quirk et al., 2015). In effort to equip citizens for the high-skilled jobs of today's competitive global market, American schools have increased academic expectations and implemented rigorous literacy and math standards for children as young as three (Powell, 2007; Repko-Erwin, 2017). The increase in educational expectations for children in preschool and kindergarten is based on the belief that children who master basic academic content early are more school-ready than those with poor early academic understanding and will therefore go on to perform better in school and be better prepared for high-skilled careers.

However, school readiness is not comprised of academic performance alone but instead is a multi-faceted construct. As described in the review above, school readiness studies measure the degree to which children's skills in domains including (but not limited to) social-emotional functioning, executive functioning, academic achievement, demographics, and home and school environment predict a variety of outcomes measured months to years later, ranging from children's early literacy to high school graduation rates (Figure 1, see Appendix A for full-page view). In several studies, school readiness outcomes are not measured by academic achievement but rather by indicators of whether students are engaging positively in the school environment, such as class participation and disciplinary violations (Denham et al., 2014; Sabol & Pianta, 2012; Schweinhart et al., 1993; Weikart, 1998). A school readiness study may not directly measure academic achievement as either predictor or outcome. Due to the variety of predictors and outcomes of school readiness studies, the remainder of the present study will use the phrase *readiness-predictive-constructs* to refer to variables studied as predictors of school readiness (left-hand portion of Figure 1) and *readiness-related-outcomes* to refer to

variables studied as outcomes (right-hand portion of Figure 1). As the present study moves into discussion of the present study, the terms readiness-predictive-constructs and readiness-related-outcomes serve to distinguish between predictors and outcomes of school readiness as a broad construct and the predictors and outcomes of this study's specific analyses.



School readiness research selects one or more predictors and examines their relationship to one or more outcomes anywhere from months to years later. In school readiness research, students who perform well on one or more outcome measures are said to be "school ready."

Assessment of both predictors and outcomes is impacted by the student's behavior during the measurement period (i.e. while taking a test, during an observation, over a marking period) and can be impacted by teacher perspective if the measure uses teacher ratings or incorporates teacher decision making (such as in the case of school grades and disciplinary violations).

Figure 1. Predictors and outcomes in school readiness research

There is good reason that school readiness research incorporates a number of predictors and outcomes aside from academic achievement. The literature reviewed above found that though one might expect school readiness to be most dependent on academic knowledge, teachers report that social-emotional and executive functioning skills such as the ability to take turns, follow directions, and voice one's needs are more important for kindergartners' school readiness than are academic skills such as knowledge of the

alphabet and ability to count (Lin et al., 2003). Social-emotional and executive functioning skills are considered by teachers to be prerequisites for acquiring academic skills (Lin et al., 2003) because students must be able to regulate themselves enough to focus on acquiring new knowledge, seek help when needed, and demonstrate their understanding, all while sharing a teacher with other students who have their own needs for academic skill development. Therefore, a student who enters their formal education with low academic achievement but strong social-emotional and executive functioning skills is likely to be viewed by teachers as more school-ready than a child who has solid grasp of academic material but poor social-emotional skills or self-control. The research reviewed above demonstrates that social-emotional skills in preschool and kindergarten predict later readiness-related outcomes including academic achievement and learning engagement (Blair et al., 2004; Cavadel & Frye, 2017; Davies et al., 2016; Denham et al., 2014; Izard et al., 2001; Panlilio et al., 2017; Sabol & Pianta, 2012; Stormont et al., 2017). Similarly, executive functioning skills including persistence, working memory, attention, and behavior regulation have been found to predict same-year academic achievement (Berhenke et al., 2011; Gestsdottir et al., 2014; Graziano et al., 2016; Lonigan et al., 2017; Sims & Lonigan, 2013). Based on the importance of social skills and executive functioning in maintaining school-appropriate behavior, some researchers have suggested that early childhood instruction would be more beneficial to school readiness if it focused more on teaching social-emotional skills and executive functioning and less on teaching basic academic skills (see Graziano & Hart, 2016; Lonigan et al., 2017). The present study is the first to utilize the Teacher School Readiness Scale (TSRS), a teacher-rated measure of 30 skills teachers find important to school readiness.

The TSRS, created in collaboration with elementary school teachers, mirrors contemporary research findings in its emphasis on social-emotional and executive functioning skills but also includes key academic skills. The aim of the present study is to better understand teachers' views of school readiness, including what broad skill sets teachers, or factors, make up the TSRS and how teachers' ratings on the TSRS relate to measures of school readiness-predictive-constructs.

Though there are a number of studies that examine teachers' views on school readiness (see Lin et al., 2003; Stormont et al., 2017), most school readiness research relies on rating scales and performance measures of readiness-predictive-constructs and readiness-related-outcomes, particularly academic achievement, social-emotional skills, and executive functioning, rather than from teacher reports of school readiness. For example, a study might examine the degree to which a child's performance on a measure of behavior regulation (a subtype of executive functioning, a readiness-predictive-construct) predicts performance on state assessments of reading and math (readiness-related outcomes). This methodology assumes that the child's performance on the measures used in the assessment reflects their performance in similar domains in the classroom. It further assumes the child's reading and math performance are representative of the child's school readiness, yet the review above demonstrates that school readiness is more complex than academic mastery alone and requires integration of academic with social-emotional and executive functioning skills. Perhaps, for example, a child performs well on a study's measures of behavior regulation, reading, and math achievement, but performs poorly in class because he is so shy that he is unwilling to participate in a group setting. Teachers who work with students on a regular basis can integrate all available

information to form nuanced opinions on students' mastery of individual skills (incorporating variations in demonstrated performance and growth over time) as well as global opinions on whether or not students are ready for the next step in their educations. The present study is uniquely comprehensive in school readiness research in its comparison of teacher-rated school readiness to both rating scales and performance measures of readiness-predictive-constructs, yielding a comprehensive understanding of how teachers' views of school readiness relate to children's performance on standardized measures of readiness-predictive-constructs. The research questions, hypotheses, and methodology of the present study are discussed in the next chapter.

Research Questions and Hypotheses of the Present Study

The aim of the present study was to use a new teacher-rated school readiness measure, the TSRS (described in *An Overview of Measurement of School Readiness*), to examine: 1) the sets of skills teachers find important for school readiness and 2) the relations between teacher-rated school readiness and rating scales and performance measures of readiness-predictive-constructs, specifically academic achievement, social skills, and executive functioning. These aims were explored through the following research questions and hypotheses:

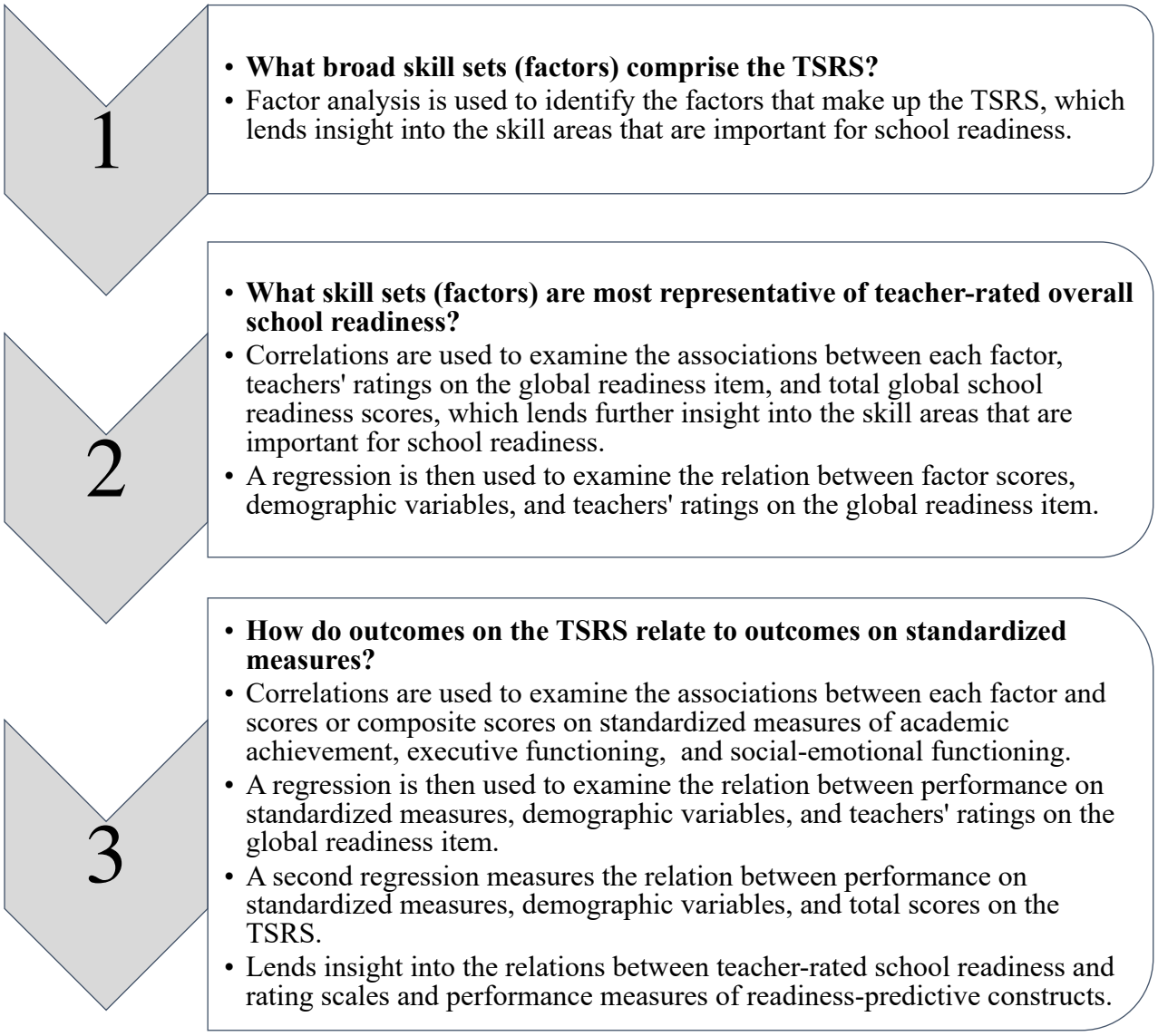


Figure 2. Research questions of the present study

Question One: What Broad Constructs Capture the Individual Skills Measured by the TSRS?

Contemporary school readiness research typically analyzes the relations between children's school readiness as measured by academic achievement or other school outcomes (readiness-related-outcomes) and readiness-predictive-constructs,

such as early academic achievement, social-emotional functioning, and executive functioning. The skills measured by school readiness research may not represent what skills teachers find most important to school readiness. The TSRS is a 31-item teacher-reported questionnaire, with 30 items assessing students' individual skills related to school readiness and one item assessing overall readiness. The present study is the first time the TSRS is being analyzed. Therefore, the first question of the present study explored the TSRS's factor structure and the internal consistency of potential subscales or the total scale. In order to identify the factors that comprise the TSRS, exploratory factor analysis was conducted using principal axis factoring with an oblimin rotation. Internal consistency of factors was measured as correlations between items within each factor.

Most of the items on the TSRS inquire about social-emotional and executive functioning skills, therefore, it was expected that a factor would emerge that includes primarily social-emotional skill items while another would emerge that includes primarily executive functioning skill items. However, given that there is not another teacher-rated school readiness measure with the same emphasis on social-emotional and executive functioning skills as the TSRS, there was no prior research basis to support this hypothesis. Given that social-emotional and executive functioning skills are reciprocally influential, it was hypothesized that many items might correlate highly with more than one factor should separate social-emotional and executive functioning factors emerge. Prior to analysis, it was unclear whether items pertaining to academic achievement and motor development would group into a single factor or would be distributed across social-emotional and executive functioning-based factors. Research questions two and

three were to be addressed in the manner presented below regardless of the number of factors identified or the items that comprised each factor.

Question Two: How Do Factors on the TSRS Relate to Teachers' Ratings of Global School Readiness? As discussed in the literature reviewed above, school readiness is comprised of academic, social-emotional, executive functioning, and motor skills, but not all these skills are considered by teachers to be equally important. Prior research has found that kindergarten teachers find social-emotional and executive functioning skills including a student's ability to follow directions, persist on challenging tasks, work well with others, and communicate their thoughts and needs effectively to be more important than academic skills when determining children's overall school readiness (Lin et al., 2003; Stormont et al., 2017). While question one explored groupings of skills sets on the TSRS, question two built on those findings by determining how these skill sets relate to teachers' ratings of overall school readiness. The question of how skill sets (factors) of school readiness relate to overall school readiness (as assessed by the TSRS global item) was answered using correlation and multiple regression. The analysis considered the correlation between each factor, teacher ratings of students' global school readiness, total school readiness scores, and group differences in mean school readiness scores explained by teacher effects and demographic variables of race and gender. Next, the analyses calculated the additive predictive value of all factors and demographics toward global ratings of school readiness. If a single factor emerged while answering the first research question, then the regression equation would include children's score on the single factor, race, and gender.

Given that the items on the TSRS were based on teacher statements about what skills are most important to school readiness, it was hypothesized that global school readiness scores would be significantly and positively correlated with children's readiness in individual domains, or factors, comprising school readiness. It was also hypothesized that the combined value of all factor scores and demographics would significantly predict global school readiness scores.

