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Predicting Academic Performance on High-Stakes Tests: Development of the Brief Behavior, Academic, and Social Screener (B-BASS)

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I am submitting herewith a dissertation written by Trisha Danielle Franklin entitled "Predicting Academic Performance on High-Stakes Tests: Development of the Brief Behavior, Academic, and Social Screener (B-BASS)." I have examined the final electronic copy of this dissertation for form and content and recommend that it be accepted in partial fulfillment of the requirements for the degree of Doctor of Philosophy, with a major in School Psychology.

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Abstract

In order to develop the Brief Behavior, Academic, and Social Screener (B-BASS), an experimental measure for identifying students at risk for academic underachievement and for predicting performance on high-stakes tests, data were obtained from elementary teachers for 198 third- through fifth-grade rural elementary students in the Southeastern United States. Teachers provided ratings on items within the following global domains: cognitive ability, social/emotional traits, socioeconomic and family characteristics, and executive functions using a brief, practical, contextually appropriate format, one sensitive to local norms. Results reveal strong test-retest correlations (*r* indices > .95) and moderate to high inter-correlations among the items. Based on a multiple linear regression analysis, B-BASS domain scores account for 81.4% and 66.2% of the variance in North Carolina End-of-Grade Tests of English Language Arts/Reading and Mathematics, respectively. These values are impressive given the brief administration time of the B-BASS, approximately 1 minute per student. Based on a stepwise analysis, two items significantly predict English Language Arts/Reading; specifically, Reading Ability ($p < .001$) and Effort ($p < .005$). Predictors of Mathematics in order of magnitude are Math Ability ($p < .001$) and Hyperactivity ($p < .001$). According to discriminant function and ROC curve analyses, B-BASS items also significantly predict proficient vs non-proficient status from the ELA ($p < .001$) and Math ($p < .001$) EOGs, with true positive rates of 93.9% and 85.4%, respectively. B-BASS composites predict 78.5% of variance in ELA EOG scores, with the strongest predictors being Academic Ability ($p < .001$), Social Adaptability ($p < .05$), and Executive Function ($p < .005$). For the EOG Mathematics scores, the strongest composite predictors, in order of magnitude, are: Academic Ability ($p < .001$), Overall Ability ($p < .05$), Home Support ($p < .05$), and Executive Function ($p < .05$); these domain scores predict 66.2% of

the variance. Composites also predict significantly categorical status (proficient vs non-proficient) on the ELA ($p < .001$) and Math ($p < .001$) EOGs; classification accuracy was determined to be 92.9% and 91.4%, respectively. Implications of using B-BASS are discussed.

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CHAPTER I

Literature Review

Student performance on grade-level standardized tests is critical for a number of reasons, including teacher accountability (specifically, teachers are evaluated based on their students' growth on these measures) and student outcomes (e.g., grade retention when tests are considered to be "gateway" measures). Thus, these tests are often referred to as "high-stakes" tests. Because performance on these tests is highly important, early identification of students who are at risk for underperformance or failure on these measures is important. Universal screening is one method by which schools attempt to identify students who are at risk and develop interventions to target areas of deficit. While universal screening has grown in popularity during the last decade, there are still barriers to its effectiveness and use. One such barrier is the efficiency of universal screeners. Most universal screeners are domain-specific (i.e., they capture student functioning in a single area, such as behavior or ability). While it is recommended that multi-domain screening strategies be utilized when identifying students in need of intervention, it is not yet resolved whether information from each domain (e.g., social/emotional, behavioral, external factors) adds significantly to the prediction equation (Eklund, Renshaw, Dowdy, Jimerson, Hart, Jones, & Earhart, 2009). Many of these screeners, although designed to be efficient, contain several items per student per domain and place demands on teacher and/or student time. There is a need for screeners that are more efficient yet strongly predictive of outcomes. The current study is designed to develop and evaluate the psychometric properties of a unique method of multi-ability screening that places minimal demands on teacher time: a one-minute screener capable of predicting academic at-risk status using multiple relevant educational and social domains.

Universal Screening

Universal screening is considered an essential component of a comprehensive assessment system (Salvia, Ysseldyke, & Witmer, 2009), and is typically conducted early in the school year. Universal screening requires collection of data from all students from a designated population, with the intention of providing equal opportunity for early identification of risk factors related to academic underachievement (Dowdy, Kamphaus, Twyford, & Dever, 2014). "Risk" is a term that is generally associated with negative outcomes, including academic failure or emotional or behavioral problems (McWhirter, 1993, cited in Glover & Albers, 2007). In the school environment, at-risk status may be most often associated with academic underachievement, including underperformance or failure on grade-level high stakes tests. According to Barriga, Doran, Newell, Morrison, Barbetti, and Robbins (2002), "academic underachievement" is performance that is below the level that would be expected for one's chronological age.

A significant number of children are either at risk for or are currently experiencing academic, behavioral, or emotional difficulties, and the ability to identify these children at an early age allows for delivery of early intervention services (Albers, Glover, & Kratochwill, 2007). The most effective delivery of those services is dependent on an identification process that accurately selects students at risk (Hosp & Ardoin, 2008). Thus, intervention services may address problems before they become deep-seated and less responsive to treatment (Cook, Volpe, & Livanis, 2010). This screening process should take place within existing systems, including preschools, childcare centers, and other educational settings (Albers, Glover, & Kratchowill, 2007).

Considerations for Screening Instruments

Correct identification of students who are considered to have increased risk for negative outcomes, and are thus in need of specialized interventions, requires use of screening tools that are "contextually appropriate, technically sound, and usable" (Glover & Albers, 2007). These measures should be efficient in terms of administration, and should yield results that provide information regarding students' needs in particular areas (Hosp, Hosp, & Dole, 2011).

When considering the contextual appropriateness of a screening instrument, Glover and Albers (2007) identified several important factors. These factors include compatibility with local service needs, alignment with constructs of interest, theoretical and empirical support, and population fit. Universal screeners are not useful unless they can reliably and accurately predict performance or behavior in the population of interest; further, while national norms are often used for screeners, local norms are more representative of the specific individuals being assessed and thus, can allow for more accurate participant selection and meaningful local interventions (Shinn, 1989; Stewart & Kaminiski, 2002, as cited in Glover & Albers, 2007).

Usability, or "user-friendliness," is an extremely important factor when evaluating the utility of a screening instrument. Even if an instrument is "appropriate and technically sound," it may not be selected for use if it is considered impractical. In particular, screeners should not overburden teachers or other examiners in terms of time, cost, or ease of administration (Glover & Albers, 2007).

Beyond basic psychometric integrity (i.e., reliability), predictive validity is the most important characteristic of a screening instrument. Effective instruments should identify those who will and will not have difficulties in the domain that is targeted by the screener, such as academic performance or social/emotional outcomes (Glover & Albers, 2007). According to the

literature, many student characteristics are associated with important student outcomes at school (Cook, Volpe, & Livanis, 2010), including cognitive ability, social/emotional/behavioral capabilities, and family and community factors. As each of these factors contributes to student performance, inclusion of these multiple factors in a screening instrument should serve to increase the predictive power of that instrument.

Teachers as Primary Informants

General education teachers are the catalyst through which most students are typically identified as "at risk" and in need of services for academic, social/emotional or behavioral services, and are extremely valuable sources of information (Eklund et al., 2009). Although the screening process often utilizes multiple informants, including parents, teachers, and students themselves as appropriate, teachers have been shown to be the most reliable informants, and teacher judgment has long been utilized as part of a comprehensive assessment process (Elliot, Huai, & Roach, 2007). This finding should not come as a surprise. After all, students spend most of their time in an educational setting interacting with their teachers, who are then able to use information observed in the classroom to draw conclusions based on patterns of performance over time (Gresham, Reschly, & Carey, 1987). McCallum and Bracken (2012) reviewed the literature and identified several reasons that teacher ratings are considered valuable: first, teachers are experienced professionals who can base their ratings on daily observations of the individual being evaluated; second, these ratings specifically represent the performance of this individual in comparison to his or her same-age peers; and third, teacher ratings are sensitive to local norms.