Question Three: How do Outcomes on the TSRS Relate to Scores on Standardized Measures of Readiness-Predictive Constructs? A unique contribution of the present study is the use of both rating scales and performance measures to better understand how the constructs associated with school readiness relate to teacher perceptions of readiness, as measured by the TSRS. Research typically assesses school readiness using performance measures and rating scales of related constructs and outcomes (readiness-predictive-constructs and readiness-related-outcomes respectively, see Appendix A), most commonly academic achievement, executive functioning, and social-emotional skills. As discussed in the literature review above, school readiness is a complex construct, comprised of a variety of skills and influenced by both environmental and demographic variables. Teachers have knowledge of children's demonstrated skills across time and situations, which allows them to formulate integrated judgments of students' school readiness. The third research question of the present study explored the relations between school readiness-predictive-constructs and teachers' perceptions of readiness, as rated by TSRS factor scores, total scores, and ratings on the TSRS global readiness item. This was done using correlations and multiple linear regression. Though it was hypothesized in response to question two that TSRS factor scores, total scores, and

ratings on the global readiness item would be significantly and positively correlated, factor, total, and global readiness scores are not measuring identical constructs. Factor scores measure children's teacher-perceived readiness in specific skill domains, thereby offering specific information about elements of children's school readiness and allowing for understanding of how the skill sets children demonstrate in the classroom relate to their measured abilities on readiness-related-constructs. Total readiness scores are sums of teachers' ratings on each skill item, giving an estimate of overall readiness based only on children's performance of observable behaviors. Global readiness scores measure teachers' perspectives of children's overall readiness, which can include both children's performance on the skills measured by the TSRS (those accounted for in factor and total scores), as well as demographic, environmental, and unmeasured characteristics. Global readiness scores allow for the possibility that there are residual skills or elements of children's school readiness that are not captured by the other variables included in this study. Analysis of children's total and global readiness allows one to answer the question of how well children's performance on standardized measures of readiness-predictive-constructs reflect the real-life/in vivo characteristics of school readiness that are demonstrated to and perceived by their teachers. Because of the differences in what TSRS factor, total, and global readiness scores are measuring, question three was answered in part by correlating readiness-predictive-constructs with factor, total, and global readiness scores.

In order to determine the relations between teacher-rated school readiness and measures of readiness-predictive-constructs, the measures used in the present study were first reduced into four composites, a fifth variable representing academic achievement

(which, for simplicity, is referred to as a fifth composite throughout the remainder of the present study), and sixth and seventh variables representing gender and race respectively. Henceforth, these variables will collectively be referred to as predictors. The four composites are comprised of scaled, standard, or t-scores (detailed in chapter three) for: 1) performance measures of social-emotional skills, 2) rating scale of social-emotional skills, 3) performance measures of executive functioning skills, and 4) rating scale of executive functioning skills. Rating scales and performance measures were separated into two composites due to research findings that show rating scales and performance measures often have weak correlations, even when measuring the same construct (Toplak et al., 2013). Because of their low correlation, unique benefits, and drawbacks (see *An Overview of Measurement of School Readiness,* above), rating scales and performance measures of the same construct are best considered separately. Before examining the relations between predictors and teacher-rated school readiness, the relations between the five variables measuring academic, social-emotional, and executive functioning skills were assessed using bivariate correlation.

Next, children's scores on each factor that emerged in response to research question one were correlated with their performance on each predictor defined in chapter three. Predictors included tasks and rating scales that assess vocabulary (a proxy for academic achievement), executive functioning, and social-emotional skills. The strength of correlations was hypothesized to be dependent both on what factors emerged during factor analysis (if, for example, a factor of executive functioning skills emerged, then it was logically expected that this would correlate with standardized measures of executive functioning skills) and the extent to which the standardized measures used are measuring

the same underlying abilities as those necessary for classroom behaviors (i.e. if ability to sustain attention during a structured performance task is similar to the ability to sustain attention in a classroom environment). Generally, it was hypothesized that TSRS factors would correlate weakly to moderately with the standardized measures of similar constructs.

Third, the correlation between each predictor (as defined in chapter three), total school readiness, and global school readiness was examined to determine whether standardized measures of readiness-predictive-constructs are in fact predictive of teachers' perceived global and total school readiness. Then, two multiple linear regressions were utilized to determine whether the combination of all measured readiness-predictive-constructs predicted total (regression one) and global (regression two) readiness. Regressions were conducted both with and without inclusion of demographic variables. Given that the research reviewed above has found academic achievement, executive functioning, and social-emotional functioning as assessed through both performance measures and rating scales all positively predict school readiness (such that higher scores on measures of readiness-predictive-constructs are correlated with higher readiness-related-outcomes), it was hypothesized that each composite would be significantly and positively correlated with teachers' total and global readiness ratings. It was further hypothesized that the summative effects of the academic achievement, executive functioning, and social-emotional composite variables, together with the demographic variables of gender and race, would significantly predict total and global school readiness scores.

Analyses relating the TSRS to measures of readiness-predictive-constructs offer insight into the ecological validity of rating scales and performance measures used in school readiness research. These analyses can inform measure selection and interpretation of results in future school readiness research.

Chapter 3: Research Methods

The present study examines the skills that comprise the Teacher School Readiness Scale (TSRS) and the relations of teacher-rated school readiness with rating scales and performance measures of readiness-predictive-constructs, specifically academic achievement, social skills, and executive functioning.

Overview of Methods

For the present study, teachers' perceptions of school readiness were assessed using the new teacher-completed rating scale, the TSRS, which was designed with input from current and former kindergarten teachers. TSRS data were collected each spring from 2013 to 2017, as teachers were planning their students' transition to first grade. Throughout students' kindergarten year, norm-referenced performance measure and rating scale data were collected assessing the children's vocabulary, social-emotional, and executive functioning skills. The measures included in this study are a subset of the data collected. Factor analysis and multivariate regression were used to address the presenting research questions. Analyses explore the properties of the TSRS, including the comprising factors and their internal consistency reliabilities, and the relations between TSRS global readiness scores and children's scores on norm-referenced measures. This study may lend insight into teacher judgments of school readiness, including what skill areas (factors) teachers find important for readiness and how teacher-rated school readiness relates to children's performance on standardized measures of readiness-predictive-constructs, such as those typically used in school readiness research. This section states the measures used, participant sample, and data collection, cleaning, and analyses for the present study.

Design

The present study uses quantitative data collected as a part of a broader study investigating the relationship between self-regulation and social competence in kindergarten children. Measures include the TSRS, a 31-question teacher report of students' school readiness; the Wechsler Preschool and Primary Scale of Intelligence—Third Edition (WPPSI-III) Vocabulary subtest, a standardized free response measure of children's knowledge of vocabulary words; the Developmental Neuropsychological Assessment—Second Edition (NEPSY-II), a multipart standardized measure of children's neuropsychological functioning, which includes measures of executive functioning and social perception (part of social-emotional understanding); the Behavior Rating Inventory of Executive Function—teacher report (BRIEF-T), a standardized, teacher-report measure of executive functioning; and the Social Skills Improvement System—teacher report (SSIS-T), a standardized, teacher-report measure of social skills.

Data Collection and Preparation

The data are archival and were collected between 2012 and 2018 with approval from the University of Maryland Institutional Review Board (IRB). The researchers obtained consent to conduct research at a preschool or elementary school. Researchers spoke with and disseminated consent forms to parents of potential participants during school open houses and back to school nights. The only bases for participant selection were age and parental permission. Teachers were also asked for consent to participate. Researchers administered the performance measures used in the present study (NEPSY-II and WPPSI-III) during one of several 30-minute sessions with child participants. The BRIEF-T and SSIS-T rating scales were given to teachers early in the school year and

asked to be returned within a month. The TSRS was given in April, when the teacher could best assess the child's preparedness for elementary education and was also asked to be returned within a month.

Each child was assigned a case number, under which all materials were stored and scored. A master sheet of names corresponding with case number is kept in a locked file cabinet for preschool data collection and password-protected spreadsheet for kindergarten data collection. The data collected were stored confidentially in locked file cabinets in the office of Dr. Teglasi, the primary investigator. Measures were scored by two independent graduate student researchers. The data were then entered into either EpiData, a double entry software program (early participants), or a double entry spreadsheet in Microsoft Excel (later participants) by two independent graduate student researchers. Verified matching scores were transferred from EpiData and Microsoft Excel into SPSS. All relevant data were merged into a single R file for analysis. Data were analyzed using R Version 3.2.2 (The R Foundation for Statistical Computing, 2015).

Participants

TSRS scores were available for 79 participants from the larger research sample. Data from one child was excluded from all analyses because preliminary analyses revealed them to be an outlier on nearly all measures. The child's TSRS total score was 82, which was well below the first quartile score of 168. Notably, the child was the oldest participant in the sample at age 78 months. Data from eight children were included for the factor analysis but excluded from correlation and regression analyses because they had TSRS results but were lacking scores on several performance measures and/or rating

scales used in the analyses. A tenth child was excluded because a global rating of school readiness was not identified by the teacher.

The final sample consists of 69 kindergarten students and their teachers *(n* = 11). Throughout the present study, the term "participant" refers to the students rather than the teachers. The current sample of participants include 69 kindergarten students (62% boys and 38% girls) attending two private schools in a semi-urban area (48% at school one, 52% at school two). Children attending these schools typically have highly educated and employed parents. Specific information about the income and educational attainment for parents of the children in the present sample is not available. Participant age averages 67.78 months (*SD* = 3.84 months) and ranges from 60 to 75 months, with age normally distributed. The students are primarily White: 51% are European American or White, 10% African American or Black, 9% Hispanic-American or Latino, 10% Asian American, 12% multiracial or other, and 8% not supplying racial information.

Table 2

Demographic Characteristics of Participants

Demographic	n	%
Gender		
Male	43	62
Female	26	38
Race/ethnicity		
European American or White	35	51
African American or Black	7	10
Hispanic American or Latino	6	9
Asian American	7	10
Multiracial or Other	8	12
Unknown	6	8
School		
School 1	33	48
School 2	36	52
Teacher		
A1	22	32
A2	7	10
A3	4	6
B1	4	6
B2	3	4
B3	12	17
B4	6	9
B5	3	4
B6	3	4
B7	2	3
B8	3	4

Percentages are rounded to the nearest whole number
A teachers are from school 1, B teachers are from school 2

All rating scales included in this study were completed by the children's teachers. All teachers were female, and they were primarily European American or White. Detailed teacher demographic data was not collected. Eleven teachers provided data for the study; however, the number of children rated by each teacher was highly variable. The teacher with the fewest student participants supplied rating scale data for two children, while the one with the most student participants provided data for 22 children. Possible variation in ratings due to teacher differences was assessed by computing intraclass correlation coefficient statistics via one-way random analysis of variance tests (described below).

Measures

School Readiness. The Teacher School Readiness Scale (TSRS) is an unpublished and unstandardized measure developed due to the dearth of school readiness measures, particularly those that were developed in collaboration with teachers to ensure that they are assessing the skills that practitioners find essential to readiness. The final TSRS, created in 2013, has 31 items, with a substantial portion of items devoted to assessing social-emotional and executive functioning skills. One item asks for teachers' perspectives of the student's overall readiness (later referred to as a global rating). All items ask for responses on a 7-point Likert-type scale and no items are meant to be reverse scored (for more information on the TSRS, see *Development of the Teacher School Readiness Scale*, above). For the present analyses, a TSRS global score was computed for each participant as the sum of scores for all individual skill items (items 1 through 30). The present study is the first analysis of the factor structure and internal consistency reliabilities of the TSRS, as well as the first to assess the relations between

TSRS scores (including factor and global scores) and results of standardized measures of the school readiness-predictive-constructs.

Preliminary analyses revealed results of the TSRS to be negatively skewed, with teachers rating children as "extremely ready" in most instances. In order for data to be considered normally distributed, skew and kurtosis should be between negative two and positive two at a minimum, with more stringent criteria being skew between negative one and positive one (Garson, 2012). In the current sample, nine items on the TSRS met the more stringent criteria of have skew less than negative one and 29 of the 31 items met the minimum criteria of having skew less than negative two. Skew ranged from -0.25 for item 20, "Responds well when redirected with positive feedback,' to -2.27 for item 18, "Motor coordination is sufficient for carrying out required activities." Both total and global school readiness scores met the minimum criteria for skewness: the skew of the global item is -1.95 and the skew of the total/sum score is –0.18. Kurtosis ranged from -1.02 for item 20, "Responds well when redirected with positive feedback," to 7.84 for item six, "Shares materials and space." This range of kurtosis indicates that there was not enough data in the tails of the distribution of scores (Garson, 2012). This skew is logical in context. As the TSRS was completed one to two months prior to the end of the school year, it is expected that most children would be ready or near-ready by that point.

Vocabulary (A Proxy for Academic Achievement). Research by Sabol and Pianta (2012) found that higher scores on performance measures of vocabulary in pre-kindergarten predict higher social emotional skills on teacher-rated measures of social skills as well as higher scores on performance measures of reading and math achievement in fifth grade. Others have found vocabulary in pre-kindergarten (Kaplan, 1993) and

kindergarten (Kastner et al., 2001) to predict overall achievement in first grade. In the present study, the WPPSI-III Vocabulary subtest is used as a performance measure of vocabulary and proxy for academic achievement. The WPPSI-III is a standardized, comprehensive assessment of cognitive functioning for children ages 2 years 6 months to 7 years 3 months; its Vocabulary subtest requires children to define words of increasing difficulty. Children are awarded no, partial, or full credit depending on the accuracy of their response. WPPSI-III Vocabulary provides age-based scaled scores; split half reliability for the subtest is 0.89 and test-retest reliability is 0.84 (Wechsler, 2002). It is strongly correlated with overall academic achievement. Correlations between the WPPSI-III Verbal IQ (comprised of Vocabulary and two other subtests) and WIAT-II overall achievement scores for kindergarten-aged children is 0.77 (Wechsler, 2002).

In the present sample, Vocabulary scores were normally distributed (*skew* = -0.11) with a mean of 12.06. This is approximately two points higher than the average of the normative sample. Standard deviation was 2.21, 0.79 points lower than in the normative sample. Scores ranged from 6 to 17. The sample included one outlier, but their scaled score of 6 is believed to represent true variance in the population that is otherwise under-accounted for in the present sample. The split-half reliability for the present sample could not be calculated because all participants answered the first five items correctly. For the remaining items, average split-half reliability was 0.67.

Social-Emotional Skills. In the present study, social-emotional skills are measured using subtests from the NEPSY-II performance measure and the SSIS-T rating scale. Scores were combined to yield a single performance composite and a single rating scale composite, each of which served as a variable in the multiple regression analyses.