Support in the literature for using teachers as informants is based primarily on their ability to predict a variety of important school-related outcomes. For example, according to

Cullen and Shaw (2000) teachers can accurately predict their students' performance on standardized tests. Hoge and Coladarci (1989) explored a variety of achievement outcomes through a meta-analysis assessing the accuracy of teacher judgments as predictors of achievement. They examined 16 studies, and overall, found strong correlations between teacher judgments and a variety of objective measures of achievement. Further, although there is evidence to support the conclusion that extraneous factors (e.g., student demographic characteristics, teacher stress level) have some impact on teacher judgment, teacher reports do appear to be based on observation of actual behaviors (Elliott, Huai, & Roach, 2007). In fact, Elliott et al. recommend that teacher judgments be included as a component of comprehensive screening instruments, based on the accuracy of teacher perspectives and the efficiency and cost-effectiveness of gathering information from teachers regarding both social-emotional and academic factors. Teachers can predict other important outcomes as well. For example, when assessing parental involvement, teacher ratings showed higher correlations with achievement than student ratings or parent self-ratings of parental involvement (Reynolds, 1992). Gresham et al. (1997) provided additional evidence of the accuracy of teacher judgement. Teachers correctly identified 91% of referred students as having a learning disability, 100% of students with a low IQ, and 95% of students with poor achievement. Thus, teachers have been shown to be reliable informants across domains when providing information about student characteristics; characteristics that impact student performance are detailed below.

Screening Multiple Domains

Multiple student characteristics are predictive of academic performance, though some are more powerful than others. Broadly, those domains include academic and cognitive ability, social/emotional or affective characteristics, executive functions, and outside-of-school factors.

Cognitive and Academic Ability

Cognitive ability, a term often used interchangeably with the term "general intelligence" or *g*, accounts for more variance than any other factor when predicting student achievement, *other* than like-named academic test results (e.g., the results of a reading achievement test predicting performance in reading) (Taub, Floyd, Keith, & McGrew, 2008; Sattler, 1992). Cognitive ability is generally considered to account for about 50% of the variance in academic achievement (Colom & Flores-Medoza, 2007). There is a higher correlation between aptitude and achievement when both variables are specific (Gonzalez-Pienda, Nunez, Gonzalez-Pumariega, Alvarez, Roces, & Garcia, 2002), such as using verbal aptitude to predict reading achievement, rather than a general measure to predict general achievement. Notably, verbal ability is considered the best predictor of overall scholastic achievement (Colom & Flores-Medoza, 2007).

Historically, educators relied only on prediction of student performance based on cognitive ability alone, given the high correlation between cognitive ability and achievement. While cognitive ability is generally regarded as the best predictor of student achievement, accounting for cognitive ability alone during the screening process is problematic for several reasons. One limitation of predictive models that emphasize cognitive ability alone is that while scores from cognitive tests are relatively high in predictive validity, there is limited opportunity for intervention. While these tests can accurately predict achievement, they do not always lead to effective interventions. In any case, it is important not only to identify factors that accurately predict student success, but to also identify those factors that are most amenable to interventions (Schaefer & McDermott, 1999). As cognitive ability accounts for only 50% of the variance in academic achievement, the remaining variance is explained by other factors (Spinath, Spinath,

Harlaar, & Plomin, 2006). The primary goal of education is to improve students' learning and achievement; consequently, identifying student behaviors and characteristics that will improve as a function of targeted intervention is a worthwhile goal, even if the amount of variance in achievement that is accounted for by those factors may be comparably small (Spinath et al., 2006).

Social/Emotional Adaptability

Children's affective or emotional traits are often characterized as the next best predictors of school achievement, second only to cognitive ability (Monette, Bigras, & Guay, 2011), and play a vital role in student success (Hamre & Pianta, 2001). Eklund et al. (2009) suggested that data on emotional and social difficulties be collected in addition to academic data to further identify children at risk. These factors contribute significantly to predictions of achievement even after controlling for cognitive ability (Gumora & Arsenio, 2002), and some researchers believe that social-emotional factors predict achievement as well as cognitive ability (Horn & Packard, 1985). In particular, a number of studies have demonstrated a connection between problem behaviors and academic underachievement (Barriga et al., 2002). For example, Trzesniewsli, Moffitt, Caspi, Taylor, and Maughan (2006) found that children with behavioral problems often have learning difficulties in the areas of reading and writing. Inversely, appropriate behavior in the classroom has been linked to academic success (Lambert & Nicoll, 1977).

Social Skills. According to Mashburn and Pianta (2006) relationships with peers and authority figures were important contributors to achievement during the elementary years. Finn and Cox (1992) describe cooperative peer participation as being "central to classroom survival," and students who have positive relationships with other students show better academic

achievement when compared to students without such relationships (Cobb, 1972; Cohen & McKay, 1984; Green, Forehand, Beck, & Vosk, 1980). Students who have poor relationships with peers and teachers have been shown to be at increased risk for academic failure (Wentzel, 1991). Children with well-developed social skills, such as empathy, are more sensitive to the feelings of others and are more skilled at perspective-taking. These skills not only improve interactions with classmates and teachers, but are also useful for reading comprehension, which often requires the reader to make predictions about the actions of characters or to share their perspective (Feshbach & Feshbach, 1987).

Compliance with Rules. Adherence to social rules and expectations, also referred to as social responsibility, has been associated with school performance in several domains (Parker & Asher, 1987; Wentzel, 1996; Wentzel, Weinberger, Ford, & Feldman, 1990). In the classroom, students must follow rules and conform to social expectations, many of which are designed to positively influence academic performance. These rules include expectations for effort, participation, and assignment completion, all of which contribute to learning (Wentzel, 1991). Compliance with these rules has been correlated with academic success (Cobb, 1972). When students can follow classroom rules, teachers are able to devote more time to teaching, rather than behavior management, which also impacts students' learning opportunities because of the ability to use that time for instruction (Wentzel, 1991). In summary, teaching skills related to compliance and rule adherence leads to improvement in academic achievement (Cobb & Hopps, 1973; Hopps & Cobb, 1974).

Effort. Meltzer, Katzir-Cohen, Miller, and Roditi (2001) define effort as "a conscious attempt to achieve a particular goal through persistence over time" (p.86). Natriello and McDill (1986) developed a model of student achievement that shows effort as directly impacting

performance in school; with effort being impacted by variables such as student background, expectation, and performance standards by their peers, teachers, and parents. Using a regression analysis, Meltzer et al. evaluated the effect of seven variables (planning, checking, organization, effort, strategy use, gender, and grade level) on spelling, reading, writing, and math. Of these predictor variables, effort was the strongest in each subject area for students with and without learning disabilities. Similarly, Siegle and Reis (1998) examined the effect of effort on the academic performance of students identified as gifted; effort was a significant predictor of performance among this population as well.

Executive Functions

While behavioral indicators are known to influence academic achievement, the association between academic performance and executive functions is also important, i.e., the extent to which executive functioning predicts academic outcomes. While there is no single definition of the term "executive functioning" that is generally accepted - in their *Handbook of Executive Functioning,* Goldstein and Naglieri (2003) review more than 30 definitions – common elements of most definitions include references to cognitive regulation, impulse control, and goal-directed behavior. Models also vary in the number of functions identified under this term, ranging from four functions to 23 (Goldstein & Naglieri, 2013; McCloskey, Perkins, & Van Divner, 2009); however, present in most models are the constructs of attention, self-regulation/inhibition, and shifting/cognitive flexibility. As noted above, the literature provides evidence of an association between executive functions and academic achievement (Monette, Bigras, & Guay, 2011) and this association is present in middle and late childhood (Best, Miller, & Naglieri, 2011). Longitudinal research indicates that the direction of the effect is such that executive function predicts academic achievement, rather than the reverse. This effect is present

across ages and exists in children with and without learning disabilities (Best, Miller, & Naglieri, 2011). For example, according to Blair and Razza (2007), cognitive processes which comprise executive function contribute to the ability to acquire knowledge that is integral to early reading and math ability in all children. In fact, results of several studies (e.g., Bull & Scerif, 2001; Espy, McDiarmid, Kwik, Stalets, Hamby, & Senn, 2004) support the relations between executive function and early math ability. Further, Clark, Pritchard, and Woodward (2010) found that executive functions predicted math achievement to the same degree as IQ. Because both domains require mastery of complex skills, they likely require individuals to utilize many components of executive function, including inhibition, shifting, and attentional control (Best, Miller, & Naglieri, 2011). Importantly, improvements in performance in both reading and mathematics have been reported when children have received training in strategies related to executive function (Best et al., 2011; Haddad, Garcia, Naglieri, Grimditch, McAndrews, & Eubanks, 2003; Naglieri & Johnson, 2000).

On a related note, executive control mediates the expression of aggression, and allows for regulation of displays of emotional dysregulation, a functional relation Monette, Bigras, and Guay (2007) refers to as "top-down." They state that children with poor executive control may give in to frustration and expressions of anger when facing challenging learning material, rather than working through the problem. Eisenberg and Fabes (1992) also state that a portion of the connection between students' emotional regulation and social interactions depends on their ability to self-regulate their emotions (particularly their negative emotions). Finally, executive/cognitive processes that mediate behavior and are associated with academic achievement are critical for determining successful interventions (Normandeau & Guay, 1998).

Self-Regulation. The ability to accurately define and measure self-regulation contributes to the understanding of the strategies children employ in a school setting (Blair & Razza, 2007). According to some experts, self-regulation refers to "inhibition," and is defined as the ability to withhold prepotent behavioral and cognitive responses (Lan, Legare, Ponitz, Li, & Morrison, 2011). The ability to self-regulate is a precursor to compliance (Blair & Razza, 2007) and is of especial importance during the early years (Kendall, 1993). The ability to demonstrate independent control of impulses and self-regulate one's own behavior is considered an important contributor to student motivation and engagement in school (Rothbart & Jones, 1998). For example, Blair and Razza (2007) found that self-regulation accounted for significant variation in letter and mathematics knowledge among young students; specifically, students' inhibitory control abilities were associated with an increase in both math and reading ability, a finding supported by results from Best et al. (2011). In summary, St. Clair-Thompson & Gathercole's 2009 study found that inhibition and self-regulation was a factor in academic achievement across subject areas, which suggests that these skills can support general learning rather than domain-specific learning and probably overlaps with general intelligence.

Shifting/Flexibility. "Shifting" involves moving between different operations, rules, or mental sets (St. Clair-Thompson & Gathercole, 2009). Researchers have identified shifting between the processing and storage aspects of working memory to be critical in determining performance on mental tasks. As an example, Hooper, Swartz, Wakely, de Kruif, and Montgomery (2002) found a positive association between shifting and writing ability, and Bull, Johnson, & Roy (1999) found a similar positive association between shifting and mathematics. Agostino, Johnson, & Pascal-Leone (2010) found that increased flexibility was correlated with improved reading and writing skills; similarly, Monette, Bigras, and Guay (2011) found that

executive functions, including shifting, are more strongly associated with higher achievement in reading and writing.

Attention and Hyperactivity. The ability to focus on tasks despite distractions is a vital component of executive function (Lan, Legare, Ponitz, Li, & Morrison, 2011), and is a factor in determining school achievement (Alexander, Entwisle, & Dauber, 1993). The ability to sustain attention and focus on a task are "consistent and positive" predictors of academic performance (Wentzel, 1991). For example, teacher reports of behavioral indicators such as activity level and sustained, directed attention have been shown to be related to academic success in elementary school. Students who were described by teachers as being better able to sustain attention and to maintain an activity level that did not exceed that of their typical peers showed higher performance across academic subjects (Martin, Drew, Gaddis, & Moseley, 1988; Normandeau & Guay, 1998); conversely students with inattention have lower academic performance than their peers after controlling for cognitive ability (McKinney, Mason, Perkerson, & Clifford, 1975; Swift & Spovack, 1969). In a study across two countries (the Unites States and Brazil), attention was shown to predict achievement in multiple domains and was an especially strong predictor of reading skills (Lan et al., 2011) and math skills for students in the U.S. (Dobbs, Doctoroff, Fisher, & Arnold, 2006).

Home Support

Socioeconomic Status. The literature contains several studies that focus on the influence of outside-of-school factors on school achievement, such as family characteristics (Normandeau & Guay, 1998). For example, socioeconomic status (SES) is positively correlated with academic achievement (Colom & Flores-Medoza, 2007). On average, students from low-SES backgrounds are behind their higher-SES peers even at the beginning of kindergarten, and this gap widens as

they progress through school (Ready, 2010). Students with higher socioeconomic status are more likely to have parents who are involved at school, reflecting an interaction between these two factors and academic success (Hill & Taylor, 2004). Lower socioeconomic status or the effects of poverty also impacts parent mental health and stress levels, which leads to an impaired ability to provide academic support at home and difficulty or reticence to become involved in school (Hill & Taylor, 2004).

Family Involvement. Parental involvement is a well-established contributor to academic achievement, and studies have consistently shown a correlation between increased school involvement and improved academic achievement among students (Hill & Taylor, 2004). Parental involvement is generally considered to consist of factors such as volunteering at school, responding to and initiating communication with teachers, providing academic support at home (such as help with homework), and attending school functions such as parent-teacher conferences or PTA meetings (Hill & Taylor, 2004). Children's families influence the child's attitudes, cognitive characteristics, self-concept, and attributions, among other factors. As parents become more involved in their children's educational process, their children are better able to cope with the learning environment at school. For example, students whose parents were significantly involved earned much higher grades than students whose parents showed little to no involvement, even when students were assigned to the same classroom and had the same classmates and teachers (Gonzalez-Peinda, Nunez, Muniz, Alvarez, Gonzalez-Pumariega, & Roces, 2000; Gonzalez-Pienda et al., 2002). When asked teachers are asked to rate parent involvement students whose parents were rated as more involved produced stronger academic performance.

Homework Completion. Completion of homework, defined by Cooper (1989) as "tasks assigned to students that are meant to be carried out during non-school hours," has been associated with increased understanding and retention of academic material, better study skills, more positive academic attitudes, development of self-regulatory processes, and greater responsibility toward learning (Zimmerman & Kitsanias, 2005). Parental involvement is associated with homework completion, and completion and accuracy of homework are known to promote achievement (Hill & Taylor, 2004).

Attendance. The correlation between student attendance and achievement is moderate to strong (Roby, 2004). Regular attendance at school allows students to gain consistent exposure to academic material. Missing lessons, especially in areas with subject matter that relies on cumulative skill, can contribute to student academic difficulties. Attendance is especially important for lower-income children, whose cognitive development and summer learning loss is more negatively impacted by erratic school attendance (Ready, 2010). In addition to low SES, chronic absenteeism is also more prevalent in students with chronic health conditions and residential mobility. Data from the National Assessment of Educational Progress (NAEP, 2000) show that only 21 percent of eighth graders with greater than three absences achieved scores at or above the "basic" level, compared to 45 percent of students without documented absence. Studies show that attendance has a significant, positive relation to student performance Caldas, 1993; Lamdin, 1996); on the other hand, students with high rates of absenteeism scored lower on standardized tests than their peers (Barrington & Hendricks, 1989) and earned lower literacy and math scores, particularly if they were from low SES families (Ready, 2010).

Statement of the Problem

As demonstrated in the literature review above, a number of factors influence academic performance. The purpose of the present study is to determine the relative predictive power of these factors from teachers' perspectives using an efficient time-sensitive screening method that is contextually appropriate and highly practical. Currently, many universal screeners are available, but most are limited in a variety of ways, e.g., they are domain-specific, time-consuming (requiring several items per construct to attain a rating); and are not sensitive to local norms. The Brief Academic, Behavior, and Social Screener (B-BASS) addresses these limitations by employing a unique teacher-rating format, i.e., multiple constructs across domains are rated for each within approximately one minute per student. Because teachers rate each student within her/his class by comparing the student to class peers, the predictive equation allows for sensitivity to local expectations.

Research Questions

1. What is the relative predictive power of the B-BASS items to predict end-of-grade high stakes test scores in English Language Arts/Reading (specifically, the North Carolina End-of-Grade Test of English Language Arts/Reading)?
2. What is the relative predictive power of the B-BASS items to predict end-of-grade high-stakes test scores in Mathematics (specifically, the North Carolina End-of-Grade Test of Mathematics)?
3. What is the relative predictive power of the B-BASS items to predict proficient/non-proficient status in English Language Arts/Reading based on high-stakes end-of-grade tests (specifically, the North Carolina End-of-Grade Test of English/Language Arts)?