NEPSY-II. The NEPSY-II, used with ages three through 16, was developed as a measure of educationally relevant neuropsychological domains not typically assessed through cognitive or achievement measures, including attention and executive functioning, language, memory and learning, social perception, sensorimotor, and visuospatial processing. Subtests of the NEPSY-II are used in this study to assess both social-emotional skills and executive functioning (and so the measure is discussed in both sections of the present study). The NEPSY-II was normed to maximize differentiation between individuals at the lower tail of the distribution of standardized scores, allowing clinicians to more easily determine whether a lower score represents clinically significant impairment or merely a statistical weakness. Each domain on the NEPSY-II is comprised of several subtests which attempt to provide more reliable information about their represented constructs than typical neuropsychological measures (whose brevity decreases internal consistency and test-retest reliability).

The two NEPSY-II subtests used in this study as measures of social-emotional functioning are Affect Recognition and Theory of Mind. Affect Recognition assesses children's emotional understanding through their ability to discriminate between emotional expressions (Korkman et al., 2007). Prior research has found that preschool children's performance on a task of emotion identification predicted teacher-rated academic competence in third grade, even after controlling for verbal ability, gender, and temperament (Izard et al., 2001). The NEPSY-II Affect Recognition task provides age-based scaled scores. It has a split half reliability of 0.67 for children ages five to six according to the test developers' norming sample (Korkman et al., 2007). In the present sample, Affect Recognition scores were normally distributed (*skew* = -0.52) with a mean

of 10.75 and standard deviation of 2.55. The minimum score was three and maximum score was 16. This is a close approximation of the normative sample. Average split-half reliability for the present sample was 0.49.

Theory of Mind assesses children's understanding of what others are thinking or feeling, particularly when these thoughts and feelings are different from one's own (Korkman et al., 2007). Theory of Mind is a critical social-emotional skill typically developed during the early school years (Cavadel & Frye, 2017). Prior research has found that children's scores on performance tasks of theory of mind are highly correlated with children's teacher-rated learning behaviors, including motivation, attitudes toward learning, and attention and persistence. Furthermore, theory of mind in preschool predicts literacy and math scores in both preschool and kindergarten (Cavadel & Frye, 2017). The NEPSY-II Theory of Mind measure used in the present study provides age-based scaled scores and demonstrates split half reliability above 0.80 and test-retest reliability of 0.77 for children ages five to six (Brooks et al., 2009). In the current sample, scores approached negative skew (-0.97), with 50% of data clustered between scaled scores of 10 and 12. The mean score was 10.75, standard deviation was 2.54, minimum score was two, and maximum was 16. Average split-half reliability for the present sample was 0.70.

Most reviewed studies of school readiness used rating scales to assess children's social-emotional functioning. Though rating scales are valuable for describing the social-emotional skills children display in the classroom, performance measures demonstrate what skills children *know* and may be capable of in controlled conditions. Therefore, having both rating scales and performance measures of children's social-emotional functioning allows for a more nuanced view of the relation between social-emotional

skills and school readiness, and allows for the possibility that children's knowledge but not classroom demonstration (or vice versa) of social-emotional skills relates to school readiness. Participants' scaled scores on the NEPSY-II Theory of Mind and Affect Recognition tasks were summed to yield a single social-emotional performance composite as part of the analysis to address the second research question.

SSIS-T. Prior research has found that children with higher teacher-rated social problems at four and a half years of age have significantly lower reading and math achievement, lower school engagement, and more disruptive behavior in fifth grade than children without social and externalizing problems (Sabol & Pianta, 2012). Teacher-rated social problems are measured in the present study using the Social Skills Improvement System-Teacher Report (SSIS; Gresham & Elliott, 2008). The SSIS is a revision of the Social Skills Rating System (Gresham & Elliott, 1990), cited in several reviewed studies and measures the social skills and problem behaviors of children ages 3 to 18. Its Social Skills Index includes 46 items answered on a four-point Likert-type scale from "never" to "always." The Social Skills Index is comprised of seven scales: communication skills, cooperation, assertion, responsibility, empathy, engagement with others, and self-control. The measure also produces a Problem Behaviors Index and Autism Spectrum Behavior Scale; however, these were not included in the present study.

SSIS index scores are standard scores derived by adding the scores from each individual item on the index and then comparing the total to age-based norms. As reported by Gresham et al. (2011), the internal consistency and test-retest reliability for the Social Skills Index and all contributing scales are above 0.8. In the present study, scores on the Social Skills Index were normally distributed (skew=0.15) around a mean

of 101.33, with a standard deviation of 10.59. Scores ranged from a minimum of 77 to maximum of 126 with no apparent outliers. Average split-half reliability for the present sample was 0.80. In combination with the NEPSY-II performance tasks, the SSIS-T ends a well-rounded view of children's social-emotional skills.

Executive Functioning. In the present study, executive functioning is measured using subtests from the NEPSY-II performance measures and the BRIEF-T rating scale.

NEPSY-II. The three NEPSY-II subtests used in this study as performance measures of executive functioning are Inhibition, Statue, and Auditory Attention; these fall within the NEPSY-II's attention/executive functioning domain. Inhibition evaluates children's ability to selectively focus and sustain attention to visually presented information under both simple and complex conditions. It requires response inhibition, behavior regulation, attention to and memory of task rules, and quick adjustment to changing task rules (Korkman et al., 2007). For the present study, the inhibition total errors scaled score was used. Scores were normally distributed (*skew* = -0.58) around a mean of 9.02 with standard deviation of 3.69 and range from 1 to 16. This is a close approximation of the normative sample. The total error scaled score in the standardized sample has a split-half reliability of 0.74 for five- to six-year-olds (Korkman et al., 2007).

Statue evaluates children's self-monitoring and inhibitory control by requiring children to hold a position for 75 seconds without responding to auditory distractors. In the present sample, Statue scaled scores were negatively skewed (-1.04) with thin tails. Scores ranged from one to 14, with a mean of 10.19 and standard deviation of 3.05. Fifty percent of scores were between 8 and 13. Statue scaled scores in the normative sample have a split-half reliability of .88 for five- to six-year-olds (Korkman et al., 2007).

Together, Statue and Inhibition assess the same executive functioning skills that are assessed in the frequently-used Head Toes Knees Shoulders task, including selective attention, regulation and inhibition of behavior, memory of rules, and adjustment to changes in demand. There is mixed evidence that HTKS is a good predictor of school readiness (supportive results: Lonigan et al., 2017; contradictory results: Gestsdottir et al., 2014; Matthews et al., 2009; Son et al., 2013); however, it is unclear whether this is because behavior regulation does not predict school readiness-related-outcomes or because the HTKS is a poor measure of behavior regulation. Measures of other related executive functioning skills, specifically working memory (Graziano et al., 2015) and behavioral persistence (Berhenke et al., 2011) do predict school readiness-related-outcomes. Therefore, Statue and Inhibition can be used to further tease out relations between components of executive functioning and school readiness.

NEPSY-II's Auditory Attention subtest evaluates children's ability to listen to a long series of words and tap a colored circle when the name of the color is stated. However, children must also refrain from tapping other circles whose colors are named. Auditory attention therefore requires selective focus, response inhibition, and sustained attention (Korkman et al., 2007). Sims and Lonigan (2013) have found that kindergartners' scores on a task of continuous attention were significantly correlated with same-year literacy achievement on three performance measures. Literature reviewed above suggests that attention may be a key component of the link between executive functioning and school readiness. Auditory Attention combined scaled scores were used in the present study and assess both children's total correct responses and number of times the child accidentally tapped a circle when uncalled for (commission errors).

Scores in the present sample were normally distributed (*skew* = -0.25) with a mean of 10.24 and standard deviation of 3.24, closely approximating the normative sample. Scores ranged from 1 to 16, with 50% of scores falling between eight and 12, consistent with the normative sample. Combined scaled scores for five to six-year-old children in the normative sample have a split-half reliability of 0.91 (Korkman et al., 2007). Participants' scaled scores on the NEPSY-II Statue, Inhibition, and Auditory Attention tasks were summed to yield a single executive functioning performance composite as part of the analysis for research question two.

BRIEF-T. Rating scales of executive functioning, such as the Behavior Rating Inventory of Executive Function (BRIEF), have been found to predict academic achievement (Gestsdottir et al., 2014; Lonigan et al., 2017; Matthews et al., 2009). Graziano et al. (2015) found that overall executive functioning on the teacher-rated BRIEF-preschool version predicted student-teacher relationships, academic impairment, and school readiness on teacher-completed rating scales. The BRIEF-T is the teacher report form of the BRIEF rating scales (Gioia et al., 2000), which were developed to assess executive functioning in children ages 5 to 18. The BRIEF also has parent rating scales.

The BRIEF contains 86 items on a three-point Likert-type scale with response choices "never," "sometimes," and "often." The items form eight scales: Inhibit, Shift, Emotional Control, Initiate, Working Memory, Plan/Organize, Organization of Materials, and Monitor (Gioia et al., 2000). Inhibit refers to a child's ability to resist their impulses; shift is the ability to transition between tasks and flexibly problem-solve; emotional control is the ability to regulate emotional reactions; initiate is the child's ability to

independently initiate problem solving and activities; working memory is the ability to hold information in memory long enough to complete simple and multi-step tasks; plan/organize is the ability to foresee needs and respond preemptively; organization of materials is the ability to keep track of one's materials/items; and monitor is awareness of one's impact on others. These eight scales combine to yield a Global Executive Composite (GEC). The GEC is an age-based t-score; for the present study, gender-specific norms were used. Internal consistency reliability and test-retest reliability were 0.8 or greater for the GEC and all contributing scales in the normative sample (Gioia et al., 2000). The present study uses children's gender-specific t-scores on the BRIEF's GEC as a rating scale measure of their executive functioning. Scores in the present study were slightly positively skewed (*skew* = 1.10) with a mean of 53.90 and standard deviation of 10.87. The minimum score of 41 was 11 points above the minimum score of the normative sample and the maximum score of 91 was 8 points below the maximum score of the normative sample. Average split-half reliability for the present sample was 0.91. After preliminary analysis, GEC scores were reverse coded so that lower scores would indicate weaker executive functioning in order to ease interpretability of correlations with other variables.

Few studies of executive functioning's relation to school readiness use rating scales, and no known study employs as comprehensive a measurement as the BRIEF-T. Use of this scale allows for study of the breadth of executive functioning skills which may be related to school readiness. Some, like task completion and organization of materials, have not been studied in any reviewed literature, but likely have strong relations to children's school readiness.

Table 3

Descriptive Characteristics of the Measures

Measure	n	M	SD	Minimum	Maximum	Skew
WPPSI-III Vocabulary	68	12.06	2.21	6	17	-0.11
NEPSY-II						
Affect Recognition	69	10.75	2.55	3	16	-0.52
Theory of Mind	64	10.75	2.54	2	16	-0.97
Auditory Attention	68	10.24	3.24	1	16	-0.25
Inhibition	66	9.02	3.69	1	16	-0.58
Statue	68	10.19	3.05	1	14	-1.04
BRIEF GEC	60	53.9	10.87	41	91	1.1
SSIS Social Skills Index	63	101.33	10.59	77	126	0.15

Chapter 4: Results

Preliminary Analyses

Teacher Effects on School Readiness Scores. Based on reviewed literature indicating that teacher demographics and the relationship between students and teachers impact teachers' views of children's school readiness (Graziano et al., 2016; Lin et al., 2003), and that teacher and school quality impact readiness itself (NICHD, 2002; Sammons et al., 2003), it was expected that there may be systematic differences in teacher-rated school readiness on the Teacher School Readiness Scale (TSRS). One-way Analysis of Variance (ANOVA) was used to assess whether rating scale scores differed significantly across groups of children rated by different teachers (Table 4). ANOVAs assessed group differences for TSRS total scores, TSRS global item rating scores, SSIS Social Skills Index scores and BRIEF Global Executive Composite (GEC) scores. Results indicated that there were no statistically significant differences in mean TSRS total scores, TSRS global scores, SSIS Social Skills Index scores, or BRIEF GEC scores by teacher; however, there were meaningful differences for both TSRS total scores and SSIS Social Skills Index scores, as teachers explained more than 10% of variance in scores for each. The large number of groups (n = 11) as well as small and unequal group sizes, with some teachers rating as few as two children, could artificially inflate differences between groups. Therefore, additional analyses were conducted comparing differences between teachers who each rated more than five children and differences between schools; both analyses allowed for larger and more equal group sizes.

The next set of analyses to measure teacher effects compared the ratings of the four teachers in the sample who each rated more than five students. One-way ANOVAs

assessed group differences between these four teachers for TSRS total scores, TSRS global item rating scores, SSIS Social Skills Index scores and BRIEF GEC scores. Results indicated that there were no meaningful or statistically significant differences in mean TSRS total scores, TSRS global scores, SSIS Social Skills Index scores, or BRIEF GEC scores by teacher. The measure with the greatest teacher effects was the SSIS Social Skills Index, for which differences between teachers explained 5.73% of variance in scores.

The final set of one-way ANOVAs assessed differences between groups at the school level. Results indicated that there were no meaningful or statistically significant differences in mean TSRS total scores, TSRS global scores, SSIS Social Skills Index scores, or BRIEF GEC scores by school. The measure with the greatest teacher effects was the TSRS Total Score, for which differences between schools explained 2.90% of variance in scores.

Results of the ANOVAs comparing between-school effects and between-teacher effects for the teachers with five or more students suggests that the variation in scores explained by teacher differences when comparing all 11 teachers is artificially inflated due to the small and unequal group sizes. This is supported by the F-statistics that indicate that differences between groups, even for the analyses with all 11 teachers, are nonsignificant at the $p < 0.05$ level. These results indicate that variation in rating scores are not substantially impacted by teacher effects. Based on these results, analyses did not use nesting or include teachers or schools as independent variables.