4. What is the relative predictive power of the B-BASS items to predict proficient/non-proficient status in Mathematics based on high-stakes end-of-grade tests (specifically, the North Carolina End-of-Grade Test of Mathematics)?
5. What is the relative predictive power of the B-BASS composites to predict end-of-grade high stakes test scores in English Language Arts/Reading (specifically, the North Carolina End-of-Grade Test of English Language Arts/Reading)?
6. What is the relative predictive power of the B-BASS composites to predict end-of-grade high-stakes test scores in Mathematics (specifically, the North Carolina End-of-Grade Test of Mathematics)?
7. What is the relative predictive power of the B-BASS composites to predict proficient/non-proficient status in English Language Arts/Reading based on high-stakes end-of-grade tests (specifically, the North Carolina End-of-Grade Test of English Language Arts/Reading)?
8. What is the relative predictive power of the B-BASS composites to predict proficient/non-proficient status in Mathematics based on high-stakes end-of-grade tests (specifically, the North Carolina End-of-Grade Test of Mathematics)?

CHAPTER II

Method

Participants and Setting

Participants included 11 third- through fifth-grade teachers providing data for 198 students in a small elementary school in a rural school district in the southeastern United States. Data collected included a completed B-BASS Screening Form (see Figure 1) as well as demographic information, including students' age, sex, ethnicity, special education category or gifted category if applicable, and North Carolina End-of-Grade Test Scores in English Language Arts/Reading and Mathematics. Data were collected in the late January.

The B-BASS sample consisted of 198 students from 11 third- through fifth-grade classrooms (4 fifth-grade, 4 fourth-grade, and 3 third-grade) who were enrolled in a rural elementary school in the southeastern United States. Of the 198 students, 52 (26.3%) were third-graders, 71 (35.9%) fourth-graders, and 75 (37.9%) fifth-graders. One hundred (50.5%) were female and 98 (49.5%) were male. White students made up 84.3% of the sample (n=167), 28 students were (14.1%) Hispanic, one (.5%) Black, and two (1%) Asian. This distribution is consistent with the population distribution of the geographic area in which the school is located.

Forty-five students in the sample (22.7%) were identified as students with disabilities, and are served through the school's Special Education Program. Disability categories included Specific Learning Disability (30 students, 15.2%); Autism (nine students, 4.5%); Intellectual Disability – Mild (two students, 1%); and Other Health Impairment (four students; 2%). 27 students (13.6%) were identified as Academically Gifted in Mathematics, and 27 students (13.6%) were identified as Academically Gifted in Reading.

As the primary researcher, I conducted this study for the purpose of fulfilling my dissertation requirement for my doctorate in School Psychology. Materials included a digital copy of the screening form, as well as aggregate data from school-maintained databases, including information regarding student attendance, benchmark and progress monitoring test scores, behavioral incident reports, and current and past grades.

Instruments

Brief Behavior, Academic, and Social Screener. The B-BASS is a 16-item scale on which teachers rate students in the following domains: Reading Ability, Math Ability, Overall Cognitive Ability, Effort, Eamily Involvement, Socioeconomic Status, Attendance, Homework Completion, Attention, Hyperactivity, Social Skills, Compliance with Rules, Initiative, Flexibility, Self-Regulation, and Readiness to Learn (See Figures 1 and 2). These items combine to form four composites. Reading Ability and Math Ability combine to form the Academic Ability composite; Family Involvement, Socioeconomic Status, Ready to Learn, Attendance, and Homework Completion combine to form the Home Support composite; Attention, Hyperactivity, Flexibility, Initiative, and Self-Regulation combine to form the Executive Functions composite; and Effort, Compliance with Rules, and Social Skills form the Social/Emotional Adaptability Composite. Composite scores are generated by summing the scores for all items included in the composite and dividing by the number of scores included; thus, each composite score represents a mean score for all items in that composite. All but one item (“Ready to Learn”) was selected following a review of the literature based on their documented relation (positive correlation coefficients) to academic achievement. The “Ready to Learn” item was included following a suggestion by teachers during pilot testing of this instrument. Teachers are asked to rate each item on a five-point Likert scale, with each score indicating the following:1 – Well below

expected level; 2 – Below expected level; 3 – At expected level; 4 – Above expected level; 5 – Well above expected level.

B-BASS Pilot Testing. A pilot version of the screener was developed and administered to a small sample of classroom teachers and students during the 2014-15 school year. Pilot data were collected from one third-grade and two fifth-grade teachers, with data from 55 students (40 fifth-grade students and 15 third-grade students). 28 students were male, and 27 were female; White students comprised 87.5% (*n*=48) of the sample, Hispanic students 10.7% (*n*=6), and Asian students 1.8% (*n*=1). Six students were identified as Academically Gifted in Reading and Math, and one student was identified as Academically Gifted in Math only. Seventeen students (30.4%) were identified as students with disabilities and received services through the Special Education Program. The three teachers provided ratings for each student in their homeroom class, and were asked to complete an identical form two weeks following the original administration, without referring to their original form. Test-retest reliability coefficients for B-BASS items range from .96 to 1.00. Internal consistency for all items on the pilot version of the screener was calculated using Cronbach's alpha, and resulted in a coefficient of .96. Skewness and kurtosis for each item were calculated and are acceptable generally; all fall within the -.1 to .1 range with the exception of a single variable (kurtosis for Family Involvement, with a value of -1.16).

North Carolina End-of-Grade Test in English Language Arts/Reading (ELA EOG). The ELA EOG is a high-stakes end-of-grade comprehensive test that is aligned with the North Carolina Standard Course of Study for English Language Arts/Reading (specific information regarding alignment below). It is administered during the final ten instructional days of the academic year. The third-, fourth-, and fifth-grade tests include between 44 to 48 multiple choice

items based on six reading passages (three informational, two literature, and one poetry). Students have up to four hours to complete each assessment, with extended time available to students with disabilities. Raw scores are calculated based on the number of questions that the students answer correctly, and are converted to scale scores that represent student level of performance on a scale of 1 (very limited command of material) to 5 (superior command of material). Information regarding the psychometric properties of the ELA EOG was taken from the *North Carolina Testing Program Technical Report* 2012–2015: English Language Arts/Reading Assessments End-of-Grade 3–8 and End-of-Course English II (2016). Internal consistency reliability for the ELA EOG was calculated using Cronbach's alpha. Reliability coefficients for all forms of the ELA EOG ranged from .91 to .92 for the third-grade test, .88-.90 for the fourth-grade test, and .88-.90 for the fifth-grade test. To address content validity, an analysis was conducted to evaluate the alignment of ELA EOG scores with the North Carolina Standard Course of Study in English Language Arts. Results of this analysis indicated that alignment was at acceptable levels for all tests and subtests.

North Carolina End-of-Grade Test of Mathematics (Math EOG). The Math EOG is a high-stakes end-of-grade comprehensive test that is aligned with the North Carolina Standard Course of Study for Mathematics (specific information regarding alignment below). It is administered during the final ten instructional days of the academic year. The third- and fourth-grade tests include 44 multiple choice items; the fifth-grade test includes 6 gridded items and 38 multiple-choice items. Students have up to four hours to complete each assessment, with extended time available to students with disabilities. Raw scores are calculated based on the number of questions that the students answer correctly, and are converted to scale scores that represent student level of performance on a scale of 1 (very limited command of material) to 5

(superior command of material). Information regarding the psychometric properties of the Math EOG was taken from the *North Carolina Testing Program Technical Report* 2012–2015: Mathematics Assessments End-of-Grade 3–8 and End-of-Course Math I (2016). Internal consistency reliability estimates for the Math EOG were calculated using Cronbach's alpha. Coefficients for the Math EOG for each form ranged from .89 to .91 for the third-grade test, .92 for all forms for the fourth-grade test, and .91-.92 for the fifth-grade test. To address content validity, an analysis was conducted to evaluate the alignment of Math EOG scores with the North Carolina Standard Course of Study in Mathematics. Results of this analysis indicated that alignment was at acceptable levels for all tests and subtests.

Procedure

Teachers were asked to volunteer for participation in the study via an e-mail message and personal invitation. Data collected for this study were also utilized by the school's Response to Intervention team as part of a school-wide screening effort. Teachers were provided with an electronic copy of the screening form, and asked to complete the form for each student assigned to their homeroom class. Homeroom teachers were selected as the primary informants for students, because third, fourth, and fifth grade students all spent the majority of their school day with their homeroom teacher, apart from a ninety-minute block each day, which was spent in reading groups divided by ability level. Teachers were instructed to complete the form and return it to the researcher electronically. Each student was randomly assigned an identification number, and teachers removed all identifying information before returning the forms to the researcher. School administrators retained copies of student names and identification numbers for their own use in educational planning. The researcher did not have access to this information.