Table 4

One-Way Analysis of Variance (ANOVA) Measuring Teacher Effects

Measure	All teachers			Teachers with five or more students			Schools		
	η2	F (df, df)	p	η2	F (df, df)	p	η2	F (df, df)	p
TSRS total score	0.145	0.98 (10, 58)	0.47	0.023	0.33 (3, 43)	0.08	0.029	2 (1, 67)	0.16
TSRS global score	0.099	0.64 (10, 58)	0.77	0.047	0.72 (3, 43)	0.55	0.002	0.16 (1,67)	0.69
SSIS Social Skills Index	0.141	0.86 (10, 52)	0.58	0.057	0.77 (3, 38)	0.52	0.005	0.34 (1, 61)	0.56
BRIEF GEC	0.035	0.18 (10, 49)	0.99	0.024	0.29 (3, 36)	0.83	0.004	0.24 (1, 58)	0.63

Role of Demographic Variables. In order to gather preliminary information about the role of demographics, a series of t-tests were conducted with all independent variables to assess whether children of different genders and races significantly differ in their performance or ratings on each variable. On consent forms, parents were asked to list their child's gender and race. All parents listed their child's gender as either male or female, forming the two gender groups of "boys" and "girls" used in the follow analyses. Children were identified as any of five races (with Hispanic American/Latino being treated as a different race than European American White), with some parents (n=6) leaving this section of the form blank. Because there were many more White children than children of other races, all children of color were combined into one "participants of color" group for analyses. It is understood that this combination may have understated meaningful differences between minority racial groups, which is considered a limitation of this study.

Welch's t-tests for groups with unequal variances showed significant differences by race at the $p < 0.01$ level on 16 school readiness items as well as total scores, with participants of color scoring higher than White participants. The mean TSRS total score for participants of color was 187.23 ($SD = 17.75$, $n = 37$) and the mean total score for White participants was 175.10 ($SD = 16.29$, $n = 35$). This is contrary to findings in the reviewed literature. Further analysis found that all minority racial groups in the sample had higher mean and median total TSRS scores than did White participants. However, once Bonferroni corrections ($p < 0.05/40$) were used to account for the number of analyses conducted, none of the differences between racial groups were significant.

In analysis of gender effects, uncorrected t-tests showed gender differences on two independent variables. Girls had higher scores on one TSRS item, "organizes materials and belongings (putting things away)" (M_{girls} = 6.11, SD_{girls} = 0.77; M_{boys} = 5.70, SD_{boys} = 0.99), as well as on Theory of Mind (M_{girls} = 11.65, SD_{girls} = 2.25; M_{boys} = 10.24, SD_{boys} = 2.58). These differences are consistent with reviewed literature. After Bonferroni corrections ($p < 0.05/40$), however, neither effect was significant.

In order to further assess the role of demographics, each regression was conducted first without demographic factors and then again with demographic factors included. Measures of r squared change were used to assess whether the combination of gender and race were significantly related to the dependent variable.

Question 1: What Broad Constructs Capture the Individual Skills Measured by the TSRS?

Overview of Analysis. The question of what broad constructs capture the individual skills measured by the Teacher School Readiness Scale (TSRS) was answered through analysis of the factor structure and internal consistency of the TSRS. As discussed above, in order to identify the factors that comprise the TSRS, exploratory factor analysis was conducted using principal axis factoring with an oblimin rotation. Internal consistency of factors was measured as correlations between items within each factor. Given that most of the items on the TSRS inquire about social-emotional and executive functioning skills, it was expected that a factor would emerge that includes primarily social-emotional skill items while another would emerge that includes primarily executive functioning skill items. It was unclear at the time of hypothesis formation whether items pertaining to academic achievement and motor development would group

into a single factor or would be distributed across social-emotional and executive functioning-based factors.

Assumption Testing. Exploratory factor analysis relies on the following assumptions: a) there is univariate and multivariate normality, b) there are no outliers, c) variables are at least moderately correlated with one another ($r > 0.3$) but are not multicollinear, the relations between variables and factors are linear, and there is a sufficiently large sample (Yong & Pearce, 2013).

Normality. The assumption of univariate and multivariate normality was not met; however, this is unlikely to be problematic as factor analysis is robust to deviations from normality (Garson, 2012). In order for data to be normally distributed, skew and kurtosis should be between negative two and positive two at a minimum and preferably between negative one and positive one (Garson, 2012). In the current sample, four items on the TSRS met the more stringent criteria of have skew less than negative one and 29 of the 31 items met the minimum criteria of having skew less than negative two. Kurtosis ranged from -1.02 to 7.84. The skew and kurtosis of the present data indicates that teachers believed most children were "extremely ready" for first grade.

Multivariate normality for the set of all TSRS items was then assessed using Mardia's measures of multivariate skewness and kurtosis. Data is considered to lack multivariate normality when one or both of Mardia's statistics are significant at the $p < 0.05$ level. For the TSRS data, Mardia's statistics for both skewness and kurtosis are significant, indicating that the data lacks multivariate normality. Again, this is unlikely to be problematic given robustness to deviations from normality (Garson, 2012).

Outliers. The assumption that there are no outliers was not met; however, this is believed to be a benefit of the sample given the present research question. Of the 31 items on the TSRS, 23 had outliers. Presence of statistical outliers was likely the result of high clustering of scores. For 30 of 31 questions on the TSRS, 50% of children earned scores between 5 and 7, with the maximum score for all items being 7 and the mean score ranging from 5.20 to 6.61. However, outliers on individual items were *not* always the same child; therefore, these data points are believed to provide meaningful information about patterns of school readiness across participants and contribute to needed variability in the data. A single child who had very low scores on all measures was dropped from the data set in order to reduce the impact of outliers.

Correlations and multicollinearity. The assumption that test items are at least moderately correlated without being multicollinear was met. For the TSRS as a whole, Cronbach's alpha was 0.94. In review of a correlation matrix, the 30 skill items of the TSRS have moderate to large correlations with one another, with 271 of 435 item pairs having correlations between 0.30 and 0.90. The highest inter-item correlations were items 4 and 5 with a correlation of 0.85, 13 and 14 with a correlation of 0.88, and 15 and 16 with a correlation of 0.87. Item 18, "Motor coordination is sufficient for carrying out required activities" had the lowest correlation with other items, with correlations below 0.3 for 23 of 29 correlations. Graphical representations of the data demonstrated that items on the TSRS were not consistently related to one another or to global readiness scores, though there are some items that are linearly related. This is promising evidence that TSRS items group into factors. Items are consistently related to TSRS total scores, which is to be expected as the total score is computed as a sum of the individual items.

Linear relations between variables. The assumption of linearity may not be met, as items on the TSRS are not consistently linearly related to one another or to global readiness scores. They are consistently linearly related to TSRS total scores, but this is to be expected because the total score is computed as a summary of individual items. Items on the TSRS are expected to represent different factors and not all factors may be related to one another. Follow-up analysis will determine whether all items on a given factor are linearly related to one another and whether the factors are linearly related.

Sample size. The assumption of a sufficient sample size was met. Sufficiency of sample size for factor analysis is a matter of debate in statistical literature. Prevailing contemporary thought is that exploratory factor analysis can be conducted with samples smaller than 50 participants if there is high communality, a high number of observed variables, and a small number of factors (deWinter et al., 2009) or if using modified methodologies such as regularized exploratory factor analysis (Jung & Lee, 2011). This suggests that the current sample size may be adequate but should be verified after the factor analysis is conducted.

Adequacy of the sample was supported by Kaiser-Meyer-Olkin Measure of Sampling Adequacy (KMO) and Bartlett's Test of Sphericity statistics. The KMO measures whether there is sufficient distribution of values for conducting factor analysis. KMO values should be at least 0.50 (UCLA, 2019). For the present sample, the KMO Measure of Sampling Adequacy (MSA) for the TSRS was 0.81 overall. The majority of individual items also had MSAs equal to or greater than 0.8. Item 18 had the lowest MSA, 0.60, which is mediocre by Kaiser's standards (1974) but above the minimum threshold. Bartlett's test of sphericity is used to assess the extent to which correlations

between variables in a matrix are the result of common variance (Zygmont & Smith, 2014). A chi-square test is used to test the hypothesis that correlations are not due to common variance, with significant p-values ($p < 0.05$) indicating that the correlations do covary and therefore may be part of one underlying construct (Zygmont & Smith, 2014). In the present study, Bartlett's test of sphericity was significant, with a p-value of less than 0.001. Therefore, despite the non-normality of responses on the TSRS and the relatively small number of participants ($n = 69$), preliminary statistics indicated that the sample was sufficient for factor analysis.

Extraction of Factors. The number of factors to be extracted for the model was determined by use of eigenvalues and scree plot. Based on a maximum of 30 possible factors, six factors had eigenvalues greater than one, which is the typical cutoff to be included in factor analysis (Kaiser, 1960). A scree plot indicated that the data is best represented by six factors if using principal components analysis and three factors otherwise. A series of factor models with two to six extracted factors were estimated and compared to determine the best-fit model. The five different models explained between 50% (2-factor model) and 67% (5-factor model) of variance in TSRS item responses. All models had wide levels of communality (Jung & Lee, 2011), ranging from 0.15 to 0.92. Mean communalities ranged from 0.50 (two-factor model) to 0.67 (six-factor model). Though the models with more factors explained a greater proportion of the data and had higher communalities, when conducting factor analysis with a small sample size, it is advised that factor solutions should have at least three items on each factor with loadings equal to or greater than 0.60 (DeMars, 2016; Lingard & Rowlinson, 2006). Only the two-factor and three-factor models met this criterion. Additionally, contemporary statistics

often use Horn's Parallel Analysis to determine the optimal number of factors to retain for a factor model, meaning the number of factors that best explains the data. For the present data set, the Horn's Parallel Analysis indicated that two factors should be retained. Based on all analyzed criteria, the two-factor model was selected for subsequent analyses.

Factor Analysis. Exploratory factor analysis was conducted using principal axis factoring of a two-factor solution with oblimin rotation (Table 5). The two factors that emerged explain a total of 50% of variance in TSRS scores and had a model fit of 0.95. Though one factor relates to social-emotional skills, as expected, a factor pertaining to executive functioning skills did not emerge. Items relating to executive functioning skills were split across the two factors or double-loaded and were removed from analysis. The two factors that emerged represent academic understanding and social interactions and are moderately correlated with one another ($r = 0.30$).

The first factor that emerged addresses Academic Understanding and includes eleven items. The highest-loading items are: "Comprehends the meaning of what he or she hears or reads to benefit from grade level instruction" ($r = 0.90$), "Is able to get meaning from context when he/she encounters unknown words" ($r = 0.87$), "Remembers the important points taught during class" ($r = 0.75$), "Has basic math facts and knowledge that is sufficient for the next grade level" ($r = 0.74$), "Can understand math concepts needed to learn at this grade level" ($r = 0.73$), and "Can write words, or sentences at a level that permits him/her to complete required tasks" ($r = 0.72$). The items on factor one had an internal consistency reliability (Cronbach's alpha) of 0.92 and mean inter-item

correlation of 0.51. All items were linearly related to one another. Collectively, the items on factor one explained 26% of variance in TSRS scores.

The second factor that emerged addresses Social Interactions and includes 10 items. The highest-loading items are: "Takes turns appropriately" ($r = 0.88$), "Considers the interests and needs of others in social interactions" ($r = 0.88$), "Shares materials and space" ($r = 0.86$), "Interacts well with other children" ($r = 0.85$), "Follows directions" ($r = 0.73$), and "Forms new friendships with peers" ($r = 0.71$). The items on factor two have an internal consistency reliability (Cronbach's alpha) of 0.92 and mean inter-item correlation of 0.55. All items are linearly related to one another. Collectively, the items on factor two explained 24% of variance in TSRS scores.

Given a combination of the small sample size and small number of items, a cut-off factor loading of 0.5 was used in determining these items. This cut-off is considered "acceptable" to "good" given the sample size ($n = 69$; Matsunaga, 2010; MRC, 2009) and allowed most items to be retained. Using this criterion, eight items were removed from analysis. The removed items were: "Knows what materials or clothing to bring when making routine transitions (e.g., moving to the library or going to recess)," "Can attend to a task/activity as required," "Willing to try new activities," "Listens actively," "Motor coordination is sufficient for carrying out required activities," "Communicates with adults effectively," "Organizes materials and belongings (putting things away)," and "Does not get anxious or upset when introduced to a new topic or challenging task." Most of these items had moderate loadings (between 0.30 and 0.50) on both factors and greater variability in item scores than those items that loaded strongly onto single factors. Conceptually, many of them are communication and self-regulation skills that are

required for both academic and social success. It is believed that these items may be useful indicators of child variance in school readiness on a larger scale (and likely longer-term) and that with a larger sample size, they likely would have double-loaded onto both factors.

A single other item was removed from factor one. This item, "appears to be in good physical health," had a factor loading of 0.58 (and a loading onto the social skills factor of 0.02) but did not make conceptual sense with the other factor items, all of which addressed academic understanding. It is likely that with a larger sample size, an additional factor may emerge which better conceptualizes this item.