Following the administration of North Carolina End-of-Grade Tests in English Language Arts/Reading (ELA EOG) and Mathematics (Math EOG), teachers provided de-identified copies of student score reports to the researcher. Each student was represented on this report using the identification number assigned during the screening process, which was used to match student EOG scores to screening data in the database.

CHAPTER III

Results

Eleven third- through fifth-grade teachers completed the Brief Behavior, Academic, and Social Screener (B-BASS) for a total of 198 students. This group included teachers with three to thirty years of experience. Several analyses were conducted to determine the relative predictive power of the B-BASS to identify students at risk based on data from the North-Carolina End-of-Grade Tests of English Language Arts/Reading and Mathematics. Descriptive statistics are presented initially, followed by results from the various analyses.

Descriptive Statistics of B-BASS and North Carolina End-of-Grade Test Scores

Descriptive statistics for the 198 students in the sample were calculated for each of the B-BASS items and composites, as well as scores on the North Carolina End-of-Grade tests of English Language Arts/Reading (ELA EOG) and Mathematics (Math EOG). Mean scores for items on the B-BASS range from 3.05 to 3.72, and mean scores for composites range from 3.12 to 3.36. The mean score on the ELA EOG is 2.93, and the mean score on the Math EOG is 3.45. These scores are consistent with typical scores for this district over the past five school years. Accountability data for end-of-grade testing for all districts in North Carolina are available on the North Carolina Department of Education website (North Carolina Department of Education, 2017); links to specific data for this school and district are not included here to avoid identification of the school at which this study was conducted. Means, standard deviations, skewness, and kurtosis for individual variables are available in Table 1. The average score of 2.93 on the ELA EOG is slightly below the proficient level, and the mean score of 3.45 is slightly above proficient. In general, scores fall within the expected range for this population (rural, economically disadvantaged) and age group. Test-retest reliability coefficients were

calculated for all B-BASS items, and ranged from .96 to 1.00. Internal consistency was calculated using Cronbach's alpha and yielded a coefficient of .96.

A zero-order correlational matrix was generated to represent the intercorrelations among B-BASS items and B-BASS items and composites. Correlation coefficients range from .14 to .97, with most showing moderately strong correlations. This matrix is available in Table 2. As expected, items from related composites are more highly correlated with each other than items in different domains. For example, a correlation coefficient of .87 was obtained between Reading Ability and Math Ability, which make up the Academic Ability composite. Items in the Executive Function composite show intercorrelations between .60 and .86; items the Social Adaptability composite items show intercorrelations ranging between .54 and .69; and items from the Home Support Composite show intercorrelations ranging from .43 to .89.

B-BASS Items as Predictors of EOG Scores

B-BASS items were entered into the regression equation in the order in which they are presented on the B-BASS form (see Figure 1) for both the English Language Arts/Reading and Mathematics EOG scores. Based on the simultaneous/standard multiple regression analyses, all B-BASS items together predict significantly the composite English Language Arts/Reading EOG scores (R^2 = .81, p <.001), and account for 81.4% of the variance (Research Question 1). Variance shared between each of the predictor variables (B-BASS items) and EOG scores can be determined by calculating the coefficient of determination (R^2); those values can be obtained from the zero-order correlation matrix (see Table 2). In order to determine the relative predictive power of B-BASS items, a stepwise multiple regression analysis was conducted; two items were identified as providing a statistically significant ELA EOG composite score. The Reading Ability item accounts for 77% of the variability in ELA EOG scores (R^2 = .77, p < .001), and the

addition of the Effort item accounts for an additional 1% of the variability (R^2 = .01, p < .005). This model accounts for 77.9% of the total variance in ELA EOG scores. Detailed results of this stepwise regression analysis can be found in Table 3.

Based on the simultaneous/standard multiple regression analyses, all B-BASS items together predict significantly the composite English Language Arts/Reading EOG scores (R^2 = .63, p <.001), and account for 63.2% of the variance (Research Question 2). Variance shared between each of the predictor variables and EOG scores can be determined by calculating the coefficient of determination (R^2); those values can be obtained from the zero-order correlation matrix (see Table 2). In order to determine the relative predictive power of B-BASS items, a stepwise analysis was conducted; two items were identified as providing a statistically significant Mathematics EOG composite score. The Math Ability item accounts for 57.4% of the variability in Mathematics EOG scores (R^2 = .574, p < .001), and the addition of the Hyperactivity item accounts for an additional 2.6% of the variability (R^2 = .026, p < .001). This model accounts for 60% of the total variance in ELA EOG scores. Detailed results of this stepwise regression analysis can be found in Table 4.

B-BASS Items as Predictors of Proficient/Non-Proficient Status

A stepwise discriminant function analysis was used to determine the accuracy of the B-BASS as a predictor of proficiency status on the ELA EOG and Math EOG. Two categories of proficiency were determined: proficient and not proficient. Receiver Operating Characteristic (ROC) curve data were used to evaluate sensitivity (true positive) and specificity (true negative) values for specific cutoff points. The NC EOG in both English Language Arts/Reading requires a score of 3 or better for a student to be considered “proficient,” or passing. Thus, students with

scores of below 3.0 were classified as below proficient, while students with scores of 3.0 or better were classified as proficient

The B-BASS items significantly predict proficiency on the ELA EOG (Research Question 3). Only two variables contribute significantly to the resulting discriminant function. The variables were Reading Ability (.90 correlation with the function) and Effort (.22 correlation with the function). This discriminant function yields the following Chi-Square statistic: $X^2(1, 198) = 215.74$, $p < .001$. It correctly classifies 93.9% of the sample. According to the AUC analysis, B–BASS-determined student proficiency strongly predicts EOG proficiency (AUC = .92, $p < .001$). Using the North Carolina End-of-Grade Test score of 3 or better to operationalize proficient status analysis produces a sensitivity value of 94.3% (true positives) and a specificity value of 33.1% (true negatives); the percentage of false positives and false negatives were also obtained and are 4.5% and 1.5% respectively.

B-BASS items also significantly predict proficiency on the Math EOG (Research Question 4). Two variables, Math Ability (.90 correlation with the function) and Hyperactivity (.32 correlation with the function) contribute to the resulting discriminant function, $X^2(1, 198) = 119.58$, $p < .001$. This equation correctly classifies 85.4% of cases. Based on AUC analysis B-BASS items significantly predict scores on the Math EOG (Research Question 4), i.e., B-BASS-determined student proficiency strongly predicts EOG proficiency (AUC = .96, $p <.001$). Using EOG score of 3 or better to operationalize proficient status, analysis produces a sensitivity value of 71.7% (true positives), a specificity value of 3.4% (true negatives); the percentage of false positives and false negatives were also obtained and are 9.5% and 4.5% respectively.

B-BASS Composites as Predictors of EOG Scores

B-BASS composites were entered into the simultaneous/standard regression equation in the order in which they are presented on the B-BASS form (see Figure 1) for both the English Language Arts/Reading and Mathematics EOG scores. Taken together, the B-BASS composites predict significantly the composite English Language Arts/Reading EOG scores, (R^2 = .79, p < .001), and account for 78.5% of the variance (Research Question 5). Variance shared between each of the predictor variables and EOG scores can be determined by calculating the coefficient of determination (R^2); those values can be obtained from the zero-order correlation matrix (see Table 2). In order to determine the relative predictive power of B-BASS composites, a stepwise analysis was conducted; three items significantly predict the ELA EOG composite score. The Academic Ability composite accounts for 77% of the variability in ELA EOG scores (R^2 = .77, p < .001); the addition of the Executive Function composite accounts for an additional 1% of the variability (R^2 = .01, p < .005); and the addition of the Social Adaptability composite accounts for an additional .5% of the variance (R^2 = .01, p < .05). Consequently, this model accounts for 78.5% of the total variance in ELA EOG scores. Detailed results of this stepwise regression analysis can be found in Table 5.