Table 5

Results from a Factor Analysis of the Teacher School Readiness Scale

TSRS item	Factor loading	
	Factor 1	Factor 2
Factor 1: Academic Understanding		
13. Comprehends the meaning of what he or she hears or reads to benefit from grade level instruction	**0.9**	-0.16
14. Is able to get meaning from context when he/she encounters unknown words	**0.87**	-0.23
19. Remembers the important points taught during class	**0.75**	0.04
15. Has basic math facts and knowledge that is sufficient for the next grade level	**0.74**	-0.04
16. Can understand math concepts needed to learn at this grade level	**0.73**	-0.06
12. Can write words, or sentences at a level that permits him/her to complete required tasks	**0.72**	-0.03
10. Recognizes what is important to remember	**0.68**	0.21
5. Demonstrates independence, such as initiating and/or completing tasks alone	**0.63**	0.29
25. Able to tell coherently about an experience (such as what happened earlier on the playground).	**0.6**	0.22
17. Appears to be in good physical health	0.58	0.02
11. Demonstrates curiosity	**0.55**	0.02
9. Shows enthusiasm for learning	**0.5**	0.28
Factor 2: Social Interactions		
28. Takes turns appropriately	-0.12	**0.88**
26. Considers the interests and needs of others in social interactions	-0.13	**0.88**
6. Shares materials and space	-0.03	**0.86**
1. Interacts well with other children	-0.14	**0.85**
8. Follows directions	0.21	**0.73**
2. Forms new friendships with peers	0.07	**0.71**
27. Expresses needs appropriately	0.09	**0.68**
30. Can handle negative feedback	0.09	**0.61**

29. Adjusts behavior to the context (transition between recess to class)	0.25	**0.52**
20. Responds well when redirected with positive feedback	0.18	**0.52**
<u>Double-Loaded Items (Dropped from Analysis)</u>		
21. Knows what materials or clothing to bring when making routine transitions (e.g., moving to the library or going to recess)	0.48	0.26
4. Can attend to a task/activity as required	0.47	0.37
24. Willing to try new activities	0.47	0.42
23. Listens actively	0.41	0.43
18. Motor coordination is sufficient for carrying out required activities	0.4	-0.02
7. Communicates with adults effectively	0.37	0.45
22**.** Organizes materials and belongings (putting things away)	0.34	0.31
3. Does not get anxious or upset when introduced to a new topic or challenging task	0.31	0.35

Secondary analysis of the factor structure. A second exploratory factor analysis (principal axis factoring with oblimin rotation) was conducted using only the 21 TSRS items retained in the original model, meaning those with factor loadings of 0.50 or above and without double-loadings. The aim of this second analysis was to determine whether items would continue to load onto the initial factors. The second factor analysis confirmed the initial findings. Both the Academic Understanding and Social Interaction factors emerged and all but one item remained on the original factors. A single item, "shows enthusiasm for learning" dropped from the model, with its loading on factor one decreasing from 0.50 on the original model to 0.49 on the secondary analysis. Together, the two factors explained 56% of variance in scores for the retained subset and had a model fit of 0.97. The Academic Understanding factor consisted of 10 items and explained 28% of variability in TSRS scores on the retained subset. It had an internal consistency reliability (Cronbach's alpha) of 0.92 and mean inter-item correlation of

0.53. The Social Interaction factor consisted of 10 items and explained 29% of variability in TSRS scores on the retained subset. It had a Chronbach's alpha of 0.92 and mean inter-item correlation of 0.55. The correlation between the two factors was 0.24.

Question 2: How Do Factors on the TSRS Relate to Teachers' Ratings of Global School Readiness?

Overview of Analysis. While question one explored what factors emerge on the TSRS, question two built on those findings by determining how these factors relate to teachers' ratings of global school readiness using Pearson's correlations and multiple regression. First, factor scores for the TSRS were calculated using Thurstone's method, which weights items based on their factor loadings (these are hereafter referred to as "factor scores"). Next, factor scores were each correlated with one another, students' total school readiness scores, and global readiness scores. It was hypothesized that all factor scores would be significantly and positively correlated with students' global readiness scores because students who are more ready overall should also be more ready when measured on individual readiness-related skills. In other words, the correlation coefficient of the relationship between each factor score, B_n, and global item scores, *Y,* was expected to be positive and significant.

After conducting the correlations, multiple linear regressions were used to examine the combined effects of all factor scores and measured demographic variables. It was hypothesized that the combined value of all factor scores and demographics would significantly predict global school readiness scores, as measured by F-tests for joint significance. This was assessed using the regression equation $y = \alpha + \beta_1(Female) + \beta_2(White) + \beta_3 X_3 + \cdots + \beta_n X_n$ where variables X_3 through X_n represent scores for each

factor identified in response to question one. An initial regression included the two factor scores and a second regression included factor scores and demographic variables of race and gender. For these analysis and future analyses including demographic variables, gender and race were coded using dummy variables, where *Female* is a dummy variable taking on the value of 1 for female students and 0 for male students and *White* is a dummy variable taking on the value of 1 for White students and 0 otherwise.

Calculation of Factor Scores. Factor scores were calculated using Thurstone's method. Under Thurstone's method, all items on the rating scale are included in calculations of each factor score but items are weighted based on their factor loadings, such that those with very low loadings on a given factor will have a small contribution toward that factor score, while those with higher loadings will have a larger contribution toward the factor score. Thurstone's method is considered best practice for calculation of factor scores (Revelle, 2013). Factor scores for factor one, Academic Understanding, are normally distributed, with skew of -0.63 and kurtosis of 0.14. For factor two, Social Interaction, there is negative skew (-1.39) and sub-optimal variability in the data (kurtosis=3.4), indicating that most children had high factor two scores. The correlation between the two factor scores is 0.32, which is significant at the $p < 0.01$ level.

Assumption Testing. There are four core assumptions of multiple linear regression: linearity, multivariate normality, independence of observations, and homoscedasticity.

Linear relations between variables. The assumption of linearity was met for all variables according to visual inspection of graphical plots of the linear relations between TSRS global readiness scores, total scores, and factor scores. Items on the same factor

had positive linear relations with one another. As posited during assumption testing for the factor analysis (question one), items on different factors did not always have linear relations with one another. Items that did not load onto either factor had particularly weak and/or nonlinear relations with other items.

Normality of errors. The residuals from multiple regressions using TSRS global and total scores were examined using graphical and Shapiro-Wilk tests in order to assess the assumption of normality. Both graphical and Shapiro-Wilk tests revealed that the residuals were not normally distributed ($p < .05$); however, the sample size used in the present study is likely sufficiently large for t-tests and F-tests to be appropriate despite the non-normality (Wooldridge, 2008).

Independence of observations. An assumption of multiple regression analysis is that observations are independent of one another. For the present set of analyses, the sample is semi-random as schools, parents, and children opt-in to participate. There is also some possibility that children's ratings on the TSRS are not independent of one another, as teachers may compare children within their class in order to form their opinions (despite the fact that teachers are told to rate each child independently). Based on preceding analyses showing that teacher effects were nonsignificant, it is believed that observations were sufficiently independent to meet criteria for multiple linear regression.

Homoscedasticity. The assumption of homoscedasticity was not met. The homoscedasticity assumption is that the variance of the error term is constant across all values of the independent variables in the regression model. The homoscedasticity assumption was tested graphically via plots of the residuals in the regression model against the independent variables. Graphical plots revealed a cone-shaped pattern

indicative of heteroscedasticity. The presence of heteroscedasticity was confirmed via the Breusch-Pagan test (Wooldridge, 2008). The violation of the assumption of homoscedasticity is addressed in this study's regression analyses through the use of Welch's t-tests, which are intended for use with samples that have unequal variance and are calculated without pooling the sample variance (White, 1980).

Correlations of Factors. The present study hypothesized that global school readiness scores would be significantly and positively correlated with children's readiness in individual factors comprising school readiness. This hypothesis is supported. There are significant positive correlations between the Academic Understanding factor, Social Interaction factor, TSRS global item ratings, and TSRS total scores, all at the $p < 0.01$ level (Table 6). Both factors are more strongly correlated with TSRS total scores ($r_{Academic\ Understanding} = 0.83$, $r_{Social\ Interaction} = 0.78$, $p < 0.01$ for both correlations) than global readiness item scores. Scores on the Academic Understanding factor are more strongly correlated with global readiness ratings ($r = 0.72$, $p < 0.01$) than are scores on the Social Interaction factor ($r = 0.28$, $p < 0.05$). This suggests that the teachers in the present sample may weigh academic understanding (such as reading and listening comprehension, memory for academic content, mathematical knowledge, and expressive writing) more highly than social skills when considering children's overall school readiness.

Table 6

Correlations of TSRS Scores

Variable	Academic Understanding Factor	Social Interaction Factor	TSRS Global Item Scores	TSRS Total Scores
Academic Understanding Factor		0.32**	0.72**	0.83**
Social Interaction Factor			0.28*	0.78**
TSRS Global Item Scores				0.63**
TSRS Total Scores				

*$p < 0.05$, **$p < 0.01$

Regression. After analysis of bivariate correlations, multiple linear regression was used to examine the extent to which the combined value of all factor scores and demographics would predict global school readiness scores. It was hypothesized that the combined value of all factor scores and demographics would significantly predict global school readiness scores. This hypothesis was supported (Table 7). Factor scores were entered in the first model and demographic variables of race and gender were added in a second model. Regression results indicate that the combined effect of children's Academic Understanding and Social Interaction factor scores significantly predict scores on the global readiness item (F (2,66) = 35.55, $p < 0.01$). The two factors collectively explain 51.86% of variance in global readiness scores (multiple r-squared). Adding demographic variables to the model explains an additional 1.10% of variance in the data. Though this model remains significantly predictive of global readiness scores (F (4, 59) = 17.77, $p < 0.01$), the unique contribution of the demographic variables is not statistically significant (t_{Female} = -0.90, p = 0.37; t_{White} = 0.86, p = 0.39). In both models, Academic Understanding factor scores are significantly predictive of global readiness scores, but

Social Understanding scores are not. A score increase of 0.74 on the Academic Understanding factor is associated with an increase of one point on the global readiness item when not accounting for demographics ($t = 5.53$, $p < 0.01$).

Table 7

Factor Scores' Prediction of Global School Readiness

Predictor	r^2	F	p	β	SE (β)	t	p
Model 1							
Intercept	0.52	35.55 (2, 66)	<0.001***	6.29	0.09	72.11	< 0.001***
Academic Understanding Factor Score				0.74	0.13	5.53	<0.001***
Social Interactions Factor Score				0.06	0.08	0.70	0.48
Model 2							
Intercept	0.55	17.77 (4, 59)	<0.001***	6.25	0.16	40.21	< 0.001***
Academic Understanding Factor Score				0.76	0.13	5.69	<0.001***
Social Interactions Factor Score				0.08	0.07	1.12	0.27
Female				-0.19	0.21	-0.90	0.37
White				0.18	0.21	0.86	0.39

*$p < 0.05$, **$p < 0.01$, ***$p < 0.001$

Question 3: How do Outcomes on the TSRS Relate to Scores on Standardized Measures of Readiness-Predictive Constructs?

Overview of Analysis. A unique contribution of the present study is the use of both rating scales and performance measures to better understand how the constructs associated with school readiness relate to teacher perceptions of readiness. The third research question of the present study explored how outcomes on the TSRS related to scores on standardized measures of school readiness-predictive-constructs. In other words, what are the relations between teacher-rated school readiness and measures of readiness-predictive-constructs? This was done using Pearson's correlations and multiple linear regression. Analyses for question three first reduced standardized measures into four composites and a fifth variable representing academic achievement (which, for simplicity, is referred to as a fifth composite). Bivariate correlations were then used to assess the relations between each composite, TSRS factor scores, TSRS total scores, and the TSRS global readiness item. Multiple linear regressions were utilized to determine whether the combination of demographic variables and standardized measures used in this study were predictive of global and total readiness as perceived by children's kindergarten teachers.

First, the standardized measures of readiness-predictive-constructs were reduced into five composites comprised of scaled, standard, or t-scores for the following: 1) a performance measure of academic achievement, 2) performance measures of social-emotional skills, 3) a rating scale of social-emotional skills, 3) performance measures of executive functioning, and 4) a rating scale of executive functioning. Details regarding what measures and scores are included in each composite are outlined in Table 8 below.

Rating scales and performance measures were separated into two composites because of research findings that rating scales and performance measures often have weak correlations, even when measuring the same construct (Toplak et al., 2013).

Second, the correlation between each composite and the TSRS factor scores was calculated to understand how children's performance on measures of readiness-predictive-constructs relates to the skills they demonstrate in the classroom, as measured with the TSRS factor scores. Specific hypotheses could not be formed because it was not known a priori what factors would emerge on the TSRS. It was generally hypothesized that TSRS factors would correlate positively and weakly to moderately with the standardized measures of similar constructs.

Third, the correlations between each composite, the TSRS global rating, and TSRS total scores were calculated to understand how children's performance on measures of readiness-predictive-constructs relates to teachers' perceptions of their school readiness. Given that the research reviewed above has found that academic achievement, executive functioning, and social-emotional functioning (as assessed through both performance measures and rating scales) all positively predict school readiness-related-outcomes, it was hypothesized that each individual variable X_1 through X_5 would be significantly and positively correlated with teachers' global and total readiness ratings (Y).

It was expected that the summative effects of all composites would yield a more accurate prediction of school readiness than analysis of the relation between school readiness and any single composite. The analyses completed to address research question three examined the extent to which the combination of all composites and measured

demographic variables predicted overall school readiness as perceived by children's kindergarten teachers. One regression measured prediction of TSRS global readiness item scores and a second regression measured prediction of TSRS total scores. The relationship between TSRS global/total readiness scores (Y), academic achievement, executive functioning, and social-emotional skills (X_1 through X_5), and demographic variables (*Female* and *White*) is represented by the equation:

$$Y = \alpha + \beta_1(X_1) + \beta_2(X_2) + \beta_3(X_3) + \beta_4(X_4) + \beta_5(X_5) + \beta_6(Female) + \beta_7(White)$$

Composites were entered into the above model first in order to assess the predictive value of these composites alone. Demographic variables were then added to the model and an F-change statistic was used to determine if the demographic variables were significantly predictive of overall school readiness beyond what was predicted by the standardized measures. It was expected that the performance measures and rating scales used in this study, together with the demographic variables of gender and race, would significantly predict both total and global school readiness scores. It is important to note that the measured effect independent variables may have on TSRS total and global readiness scores can differ when the variable is analyzed in isolation (as assessed in the preceding correlations) versus in the multiple regression equation because two independent variables may have a degree of multicollinearity.

Creation of Composites. The standardized measures of readiness-predictive-constructs were reduced into five composites, comprised of scaled, standard, or t-scores (detailed below) for 1) a performance measure of academic achievement, 2) performance measures of social-emotional skills, 3) a rating scale of social-emotional skills, 4)

performance measures of executive functioning, and 5) a rating scale of executive functioning. Rating scales and performance measures were separated into two composites because of research findings that rating scales and performance measures often have weak correlations, even when measuring the same construct (Toplak et al., 2013). Therefore, the composite variables that were used to answer research question three are as follows:

X_1 = Academic Achievement, defined by each student's WPPSI-III Vocabulary scaled score

X_2 = Social Emotional Performance, defined as the sum of NEPSY-II Affect Recognition and NEPSY-II Theory of Mind scaled scores for each student

X_3 = Social Emotional Rating Scale, defined as the SSIS-T Social Skills Index standard score for each student

X_4 = Executive Functioning Performance, defined as the sum of the NEPSY-II Inhibition, Statue, and Auditory Attention (combined) scaled scores for each student

X_5 = Executive Functioning Rating Scale, defined as the BRIEF-T Global Executive Composite t-scores for each student.

Composite descriptive statistics. The composites were all normally distributed, though three of the five have outliers. The academic achievement composite was normally distributed, with skew and kurtosis both of -0.11. The social emotional performance composite was normally distributed, with a skew of -1.02. However, kurtosis was 2.52, which is outside of the acceptable range of negative two to positive

two (Garson, 2012). This kurtosis indicates that there is a sub-optimal level of variability in the social emotional performance composite data, with too few data points in the tails. The social emotional rating scale composite was normally distributed, with a skew of 0.15 and kurtosis of -0.38. The executive functioning performance composite was normally distributed, with a skew of -0.54 and kurtosis -0.10. The executive functioning rating scale composite was normally distributed, with a skew of -1.1 and kurtosis 0.83. Additional descriptive information can be found in Table 8.

Table 8

Descriptive Characteristics of the Composites

Composite and Comprising Measures	Score Type	n	M	SD	Minimum	Maximum	Skew
Academic Achievement WPPSI-III Vocabulary	Scaled	68	12.06	2.21	6	17	-0.11
Social-Emotional Performance NEPSY-II Affect Recognition NEPSY-II Theory of Mind	Sum of scaled scores	64	21.61	3.83	7	29	-1.02
Social-Emotional Rating Scale SSIS Social Skills Index	T-score	63	101.33	10.59	77	126	0.15
Executive Functioning Performance NEPSY-II Inhibition NEPSY-II Statue NEPSY-II Auditory Attention	Sum of scaled scores	66	29.48	6.70	11	42	-0.54
Executive Functioning Rating Scale BRIEF GEC	T-score*	60	38.1	10.87	1	51	-1.1

**Executive Functioning Rating Scale scores were recoded so higher scores would characterize greater skill level, consistent with other composite measures*

Outliers. Three of the five composites had apparent outliers; however, no child was an outlier for more than one predictor. These outliers are believed to represent true variation in children's abilities and are a meaningful aspect of the data given that prior analyses did not find any of the children included in these analyses to be extreme outliers across measures. The social emotional performance composite had a singular outlier with a score more than four standard deviations below the mean, the executive functioning performance composite had an outlier with a score about 2.5 standard deviations below the mean, and the executive functioning rating scale composite had one outlier, with a score more than three standard deviations below the mean.

Assumption Testing. There are four core assumptions of multiple linear regression: linearity, normality of errors, independence of observations, and homoscedasticity.

Linearity. The assumption of linearity was not met according to visual inspection of graphical plots of the linear relations between each composite, TSRS global readiness scores, and TSRS total scores. Four of the five composites did not have linear relations with TSRS global readiness scores, and the executive functioning performance composite had a weak linear relationship with global readiness. Three of the five composites did have linear relations with total readiness scores: social emotional rating scale composite, executive functioning rating scale composite, and executive functioning performance composite.

Normality of errors. The residuals from multiple regressions using TSRS global and total scores were examined using graphical and Shapiro-Wilk tests in order to assess

the assumption of normality. Both graphical and Shapiro-Wilk tests revealed that the residuals were not normally distributed ($p < .05$); however, the sample size used in the present study is likely sufficiently large for t-tests and F-tests to be appropriate despite the non-normality (Wooldridge, 2008).

Independence of observations. An assumption of multiple regression analysis is that observations are independent of one another. One potential violation of this assumption could result from teacher-specific rating effects, as teachers' ratings of one child may be impacted by behavior or opinions of other children even though teachers are told to rate each child independently. Differences in scores due to teacher opinion (within- and between-child effects) were calculated in preceding analyses and found to be nonsignificant. The sample for the present study is semi-random as schools, parents, and children opt-in to participate.

Homoscedasticity. The homoscedasticity assumption is that the variance of the error term is constant across all values of the independent variables in the regression model. This assumption was not met. The homoscedasticity assumption was tested graphically via plots of the residuals in the regression model against the independent variables. Graphical plots revealed a cone-shaped pattern indicative of heteroscedasticity. The presence of heteroscedasticity was confirmed via the Breusch-Pagan test (Wooldridge, 2008). The violation of the assumption of homoscedasticity is addressed in this study's regression analyses through the use of Welch's t-tests, which are intended for use with samples that have unequal variance and are calculated without pooling the sample variance (White, 1980).

Correlations of Composites to Other Variables. It was hypothesized that the five composites would significantly and positively correlate with teachers' total and global readiness ratings. Results revealed that three of the five composites demonstrated consistent and significant positive correlations with ratings on the TSRS. The social-emotional rating scale, executive functioning performance measure, and executive functioning rating scale composites were all significantly correlated with TSRS total scores and scores on one or both of the TSRS's factors at the $p < 0.05$ level (Table 9). However, no composites were significantly correlated with TSRS global item scores.

Social-emotional rating scale composite scores had correlations of 0.29 with Academic Understanding factor scores ($p < 0.05$), 0.57 with Social Interaction factor scores ($p < 0.01$), and 0.53 with TSRS total scores ($p < 0.01$). Social-emotional rating scale composite scores were also significantly correlated with social-emotional performance measure composite scores ($r = 0.36$, $p < 0.01$). Executive functioning performance measure composite scores had correlations of 0.27 with Academic Understanding factor scores and 0.28 with TSRS total scores, both significant at the $p < 0.05$ level. Executive functioning rating scale composite scores had correlations of 0.32 with Academic Understanding factor scores ($p < 0.05$), 0.58 with Social Interaction factor scores ($p < 0.01$), and 0.59 with TSRS total scores ($p < 0.01$). Executive functioning rating scale composite scores were *not* significantly correlated with executive functioning performance measure composite scores ($r = 0.24$, $p = 0.07$) and scores on performance measure composites were also not significantly correlated with corresponding TSRS factors. The Academic Performance composite was not significantly correlated with scores on the TSRS Academic Understanding factor ($r = 0.13$, $p = 0.28$) and scores on the

social-emotional performance measure composite were not significantly correlated with scores on the TSRS Social Interactions factor ($r = 0.02$, $p = 0.89$). The low correlation coefficient between executive functioning rating scores and performance measure composite scores, as well as between performance measure and factor scores, highlights the possibility that performance measures used in school readiness research may not be representative of children's behaviors in the classroom.

Table 9

Correlations of TSRS Scores and Composites

Variable	Academic Understanding Factor	Social Interaction Factor	TSRS Global Item Score	TSRS Total Score	Academic Performance Composite	Social-Emotional Performance Composite	Social-Emotional Rating Scale Composite	Executive Functioning Performance Composite	Executive Functioning Rating Scale Composite
Academic Understanding Factor	1	0.32**	0.72**	0.83**	0.13	0.13	0.29*	0.27*	0.32*
Social Interaction Factor		1	0.28*	0.78**	-0.07	0.02	0.57**	0.16	0.58**
TSRS Global Item Score			1	0.63**	-0.04	-0.06	0.16	0.21	0.24
TSRS Total Score				1	0.05	0.1	0.53**	0.28*	0.59**
Academic Performance Composite					1	0.26*	0.07	0.11	0.01
Social-Emotional Performance Composite						1	0.36**	0.31*	0.11
Social-Emotional Rating Scale Composite							1	0.13	0.59**
Executive Functioning Performance Composite								1	0.24
Executive Functioning Rating Scale Composite									1

*$p < 0.05$, **$p < 0.01$

Regressions. After analysis of bivariate correlations, multiple linear regression was used to examine the extent to which variability in children's scores on composites explained variability in scores on the TSRS. Bivariate correlations indicated that three of the five composites (social-emotional rating scale, executive functioning performance measure, and executive functioning rating scale composites) had strong positive associations with TSRS total scores but only executive functioning rating scale composite scores were significantly and positively associated with global readiness ratings. It was hypothesized that the performance measures and rating scales used in this study, together with the demographic variables of gender and race, would positively and significantly predict both total and global school readiness scores.

Regression of global item ratings. Two regression models assessed the extent to which composites predicted global readiness item ratings on the TSRS. The first model included only composites, while the second included both composites and demographic variables of race and gender. In the composite-only regression, the combination of all five composite scores predicted only 9% of variance in global readiness scores (F (5, 45) = 0.86, p = 0.51). Composites were not significantly predictive of global readiness either individually or collectively.

Adding demographic variables to the regression model did not significantly increase its predictive abilities. The composite scores, race, and gender did not significantly predict global readiness scores collectively (r^2 = 0.10, F (7, 39) = 0.62, p = 0.74) or individually. Thus, the hypothesis that the combined effect of composite scores

and demographics would positively and significantly predict global readiness scores was not supported.

Table 10

Composites' Prediction of Global School Readiness

Predictor	r^2	F	p	β	SE (β)	t	p
Model 1	0.09	.86 (5, 45)	0.51				
Intercept				5.20	1.62	3.20	0.003**
Executive Functioning Performance				0.04	0.02	1.51	0.14
Executive Functioning Rating				0.01	0.02	0.61	0.54
Social-Emotional Performance				-0.03	0.05	-0.53	0.60
Social-Emotional Rating				0.01	0.02	0.28	0.78
Academic Performance				-0.03	0.07	-0.48	0.63
Model 2	0.10	0.62 (7, 39)	0.74				
Intercept				5.27	1.89	2.79	0.008**
Executive Functioning Performance				0.04	0.03	1.40	0.17
Executive Functioning Rating				0.01	0.02	0.40	0.69
Social-Emotional Performance				-0.03	0.05	-0.51	0.61
Social-Emotional Rating				0.01	0.02	0.32	0.75
Academic Performance				-0.04	0.08	-0.55	0.58
White				-0.07	0.33	-0.22	0.83
Female				-0.28	0.41	-0.67	0.51

*$p < 0.05$, **$p < 0.01$

Regression of total TSRS ratings. Two regression models assessed the extent to which composites predicted total school readiness, as represented by the sums of item scores on the TSRS. The first model included only composite scores, while the second included both composite scores and demographic variables of race and gender. In the composite-only regression, the combination of all five composite scores predicted 39% of variation in total school readiness scores (F (5, 45) = 5.86, $p < 0.01$), with higher composite scores associated with higher school readiness. However, only the executive functioning rating scale composite (BRIEF GEC Index scores) made a significant unique contribution to the model. A 0.66-point increase in executive functioning rating scale scores predicted a one-point increase in total TSRS scores (t = 2.48, $p < 0.05$). The social-emotional rating scale and performance measures of academic achievement, social-emotional skills, and executive functioning were not individually significantly predictive of total TSRS ratings.

With demographics added to the model, the model remained positively and significantly predictive (F (7, 39) = 4.29, $p < 0.01$). The demographic variables explained an additional 4% of variance in total school readiness scores due to children of minority races and ethnicities scoring an average of 9.01 points higher overall than White children (t = -2.03, $p < 0.05$). Thus, the hypothesis that the combined effect of composite scores and demographics would positively and significantly predict total readiness scores was supported.

Table 11

Composites' Prediction of Total School Readiness

Predictor	r^2	F	p	β	SE (β)	t	p
Model 1	0.39	5.86 (5, 45)	<0.001***				
Intercept				101.00	23.10	4.37	<0.001***
Executive Functioning Performance				0.48	0.34	1.40	0.17
Executive Functioning Rating				0.66	0.27	2.48	0.02*
Social-Emotional Performance				0.09	0.68	0.13	0.89
Social-Emotional Rating				0.35	0.28	1.22	0.23
Academic Performance				0.12	1.03	0.11	0.91
Model 2	0.43	4.29 (7, 39)	0.001**				
Intercept				118.31	25.37	4.66	<0.001***
Executive Functioning Performance				0.60	0.35	1.69	0.09
Executive Functioning Rating				0.75	0.31	2.39	0.02*
Social-Emotional Performance				-0.05	0.69	-0.08	0.94
Social-Emotional Rating				0.21	0.32	0.64	0.53
Academic Performance				-0.13	1.08	-0.12	0.91
White				-9.01	4.43	-2.03	0.048*
Female				-0.21	5.54	-0.04	0.97

*$p < 0.05$, **$p < 0.01$, ***$p < 0.001$

Chapter 5: Discussion

Over the past sixty years, educational researchers and policymakers have exerted efforts to improve the school readiness of students across America in hopes that doing so will raise educational attainment and the nation's position in the globally-competitive economic and scientific landscape (Powell, 2007). A review of research found no universal definition of school readiness, but trends describing it as a child's preparedness to engage in and learn from formally taught material in a classroom environment (Abenavoli et al., 2007; Graue, 1993; Quirk et al., 2005). Research on school readiness traditionally uses discrete, standardized performance tasks, such as academic achievement tests, which measure constructs predictive of school readiness rather than directly measuring readiness itself. Children's performance on these measures are then regressed to predict readiness-related-outcomes, such as graduation rates or career attainment. These methodologies make assumptions about what school readiness entails, often without ever directly observing children in their classroom environments or asking teachers, "Was this child prepared to engage and learn in your classroom?" The assumption is that children who score higher on measures of readiness-predictive-constructs, including academic, executive functioning, social-emotional, and motor skills, will be more school ready. The present study tested this assumption, examining how well children's scores on performance measures and rating scales of readiness-related-constructs predicted teachers' ratings of children's school readiness on a new measure, the Teacher School Readiness Scale (TSRS).