Taken together, the B-BASS composites predict significantly the composite Mathematics EOG scores, (R^2 = .66, p < .001), and accounts for 66.3% of the variance. Variance shared between each of the predictor variables and EOG scores can be determined by calculating the coefficient of determination (R^2); those values can be obtained from the zero-order correlation matrix (see Table 2). In order to determine the relative predictive power of B-BASS composites, a stepwise analysis was conducted; four composites were identified as providing a statistically significant Mathematics EOG composite score. The Academic Ability composite accounts for

63.3% of the variance in Math EOG scores ($R^2 = .63$, $p < .001$); the addition of the Overall Ability score accounts for an additional 1% ($R^2 = .01$, $p < .03$); the addition of the Executive Function composite accounts for another 1% ($R^2 = .01$, $p < .02$) of the variability; and the Home Support composite accounts for the final .09% of variability in scores ($R^2 = .01$, $p < .03$). This model accounts for 66.2% of the total variance in Math EOG scores. Detailed results of this stepwise regression analysis can be found in Table 6.

B-BASS Composites as Predictors of Proficient/Non-Proficient Status

A stepwise discriminant function analysis was used to determine the accuracy of the B-BASS composites to predict proficiency status from the ELA EOG and Math EOG proficiency categories. As before, two categories of proficiency were determined: proficient and not proficient based on a score of 3 and above (proficient) and below 3 (not proficient). Receiver Operating Characteristic (ROC) curve data were used to evaluate sensitivity (true positive) and specificity (true negative) values for specific cutoff points.

Although the B-BASS composites significantly predict proficiency on the ELA EOG (Research Question 7) only one variable contributed to the resulting discriminant function (Academic Ability, correlates .97, $p < .001$). The discriminant function is significant: $X^2(1, 198) = 375.5$, $p < .001$, and results in 92.9% classification accuracy. Based on an AUC analysis, B-BASS composites significantly predict proficiency status on the ELA EOG (AUC = .95, $p < .001$). A sensitivity value of 94.7% (true positives) and a specificity value of 21.3% (true negatives) were obtained; the percentage of false positives and false negatives were also obtained and are 4.5% and 2.5% respectively.

The B-BASS composites also significantly predict proficiency on the Math EOG (Research Question 8). A stepwise discriminant function analysis showed that two variables,

Academic Ability (.94 correlation, $p < .001$) and Overall Ability (.71 correlation, $p < .001$), contribute to the resulting discriminant function. This discriminant function is statistically significant: $X^2(1, 198) = 161.01$, $p < .001$, and correctly classifies 91.4% of cases. According to the AUC analysis, B-BASS composites significantly predict scores on the Math EOG (AUC = .98, $p < .001$). Using the EOG scores to again indicate proficiency status, sensitivity (71.7%; true positives), and specificity values (3.4%; true negatives) were obtained; the percentage of false positives and false negatives were also obtained and are 6% and 2.5% respectively.

CHAPTER IV

Discussion

The Brief Behavior, Academic, and Social Screener (B-BASS) is a unique multi-domain screener that is designed to identify students who are at risk of scoring at a below proficient level on high-stakes end-of-grade tests. A review of the literature provided the basis for item selection. Sixteen items were selected to operationalize domains for inclusion on the B-BASS, i.e., Reading Ability, Math Ability, Overall Cognitive Ability, Family Involvement, Socioeconomic Status, Homework Completion, Attendance, Ready to Learn, Attention, Hyperactivity, Self-Regulation, Initiative, Flexibility, Social Skills, Compliance with Rules, and Effort. These items were grouped into five composites: Academic Ability, Overall Cognitive Ability, Home Support, Executive Functions, and Social Adaptability. Based on this instrument configuration, this study was conceptualized to determine the extent to which B-BASS items and composites predict at-risk status as determined by high-stakes end-of-grade test scores in English Language Arts/Reading and Mathematics. Student performance on these tests is critical both to the students themselves (i.e., results are used to place students into ability groups, determine the need for remediation, and often to determine grade retention) and their teachers and schools (i.e., student performance and growth on these scores are often connected with funding for schools and are reflected on teacher evaluations). Consequently, early identification of students at risk for scoring below proficiency on these tests is critical.

Results of this study provide tentative evidence to support the use of the B-BASS as an efficient and psychometrically strong predictor of student proficiency. Test-retest and internal consistency reliability coefficients were strong. In addition, based on the zero-order correlation coefficients, it is apparent that every predictor is significantly correlated with ELA EOG and

with Math EOG scores (see Table 2). Based on the linear regression and ROC Curve analyses, B-BASS items *and* composites significantly predicted End-of-Grade Test scores and proficiency status in both English Language Arts/Reading and Mathematics. This is especially notable given that the B-BASS can be completed very quickly and addresses student characteristics in multiple domains, as opposed to many traditional screening instruments that focus on a single (or only a few) area(s), such as those that focus on behavior only, or academics only).

Although results of this study provide robust evidence of the predictive capability of B-BASS, it is clear that items and composites do not predict EOG academic scores equally well when prediction is based on unique variance (of the independent variables). In fact, the majority of items represented on the B-BASS were excluded from the regression equation using a stepwise method. For example, typically only two or three items or two or three composites from the B-BASS significantly predict the criterion variable in most cases. This is understandable given the significant intercorrelations among many of the predictor variables (as shown from the zero-order correlational table) and the nature of the criterion variable, i.e., the EOG scores provide one operationalization of Language Arts and one operationalization of Mathematics. Both criterion scores are limited as they represent academic performance only and are relatively gross measures, like most end-of-grade scores. In most cases, the most statistically significant predictor variables are to be expected given the literature (for example, Reading Ability as a predictor of English Language Arts/Reading EOG scores). Interestingly, one of the significant predictors for Math EOG scores identified by the stepwise regression analysis is Hyperactivity, which at first glance may be surprising. However, studies have shown achievement deficits in mathematics among students with diagnoses of ADHD (Martinussen, Hayden, Hogg-Johnson, & Tannock, 2005) and in students who display symptoms of hyperactivity and impulsivity without

a formal ADHD diagnosis (Merrell & Tymm, 2001). DuPaul and Stoner (2004) note that mathematics lessons require more independent seatwork than reading lessons, and that staying in one's seat is inherently difficult for students with increased hyperactivity; thus, this may be the rationale for the increased impact of hyperactivity on math achievement (Hart, Petrill, Willcutt, Thompson, Schatschneider, Deater-Deckard, & Cutting, 2013).

The utility of the B-BASS potentially extends beyond prediction of high-stakes test scores. Of note, the B-BASS items were selected to be sensitive to many important student behaviors beyond academic success (e.g., executive functioning) and likely will be broadly predictive of various important student outcomes. So, it is recommended that the B-BASS be administered in its current form to "cover the bases," and to maintain "face validity." In other words, teachers will likely recognize the value of obtaining data from a wide-ranging assessment of their students. While all items on the B-BASS may not contribute significantly to the variance in particular criterion test scores, information across domains may still be useful to student support teams and teachers as they identify students who may benefit from certain programs because of a range of inappropriate or limiting behaviors (e.g. for students who have difficulty getting along with peers, completing work, monitoring progress) and may need services.

Implications of Using the B-BASS

As stated in Chapter 1, Glover and Albers (2007) identified several important considerations for screening instruments. Their first consideration was that the instrument be contextually appropriate; specifically, that it is compatible with local service needs, aligns with constructs of interest, has theoretical and empirical support, and fits the population of interest. A major strength of the B-BASS is its compatibility with local service needs. The B-BASS instructs teachers to rate students in comparison to their same-age peers; thus, each student is

compared to the population of students in their classroom in their local school. As detailed in the literature review, the B-BASS was designed to assess constructs of interest based on empirical and theoretical literature, and most specifically those constructs which have been identified as being critical for academic achievement—though the goal was to develop an inclusive instrument (as described above).