Factors of the TSRS

The TSRS is a teacher-completed rating scale inquiring about 30 discrete academic, motor, social-emotional, and executive functioning skills children use in their everyday school activities, as well as teachers' perceptions of children's global readiness for the upcoming grade. For the present study, overall school readiness was measured in two ways. First overall school readiness was measured through the global readiness item on the TSRS, which asked teachers to rate the statement "Overall, this child is ready for the next grade" on a seven-point scale from "definitely no" to "definitely yes." This item allows for the possibility that there are considerations teachers weigh in their decisions of whether or not children are school ready that were *not* measured by the 30 TSRS skill items. Overall school readiness was also measured through total scores, which were sums of the ratings children received on the TSRS's 30 discrete skill items. Total scores have greater variance than global scores, with a range from 133 to 210 (rather than 2 to 7), allowing for more sensitivity when conducting statistical analyses.

This is the first study in which the TSRS has been used. Therefore, in order to conduct analyses of the relations between children's scores on measures of readiness-predictive-constructs and their teachers' direct ratings of their school readiness, the present study first examined the structure of the TSRS itself. Exploratory factor analysis found items on the scale divided into two factors, with eight items dropping from analysis due to double loading and one due to poor conceptual fit. Though it was hypothesized that factors would emerge emphasizing social-emotional and executive functioning skills, exploratory factor analysis instead grouped items into factors of Academic Understanding

and Social Interactions. Executive functioning skills such as children's attention to tasks, active listening, and organization of materials loaded onto both factors.

The Social Interactions factor included items addressing prosocial skills, behavioral control, and communication, with the highest-loading items addressing prosocial skills such as sharing and turn-taking. This finding aligns with that of Lin et al.'s 2003 survey of kindergarten teachers, which found "takes turns/shares" to be rated as one of the most essential skills for school readiness. The Social Interactions factor correlated moderately with TSRS global item ratings ($r = 0.28$, $p < 0.05$), with correlations between individual items and global item ratings being weak to moderate ($r = 0.16 - 0.40$).

Initially, academic skills were not expected to be a primary factor at all but rather subsumed under other factors measuring social-emotional and executive functioning skills. Instead, academic skills combined into an Academic Understanding factor which correlated strongly with TSRS global item ratings ($r = 0.72$, $p < 0.01$). Individual items on the Academic Understanding factor had the strongest correlations with TSRS global scores ($r = 0.26 - 0.78$) of any items on the TSRS. Though the Academic Understanding factor had stronger correlations with TSRS global scores than did the Social Interactions factor, both factors had roughly equal contribution to the factor model, with the Academic Understanding factor explaining 26% of variation in item responses and the Social Interactions factor explaining 24% of variance.

In analysis of the factor loadings on the Academic Understanding factor, it was apparent that the highest loaded items were those which measured children's acquisition and demonstration of academic content, rather than those measuring their knowledge of

discrete facts and skills. High-loaded items on the academic factor measured children's ability to "[comprehend] the meaning of what [they hear] or [read] to benefit from grade level instruction" (Academic Understanding factor loading $r = 0.90$) and "get meaning from context when [they encounter] unknown words" (Academic Understanding factor loading $r = 0.87$). These individual items also correlated strongly with TSRS global scores, suggesting academic acquisition skills such as listening and reading comprehension, may be key to children's overall school readiness. This is because children cannot demonstrate proficiency in specific academic skills, such as addition, without first being able to attend to the teacher's instruction on the subject, understand what is being taught, and apply their knowledge on assignments. Academic Understanding and the ease with which students acquire academic skills was not addressed in reviewed research and may be indicated for further study.

Academic Understanding may relate to learning engagement, meaning children's interest in and enthusiasm for learning (Abenavoli et al., 2017; Denham et al., 2014; Linder et al., 2013). Learning engagement is surprisingly under-studied. In a review of literature, no studies examined learning engagement exclusively, and only a few included it as a variable at all. On the TSRS, items such as "demonstrates curiosity" and "shows enthusiasm for learning" tapped into learning engagement as a component to academic understanding. Children who understand what they are learning are often more engaged, and those who are engaged may be likely to learn more. Given that there are no performance measures or rating scales dedicated to learning engagement, the construct could not be examined in depth in the present study; however, future research may study

the relations between learning engagement, academic understanding, achievement, and school readiness.

Factors' Prediction of Global School Readiness. After identifying the factors of the TSRS, the research went on to explore the relations between factors and teachers' ratings of overall school readiness as measured through global and total readiness scores. Correlations between the factors, total, and global readiness scores ranged from moderate to strong, as described above. Multiple linear regression was used to examine the extent to which the combined value of the two factor scores and demographic variables of race and gender would significantly predict global school readiness scores. Regressions of factors' relation to total readiness scores were not conducted, as factor scores are a subset of total scores. Regressions revealed factor scores and demographics significantly predicted global school readiness scores. Academic Understanding factor scores made unique significant contributions to this model ($p < 0.001$). Though the unique contribution of Academic Understanding was contrary to initial hypothesis, it is logical in light of the difference in strength between Academic Understanding and Social Interactions factor scores' correlations with global readiness scores ($r = 0.72$ and $r = 0.28$ respectively). The unique contribution of Academic Understanding factor scores in predicting global school readiness suggests academic engagement and knowledge acquisition are essential features of school readiness requiring further investigation. Together, the two factor scores and demographics accounted for 55% of variation in TSRS global scores. Post-hoc analysis was conducted to understand whether items which did not load onto the two factors may explain additional variation in global readiness scores.

Post-Hoc Analysis. When the TSRS factor structure was created, 30% of items were dropped from analysis. Though one item was dropped due to poor conceptual fit, most were dropped because they loaded onto both factors that emerged. The theory behind removing double-loaded items from analysis is that they do not reflect a clear construct; if they did, the items would group together as a factor. However, in the present study, double-loaded items almost exclusively represented executive functioning skills which are important in both academic and social domains, such as children's ability to "[listen] actively," "attend to a task/activity as required," and "[communicate] with adults effectively." The present study's limited sample size may have prohibited these items from grouping onto a third factor. It could also be that the double-loaded items represent an overarching construct, best represented through a multi-level factor model, estimation of which was not possible given the sample size limitations.

Post-hoc analysis added the seven double-loaded items pertaining to executive functioning skills as seven independent variables in the multiple regression analysis of factor scores on TSRS global item scores in order to assess their added predictive value. A regression was first conducted with factor scores alone, followed by a regression with factor scores and the seven double-loaded items. An F-test found the double-loaded items were jointly significant (F (7, 59) = 3.56, $p < 0.01$) and explained an additional 8.41% of variance in global item scores compared to the two factors alone ($r^2 = 63.41$). The double-loaded items remained jointly significant after demographics were added to the model (F (7, 51) = 3.34, $p < 0.01$). This post-hoc analysis indicates that even when almost all TSRS items are included (motor items still excluded due to poor conceptual fit), 36.59% of variance in global school readiness scores is left unexplained by the TSRS

items. There may be aspects of children's behavior which contribute to global school readiness but are being overlooked by the 30 TSRS items. However, it may also be that future factor analyses with larger and more heterogeneous samples, particularly analyses allowing for a multi-level factor structure and/or greater number of factors, may be able to explain a greater proportion of variance in TSRS global item scores.

Relation of TSRS to Standardized Measures

The assumption underlying most school readiness research is that measures of readiness-predictive-constructs such as academic achievement, social-emotional functioning, and executive functioning are appropriate proxies for school readiness. In a random sample of 20 studies included in the present study's literature review, 60% measured school readiness through the use of readiness-predictive-constructs alone (Abenavoli et al., 2017; Berhenke et al., 2011; Caughy & Owen, 2015; Cavadel & Frye, 2017; Cooper et al., 2011; Davies et al., 2016; Denham et al., 2012; Fitzpatrick et al., 2014; Goble et al., 2016; Graziano & Hart, 2016; Graziano et al., 2015; Guhn et al., 2015; Heller et al., 2012; Matthews et al., 2009; Panlilio et al., 2017; Quirk et al., 2015; Sabol & Pianta, 2012; Son & Peterson, 2017; Son et al., 2013; Stormont et al., 2017), meaning that whether a child was considered school ready was assessed through their academic ability, social skills, or other readiness-predictive constructs rather than a direct and comprehensive assessment of school readiness itself. With the number of factors that have been found to impact school readiness—from vocabulary (Kaplan, 1993; Sabol & Pianta, 2012) to emotion regulation (Denham et al., 2014) to maternal relationship status (Cooper et al., 2011; Davies et al., 2016)—the present study questioned whether

measures of readiness-predictive-constructs could truly capture the complexity of school readiness as a whole. The findings of the present study indicate they cannot.

In order to assess the association between measures of readiness-predictive-constructs and teacher-rated school readiness on the TSRS, the present study gathered standardized performance and rating scale data from eight measures that either have been used in prior school readiness research (see Graziano et al., 2015; Izard et al., 2001) or are similar to those that have been used (see Izard et al., 2001; Son et al., 2013). These measures were then combined into five composite variables: academic achievement performance, social-emotional performance, social-emotional rating scales, executive functioning performance, and executive functioning rating scales. It was hypothesized these five composites would significantly and positively correlate with teachers' ratings of children's global school readiness (as measured by the item, "overall, this child is ready for the next grade") and total school readiness (as measured by the sum of scores on the TSRS's 30 skill items). It was further hypothesized that the composites, together with the demographic variables of gender and race, would positively and significantly predict both total and global school readiness scores on the TSRS.

Results of composites' regression on global school readiness scores indicated the five composites could not predict teachers' ratings of students' global school readiness individually, collectively, and with or without accounting for demographic variables. Together, the five composites failed to predict global school readiness, predicting only 9% of variance in global readiness scores collectively ($p = 0.51$) and 10% of variance once demographic variables were added to the model ($p = 0.74$). No single predictor was significant. In part, this may be because global school readiness ratings may have had too

little variance for effects to be observed. However, these marginal results also suggest that children's performance on measures of readiness-predictive-constructs is in fact a very poor predictor of teacher-perceived school readiness.

Results of composites' regression on total school readiness scores found the composites to be significantly predictive of *total* readiness, explaining 39% of variance in scores. The model as a whole was highly significant, indicating that academic achievement, social-emotional measures, and executive functioning measures combined were able to predict total school readiness. This is consistent with reviewed literature indicating school readiness is a multi-faceted construct, with academic, social-emotional, and executive functioning skills comprising some of the many skills necessary for overall readiness. However, only race and teacher-rated executive functioning emerged as unique predictors of total school readiness. It is striking that no performance measures (of any construct), academic achievement, or social-emotional measures were uniquely predictive of either global or total school readiness, despite their frequent use in school readiness research. Why are these readiness-predictive-constructs poor predictors of school readiness when considered in isolation? The answer lies in the differences in methodology.

The Role of Teacher Ratings. Research by Toplak and colleagues (2013) has found performance measures and rating scales of the same construct rarely have statistically significant correlations. In a meta-analysis of 286 correlations conducted between executive functioning rating scales and performance measures, only 24% were statistically significant (Toplak et. 2013). The overall median for significant correlations was weak, at 0.19 (Toplak et al., 2013). Results in the present study showed the same, as

the academic achievement performance composite did not correlate significantly with scores on the TSRS Academic Understanding factor, and social-emotional performance task composite showed weak correlation with both the TSRS Social Interactions factor and social-emotional rating scale composite. The explanation behind these differences is that rating scales and performance measures that purport to measure the same construct may not be measuring the same phenomenon at all or may at the very least be measuring different aspects of the phenomenon.

If rating scales and performance measures intended to measure the same construct are not truly capturing the same information, then one must carefully consider what information is sought in order to determine the best methodology for answering a given research question. In the case of school readiness research, studies may all be seeking understanding of what factors impact readiness; however, the lack of a universal definition of school readiness itself has resulted in a hodgepodge of methodologies, each measuring school readiness using a different collection of readiness-predictive-constructs and readiness-related-outcomes. For example, if one considers school readiness to mean a students' performance on high-stakes standardized achievement tests, then it may be logical to use academic achievement performance tasks as a predictive variable. However, the review of literature conducted for the present study found that currently available school readiness research supports a broader definition of readiness, encompassing a child's "preparedness to engage in and learn from formally taught material in a classroom environment." If one considers school readiness to include classroom-based learning and engagement, as posited by the present study's definition,

then it is only logical that the methodology used should attempt to capture students' behavior and skills demonstrate *in the classroom*.

Currently, school readiness studies commonly use performance measures, which capture children's behaviors in one-on-one interactions with novel people (researchers) while doing novel and highly structured tasks. This environment is far from what children experience in the classroom, where they must get along with a dozen or more other peers, learn in a group environment while ignoring distractions from others, follow routines from memory or with minimal reminders, and complete activities independently. It is unsurprising then that the skills children are able to demonstrate during standardized performance tasks may not align well with skills they can demonstrate in the classroom.

Teacher-completed rating scales provide unique insight into children's classroom behaviors, not only because the teachers observe the students in the classroom environment, but also because teachers are able to integrate a holistic understanding of students into their ratings. Their ratings can account for how children's behavior is impacted by the simultaneous demands experienced in the classroom (getting along with peers, ignoring distractions, following routines, completing independent work, etc.), whereas no single performance measure can account for all these factors at once, and even a combination of performance measures may be a poor approximation. Additionally, a teacher may notice variations in a child's behavior, such as how they act in the morning vs. afternoon, on days when a parent is away on business, or when they're feeling ill. These variations would likely be considered when rating the child's behavior, whereas a performance task completed at a single point in time is unable to account for any such variation. Finally, teacher-completed ratings of school readiness may even

account for variables which researchers have not thought to consider, as is apparent in the variation in TSRS global and total readiness scores that was left unaccounted for by either composites or TSRS skill items.

Though many studies measure school readiness using performance measures alone, no one performance measure composite in the present study was predictive of school readiness as measured by global, total, or factor TSRS scores. Based on Toplak et al.'s (2013) findings, it is likely that these performance measures are not adequately capturing school readiness as interpreted by students' teachers. Only a teacher-completed rating scale of executive functioning was able to uniquely predict overall school readiness (as measured through TSRS total scores). These findings indicate that studies using performance measures alone as proxies for school readiness are likely missing key information about the readiness skills children demonstrate in the classroom. In order to gain the most accurate information about students' demonstrated school readiness in the classroom, it is essential for research to incorporate information from students' teachers.

The Role of Executive Functioning. In addition to performance measures being nonsignificant in their ability to uniquely predict global or total TSRS scores, no academic achievement or social-emotional measure was uniquely predictive of TSRS scores. Only the executive functioning rating scale composite, comprised of scores on the BRIEF teacher report, were uniquely and significantly predictive of overall school readiness, as measured through total TSRS scores. Executive functioning performance composite scores approached significance ($p = 0.09$). This finding aligns with results from Graziano et al. (2015), who found teacher-rated BRIEF scores predicted school

readiness as measured by the teacher-rated Kindergarten Behavior and Academic Competency Scale (KBACS).

The fact that executive functioning rating scale composite scores were significantly uniquely predictive of TSRS total scores, while other composites were not, suggests that measures of academic achievement and social-emotional functioning may not be the best predictors of school readiness, despite their frequent use in school readiness research. Results coincide with previous research findings that executive functioning is essential to school readiness because it facilitates learning in a classroom setting (see Boyd et al., 2005; Denham et al., 2014) and is seen by teachers as more important to overall school readiness than is academic ability (Lin et al., 2003). In addition to Graziano et al.'s (2015) findings that teacher-rated broad executive functioning predicts teacher-rated school readiness scores, a later study by Graziano et al. (2016) found children's performance on a working memory task predicted teacher-rated school readiness. Other studies found performance on measures of academic achievement are predicted by teacher-rated attention and behavior regulation (Matthews et al., 2009; Sims & Lonigan, 2013) and performance measures of attention and working memory (Graziano et al., 2016; Sims & Lonigan, 2013). These executive functioning skills of attention, behavior regulation, and working memory are all essential to regulating oneself in the classroom and learning new academic material.

These regression findings shed additional light onto the factor analysis. A factor representing executive functioning skills may not have emerged on the TSRS because executive functioning is so closely tied to school readiness that it is embedded into teachers' judgments of readiness across domains and may even be embedded into

children's skill acquisition itself. For example, children's ratings on the TSRS Academic Understanding item "Can write words, or sentences at a level that permits him/her to complete required tasks" depends not only on their writing ability, but also on their task completion, which is impacted by executive functioning skills of task initiation and self-monitoring. A child's acquisition of writing skills themselves may also be impacted by executive functioning skills that make the child available for learning. Future research is needed to better understand how executive functioning impacts children's acquisition and demonstration of academic skills, as well as teachers' observations of these processes.

The Role of Race. In addition to the executive functioning rating scale composite, the only other significant unique predictor of total school readiness was race. The predictive role of race is noteworthy because it was negatively correlated with TSRS total scores, meaning children of color had higher TSRS total scores than did White children. This finding was contrary to the literature; however, demographics of the current sample may explain this difference. In many studies, people of color also experience low socioeconomic status, low parental educational attainment, high rates of single-parent households, high rates of maternal relationship transitions, and unenriching early childhood educational environments, all of which have been found predictive of lower school readiness (Cooper et al., 2011; NICHD, 2002; Sammons et al., 2003; Son & Peterson, 2017). In the present sample, this was likely not the case as all children attended high-quality kindergartens in wealthy areas. Instead, characteristics of minority families such as parenting style and immigration status may have enhanced school readiness. Research has found that middle-class Black and Latino parents place more emphasis on teaching their young children social competence and self-regulation skills

than do White parents (Barbarin et al., 2008). This emphasis on self-regulation likely improves children's behavior in the classroom relative to similarly privileged White peers, thereby improving teachers' perceptions of school readiness. Additionally, this study was conducted in an area with a high concentration of well-educated immigrants, with approximately 12% of the population being first-generation immigrants from Asia (Montgomery Planning, 2019). Research has found American children of Asian immigrants have higher academic achievement scores, school attendance, and physical health than children of Latino immigrants or non-immigrant White Americans. Additionally, they are enrolled in high-quality preschools at a younger age, have more consistent routines at home, fathers who are more involved in their daily care, and parents who have higher educational attainment and income than children of Latino immigrants or non-immigrant White parents (Han et al., 2012). Together, these factors of parenting style and immigration history may have impacted children of color's school readiness.

Limitations

The sample size and socioeconomic homogeneity of the sample are presented as two limitations of this study. Both may have affected factor analysis results by limiting the number of factors that could emerge and by impacting factor loadings, causing one-third of TSRS items to drop from analysis. Exploratory factor analysis indicated that as many as six factors may be represented on the TSRS; however, a two-factor solution was selected based on results of Horn's Parallel Analysis and reviewed literature on conducting factor analysis with small samples (DeMars, 2016; Lingard & Rowlinson, 2006). Research with a larger and more heterogenous sample may find support for a five-

or six-factor model, which could explain a greater proportion of variance in TSRS global item scores.

This study might also have benefitted from more robust analysis of academic achievement, including a performance measure of math skills and a teacher-completed rating scale of academics, such that measurement of this construct could mirror measurement of social-emotional and executive functioning. It is possible that more robust academic achievement composites may have been able to significantly predict TSRS scores, whereas academic achievement as measured in the present study could not.

Finally, this study and any research employing rating scales may suffer from bias of social desirability, meaning the rater's incentive to project themselves in a positive light. As the raters for this study were kindergarten teachers at costly private schools, they likely felt it was their duty to ensure their students were ready for the next grade and any reports that a student was not ready may reflect poorly on their abilities as a teacher. Because of this, their ratings may have been inflated. This could partially explain the limited variance in TSRS scores, particularly on the global readiness item, and may have impacted correlation and regression results.

Future Directions

The present study calls attention to four directions for future school readiness research. First, the review of literature found no standard definition of school readiness, calling attention to a need for future researchers to establish consensus on a definition in order to allow for greater clarity in interpretation of results and comparisons across studies. The lack of a single common definition has resulted in studies using a wide variety of readiness-predictive-constructs and readiness-related-outcomes to measure

school readiness. As a result, it is difficult to conduct a meta-analysis comparing results across studies. This not only makes it difficult to thoroughly understand the research available, but also presents challenges when trying to apply research findings to policy and practice. Without clear understanding of what constructs are most significantly and consistently impactful on school readiness, it is impossible for policymakers or educators to make informed decisions about how to design programs or allocate resources in a way that will improve students' school readiness (i.e. should they devote more time to teaching children math or prosocial skills? Would direct teaching of executive functioning skills, through games such as "red light, green light" be effective?)

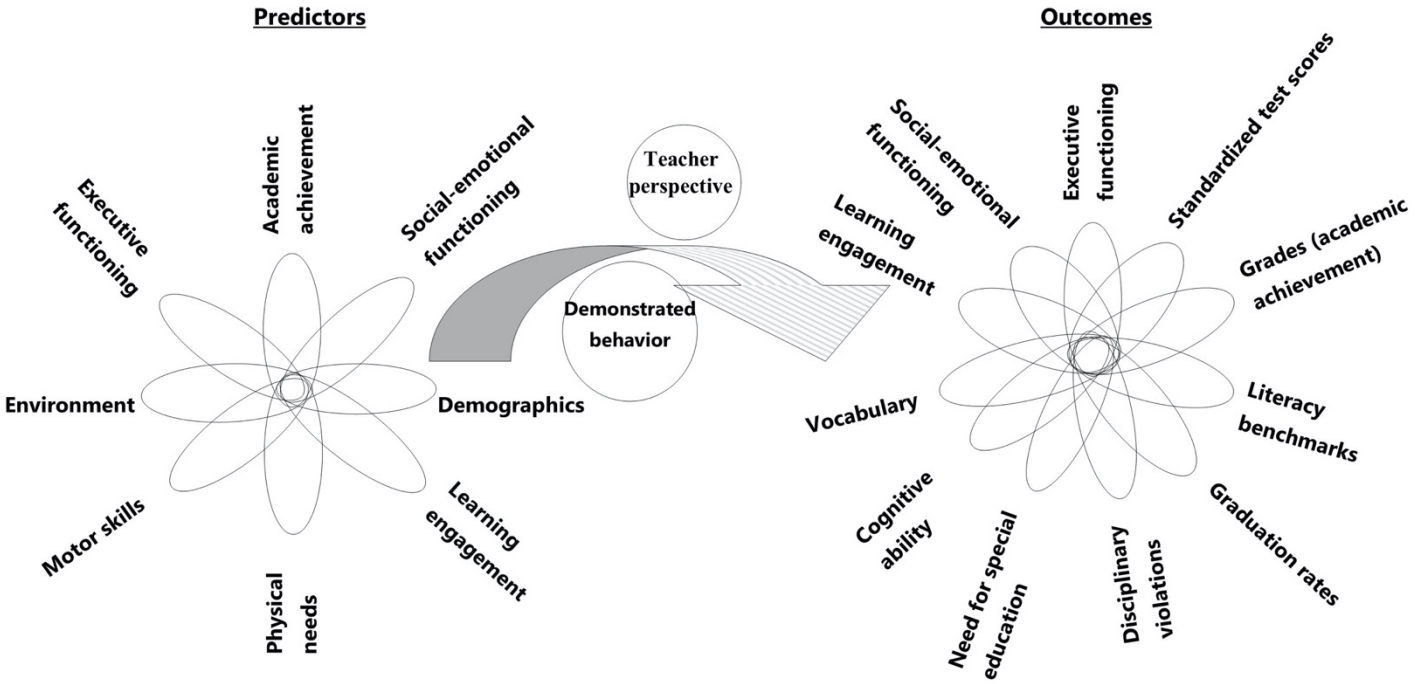
Second, the present study found teacher ratings of executive functioning uniquely predicted ratings of school readiness but social-emotional rating scales and academic achievement, social-emotional, and executive functioning performance measures did not. In addition to suggesting that executive functioning may play a central role in school readiness, these results suggest teacher ratings may be a better indicator of the readiness-related behaviors students demonstrate in the classroom than the performance measures typically used in school readiness research. These results indicate that methodology should be carefully considered when conducting school readiness research and future studies should aim to incorporate teacher perceptions of students' readiness rather than relying on performance measures alone.

Third, the present study offers preliminary support for use of the TSRS as a teacher-completed rating scale of school readiness but suggests additional work to verify the factor structure of the measure using a lager more heterogenous sample is needed before the TSRS can be used in (broader) research or applied contexts. Finally, this study

suggests additional research is needed on learning engagement and academic skill acquisition. Contrary to expectations, the TSRS split into factors of Academic Understanding and Social Interactions. The Academic Understanding factor was characterized by skills needed for students to acquire academic knowledge (i.e. "comprehends the meaning of what he or she hears or reads to benefit from grade level instruction") and demonstrate engagement in learning. Both of these avenues are under-studied in school readiness research and merit further investigation.

Appendix A

Predictors and Outcomes of School Readiness Research



School readiness research selects one or more predictors and examines their relationship to one or more outcomes anywhere from months to years later. In school readiness research, students who perform well on one or more outcome measures are said to be "school ready."

Assessment of both predictors and outcomes is impacted by the student's behavior during the measurement period (i.e. while taking a test, during an observation, over a marking period) and can be impacted by teacher perspective if the measure uses teacher ratings or incorporates teacher decision making (such as in the case of school grades and disciplinary violations).

Appendix B

Table 12

Descriptive Characteristics of the TSRS

	Overall sample				
Measure	Mean	SD	Minimum	Maximum	Skew
TSRS Scores					
1. Interacts well with other children	6.28	0.79	3	7	-1.39
2. Forms new friendships with peers	6.28	0.75	4	7	-0.69
3. Does not get anxious or upset when introduced to a new topic or challenging task	5.28	1.62	1	7	-0.63
4. Can attend to a task/activity as required	5.83	1.2	1	7	-1.48
5. Demonstrates independence, such as initiating and/or completing tasks alone	5.75	1.25	2	7	-1.04
6. Shares materials and space	6.14	0.86	2	7	-2.17
7. Communicates with adults effectively	6.23	0.83	3	7	-1.37
8. Follows directions	6.03	1.01	2	7	-1.14
9. Shows enthusiasm for learning	6.43	0.63	5	7	-0.63
10. Recognizes what is important to remember	5.88	1.19	2	7	-1.26
11. Demonstrates curiosity	6.43	0.67	4	7	-1.04
12. Can write words, or sentences at a level that permits him/her to complete required tasks	5.86	1.22	2	7	-1.23
13. Comprehends the meaning of what he or she hears or reads to benefit from grade level instruction	6.06	0.92	3	7	-1.11
14. Is able to get meaning from context when he/she encounters unknown words	5.83	1.08	2	7	-0.82
15. Has basic math facts and knowledge that is sufficient for the next grade level	6.14	0.99	3	7	-1.45

16. Can understand math concepts needed to learn at this grade level	6.2	0.88	3	7	-1.4
17. Appears to be in good physical health	6.64	0.51	5	7	-0.88
18. Motor coordination is sufficient for carrying out required activities	6.41	1.12	2	7	-2.27
19. Remembers the important points taught during class	6.12	0.85	3	7	-0.78
20. Responds well when redirected with positive feedback	6.17	0.71	5	7	-0.25
21. Knows what materials or clothing to bring when making routine transitions (e.g., moving to the library or going to recess)	6.17	0.73	4	7	-0.72
22. Organizes materials and belongings (putting things away)	5.86	0.93	3	7	-1.13
23. Listens actively	5.75	1.17	1	7	-1.54
24. Willing to try new activities	6.13	0.8	3	7	-1.24
25. Able to tell coherently about an experience (such as what happened earlier on the playground).	6.23	0.75	3	7	-1.22
26. Considers the interests and needs of others in social interactions	5.81	1.17	1	7	-1.77
27. Expresses needs appropriately	5.8	1.07	2	7	-1.25
28. Takes turns appropriately	6.01	1.01	2	7	-1.48
29. Adjusts behavior to the context (transition between recess to class)	6.07	0.85	3	7	-1.28
30. Can handle negative feedback	5.25	1.57	1	7	-0.83
Global (31. Overall, this child is ready for the next grade)	6.29	1.03	2	7	-1.95
Total (sum of 1-30)	181.08	17.97	133	210	-0.18

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