The second factor identified by Glover and Albers (2007) is user-friendliness (i.e., practicality, cost- and time-efficiency, and ease of administration), which is another strength of the B-BASS, especially when compared with other methods of screening. A literature search for "universal screening" yields many results, most of which detail procedures for using curriculum based measures to screen students. Curriculum-based measures (CBMs) are short assessments that are based on the general education curriculum, and are intended for use in progress monitoring, as well as identifying students who are at risk for academic underachievement. Hintze and Silberglitt (2005) cite several studies that link results of curriculum-based measures with performance on high-stakes tests, and state that CBM is able to predict with a high degree of accuracy (greater than 80%) student results on these tests. While CBMs are highly useful and predictive, they do come with inherent limitations. For group-administered CBMs, one such limitation is that student-completed measures take time to administer and score. If a student is absent or out of the classroom, the teacher must find time to re-administer the CBM to that student. Individually administered CBMs, such as oral reading fluency measures, often require students to read three passages aloud for one minute each, and may include a comprehension component. For example, the Dynamic Indicators of Basic Early Literacy (DIBELS) (2003) reading assessment includes an additional minute per story in which the student is asked to retell as much of the story as they can recall. This results in a time allotment of approximately six

minutes per student, excluding time spent transitioning students to and from the testing area, reading directions, and other concerns. The B-BASS, in contrast, takes less than one minute per student to complete, and provides information on multiple domains per student. It does not include lengthy directions or multiple pages. Perhaps most importantly, it predicts EOG scores about as well as typical CBM progress monitoring tool. For example, The DIBELS has also been extensively evaluated as a predictor of high-stakes end-of-grade test scores, with emphasis on using its oral reading fluency (ORF) measure as a predictor. Shaw and Shaw (2002) reported strong predictive validity between DIBELS benchmark tests and Colorado State Assessment Program (CSAP) scores (r =.73), with an overall classification accuracy of 74%. Barger (2003) found a .73 correlation between DIBELS benchmark scores and the North Carolina End-of-Grade Test of English Language Arts/Reading, and Buck and Torgenson (2003) found that ORF scores predicted Florida Comprehensive Assessment Test-Sunshine State Standards (FCAT-SSS) with 92% specificity and 77% sensitivity. Most studies have found correlation coefficients in the 60 - .75 range between performance on curriculum-based measures and end-of-year statewide reading achievement tests (Shapiro, Keller, Lutz, Santoro, & Hintze, 2006). Helwig, Anderson, and Tindal (2006) found that a 48-item CMB math probe (containing both reasoning and computation items) predicted scores on a simulated version of the Oregon standardized math achievement test. This probe predicted with 87% accuracy students who would score at a proficient level on the simulated mathematics test. Shapiro et al (2006) found that Monitoring Basic Skills Progress (MBSP) Math Computation probes were significantly correlated (.50 to .53, $p < .001$) with outcomes on the Pennsylvania System of School Assessment (PSSA; Pennsylvania Department of Education, 2002). The B-BASS shows similar predictive ability to these curriculum-based measures, and as Glover and Albers (2007) noted, predictive validity

may be the most important characteristic of a screening instrument, beyond basic psychometric integrity. It should be noted that the purpose of the B-BASS and these instruments is not the same – the B-BASS is intended as a single-use screener to predict end-of-grade test scores, while these CBMs are intended for identification of at risk status and progress monitoring and thus, are likely more sensitive to change than the B-BASS. Using the B-BASS as a precursor to progress monitoring with curriculum-based measures could potentially identify students for whom those measures are necessary, and rule out students who do not require additional assessment; thus, reducing time spent administering CBM measures to students.

On a related note, the literature supports the validity of teacher judgments; teacher ratings/rankings have been shown to be highly accurate in identifying students at risk (Eklund et al., 2009; Elliot, Huai, & Roach, 2007; McCallum & Bracken, 2012). Teachers completing the B-BASS are also able to base their response in each category on many factors per item. For example, a teacher rating of a student's reading ability typically is based on hearing the student read many times, grading many samples of their classwork and reviewing records from prior years, and their observations of the child's classroom peers and comparison of the child in question with those students. Thus, the teacher ratings of B-BASS items are well-informed and based on observation and evaluation of that student over a significant period of time. A teacher rating of 1 or 2 in reading ability would represent a concern based on significant classroom history and suggest a need for further exploration. Consequently, B-BASS has the potential to identify students who are in need of further screening, and more in-depth assessment, and can efficiently rule out assessment of students who do not require further evaluation of a particular area.

Similarly, B-BASS was designed to be sensitive to screening for potential behavioral issues. Severson, Walker, Hope-Doolittle, Kratchowill, and Gresham (2007) conducted a review of screening methods specifically to address behavioral concerns. They reference 41 different behavioral screening instruments in their article, each of which varied in terms of length, cost, and psychometric properties. While designed to be screening measures and intended to identify students in need of more in-depth assessment, some of these measures are relatively lengthy/in-depth when compared with a brief measure such as the B-BASS. For example, one measure included in this article contains 33 items.

As demonstrated by the results of this study, the B-BASS significantly predicts performance on high-stakes testing in both English Language Arts/Reading and Mathematics, and is also able to predict proficient/non-proficient status and to classify students with a high degree of accuracy. Despite its brevity, the B-BASS compares favorably with other measures that predict scores on standardized achievement tests. For example, the predictive capability of B-BASS is similar to that of the Cognitive Abilities Test (CogAT) (Lohman, 2012), which is a group-administered test of cognitive ability that requires approximately 90 minutes to complete. The CogAT manual reports that CogAT scores correlate with scores on achievement tests, with a reported correlation of .85 for the CogAT composite score. Similarly, the Stanford Achievement Test (1996) is a group-administered test of academic achievement in multiple domains, and has been shown to correlate highly (coefficients of .70 to .81) with Florida's high-stakes end-of-year tests, the FCAT-SSS. And, the predictive capability of the B-BASS is similar to that of other longer teacher-based screening scales (e.g., the Universal Multidimensional Abilities Scales or UMAS (McCallum & Bracken, 2012). Apparently, B-BASS can provide a psychometrically

sound “first gate” measure for identifying students who are academically at risk and in need of a more comprehensive screening.

Potential Uses for Information Gathered on the B-BASS

In addition to strong predictive validity (for academic performance), the B-BASS may provide additional useful information to educators. As the screener represents multiple domains in a quick, easy-to-use format, it can be analyzed easily by Response to Intervention (RtI) coordinators, school social workers, and other individuals who work to address areas of need for individual students. Identification as a student at risk for high-stakes testing failure on the B-BASS would flag a student for review by whatever existing process that an individual school had in place (e.g., Student Success Team, RtI Coordinator) and would provide a starting point for further investigation into areas of need. For example, a student identified at risk for performing at a below proficient level on the Mathematics End-of-Grade Test would logically be considered for further exploration of areas of deficit in mathematics itself, and would likely begin to receive targeted academic services. Rather than stopping with those services alone, information provided on the B-BASS provides information on how best to support that student. Review of that student’s ratings on the B-BASS would likely reflect low ratings in other areas; for example, Executive Functioning and Home Supports (and the related behaviors represented by items within the domains (e.g., homework completion, self-regulation). Thus, in addition to direct mathematics interventions, this student may be considered as a candidate for a morning or afternoon study group, invitations to Family Nights designed to provide opportunities to engage families in school-related functions, or other such services. Another student may have a similar projected end-of-grade test score and may become involved in the same direct intervention services for mathematics, but this student’s ratings in Family Involvement and Home Supports

could be high. Instead, this student may show low ratings in the areas of Attention or Compliance with Rules, which might indicate to the team that further exploration of issues related to work behavior were warranted, and may involve a school behavior specialist to address these areas.

Limitations and Future Directions for Research

Several limitations are present in the current study. First, this instrument was administered to students at a single school in a unique geographic area. It is unknown whether the results of this study would generalize to students in other geographic areas, or to students outside the age range represented in this sample (third through fifth grade). Additionally, teachers completed this instrument in January (spring semester) of the school year. Ideally, an instrument of this nature would be completed early in the school year, in order to maximize available time for intervention. While the items included on the instrument are unlikely to change a great deal during the course of the school year, it is possible that teachers would not be able to provide such accurate ratings earlier in the school year. The length of time that teachers require to know their students "well" enough to provide accurate information in these domains is unknown. Also, only eleven teachers provided data for the sample (each teacher rated approximately 18 students); in the future, information should be obtained from more teachers and inter-rater agreement gathered for each student from multiple teachers. This would be an especially important step when evaluating the efficacy of the B-BASS with students in middle school, as they frequently change classes and do not typically spend extended time with a single teacher. Logical next steps would be to administer this instrument earlier in the school year, and in different areas to students of different ages to evaluate whether such significant results would continue to be present. Finally, the criterion variables are based on assessment of academic skills

only. Future research should focus on assessing the predictive capability of B-BASS for other important areas of functioning (e.g., behavioral indicators such as office referrals). Future research may also look at differences in B-BASS predictive validity between groups; e.g., differences between male and female students, students with disabilities and typically performing students.

Summary and Conclusions

In conclusion, these data provide tentative support for the predictive utility of the B-BASS when academic at-risk status is the criterion. It appears to be capable of providing a unique and effective means of screening for to identification of students who are academically at risk. Given that performance on these tests is highly meaningful for both students (i.e., failure to perform at a proficient level could result in grade retention, intensive remediation, or other consequences) and teachers (i.e., test scores are often used to evaluate teacher performance), the B-BASS may be a time efficient and psychometrically robust strategy for predicting EOG status. Future research focusing on the B-BASS is still necessary to determine its predictive utility as a screening instrument for other geographic settings, age groups, and for other important school-based outcomes.

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Appendix

Tables

Table 1

Means and Standard Deviations of Items, Composites, and End-of-Grade Test Scores

Item/Composite	*n*	*M*	*SD*	*Skewness*	*Kurtosis*
ELA EOG	198	2.93	1.39	-.085	-1.282
Math EOG	198	3.45	1.33	-.632	-.849
Math Ability*	198	3.23	1.27	-.255	-.941
Reading Ability*	198	3.02	1.35	-.125	-1.160
Overall Ability*	198	3.05	1.26	-.111	-.976
Effort*	198	3.23	1.17	-.405	-.600
Family Involvement*	198	3.06	1.37	-.125	-1.172
SES*	198	3.09	1.45	.001	-1.335
Attendance*	198	3.64	1.15	-.443	-.399
Homework*	198	3.65	1.18	-.488	-.592
Ready to Learn*	198	3.38	1.19	-.388	-.554
Compliance with Rules*	198	3.41	1.09	-.186	-.549
Hyperactivity*	198	3.72	1.19	-.505	-.555
Attention*	198	3.15	1.17	-.126	-.740
Self-Regulation*	198	3.21	1.19	-.144	-.604
Initiative*	198	3.15	1.20	-.179	-.736
Flexibility*	198	3.39	1.07	-.293	-.274
Social Skills*	198	3.38	1.03	-.392	-.051
Academic Ability**	198	3.12	1.26	-.175	-1.064
Home Support**	198	3.36	1.07	-.198	-.630
Executive Function**	198	3.33	.99	-.266	-.285
Social Adaptability**	198	3.35	.93	-.327	-.172

* B-BASS Item
** B-BASS Composite

Table 2

Zero-Order Correlational Matrix for Items, Composites, and End-of-Grade Test Scores

	ELA EOG	Reading Ability	Math EOG	Math Ability	Overall Ability	Effort	Family Involvement	SES	Attendance	Homework	Ready to Learn	Rules	Attention	Self-Regulation	Initiative	Flexibility	Social Skills	Hyper-activity	Academic Ability	Home Supp-ort	Executive Function
ELA EOG	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-
Reading Ability	.88**	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-
Math EOG	.74**	.75**	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-
Math Ability	.81**	.87**	.84**	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-
Overall Ability	.76**	.93**	.75**	.91**	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-
Effort	.66**	.66**	.60**	.67**	.72**	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-
Family Involvement	.60**	.60**	.53**	.62**	.67**	.62**	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-
SES	.64**	.64**	.49**	.61**	.68**	.56**	.89**	-	-	-	-	-	-	-	-	-	-	-	-	-	-
Attendance	.42**	.46**	.35**	.45**	.49**	.41**	.52**	.43**	-	-	-	-	-	-	-	-	-	-	-	-	-
Homework	.46**	.53**	.40**	.52**	.59**	.56**	.64**	.60**	.57**	-	-	-	-	-	-	-	-	-	-	-	-
Ready to Learn	.58**	.65**	.54**	.66**	.73**	.74**	.73**	.67**	.55**	.81**	-	-	-	-	-	-	-	-	-	-	-
Rules	.47**	.49**	.43**	.49**	.54**	.69**	.54**	.49**	.48**	.64**	.74**	-	-	-	-	-	-	-	-	-	-
Attention	.60**	.65**	.58**	.67**	.74**	.73**	.67**	.63**	.51**	.68**	.81**	.71**	-	-	-	-	-	-	-	-	-
Self-Regulation	.57**	.63**	.54**	.62**	.69**	.68**	.60**	.57**	.51**	.69**	.79**	.80**	.83**	-	-	-	-	-	-	-	-
Initiative	.59**	.67**	.58**	.69**	.74**	.74**	.66**	.61**	.44**	.68**	.81**	.68**	.86**	.80**	-	-	-	-	-	-	-
Flexibility	.45**	.51**	.45**	.51**	.59**	.56**	.50**	.46**	.53**	.63**	.72**	.74**	.75**	.86**	.76**	-	-	-	-	-	-
Social Skills	.52**	.52**	.48**	.52**	.55**	.53**	.50**	.51**	.47**	.58**	.67**	.54**	.61**	.62**	.60**	.61**	-	-	-	-	-
Hyperactivity	.30**	.30**	.44**	.38**	.37**	.36**	.23**	.14*	.35**	.44**	.46**	.51**	.44**	.46**	.36**	45**	.35**	-	-	-	-
Academic Ability	.87**	.97**	.82**	.93**	.94**	.70**	.66**	.64**	.43**	.49**	.66**	.47**	.68**	.62**	.70**	.50**	.58**	.30**	-	-	-
Home Support	.64**	.69**	.54**	.67**	.72**	.71**	.91**	.86**	.69**	.82**	.87**	.62**	.74**	.70**	.73**	.62**	.74**	.27**	.70**	-	-
Executive Function	.57**	.65**	.62**	.66**	.71**	.74**	.57**	.51**	.52**	.69**	.82**	.77**	.89**	.92**	.87**	.88**	.75**	.60**	.67**	.74**	-
Social Adaptability	.66**	.67**	.59**	.68**	.73**	.88**	.67**	.62**	.54**	.68**	.86**	.88**	.81**	.84**	.81**	.73**	.83**	.44**	.69**	.81**	.87**

* significant at $p < .05$
** significant at $p < .001$

Table 3

Stepwise Linear Regression Model to Predict English Language Arts/Reading End-of-Grade Test Scores: Brief Behavior, Academic, and Social Screener Items

Predictor	R^2 change	β	*SEb*	*F* change	*P* <
Reading Ability	.77	.808	.058	654.44	.001
Effort	.01	.148	.061	8.8	.003

Table 4

Stepwise Linear Regression Model to Predict Mathematics End-of-Grade Test Scores: Brief Behavior, Academic, and Social Screener Items

Predictor	R^2 change	β	*SEb*	*F* change	*P* <
Math Ability	.574	.753	.060	263.63	.001
Hyperactivity	.026	.214	.066	12.82	.001

Table 5

Stepwise Linear Regression Model to Predict English Language Arts/Reading End-of-Grade Test Scores: Brief Behavior, Academic and Social Screener Composites

Predictor	R^2 change	β	*SEb*	*F* change	*P* <
Academic Ability	.770	.939	.052	656.54	.001
Social Adaptability	.005	.360	.099	4.08	.05
Executive Function	.010	-.287	.094	9.36	.005

Table 6

Stepwise Linear Regression Model to Predict Mathematics End-of-Grade Test Scores: Brief Behavior, Academic, and Social Screener Composites

Predictor	R^2 change	β	*SEb*	*F* change	*P* <
Academic Ability	.633	1.160	.130	337.34	.001
Overall Ability	.010	-.388	.142	5.33	.005
Executive Function	.010	.315	.097	5.76	.005
Home Support	.009	-.211	.091	5.33	.005

Table 7

Classification Accuracy of Brief Behavior, Academic, and Social Screener Items

Outcome Variable	True Positive	True Negative	False Positive	False Negative	Classification Accuracy
ELA EOG Score	67	119	9	3	93.9%
Math EOG Score	44	125	20	9	85.4%

Table 8

Classification Accuracy of Brief Behavior, Academic, and Social Screener Composites

Outcome Variable	True Positive	True Negative	False Positive	False Negative	Classification Accuracy
ELA EOG Score	67	117	9	5	92.9%
Math EOG Score	48	133	12	5	91.4%

Figures

		Academic Ability		Home Support					Executive Functions					Social/Emotional Adaptability		
ID #	Overall Cognitive Ability*	Reading Ability	Math Ability	Family Involvement	SES	Attendance	Homework Completion	Ready to Learn	Self-Regulation	Initiative	Flexibility	Attention	Hyperactivity	Social Skills	Compliance with Rules	Effort

Figure 1

Brief Behavior, Academic, and Social Screener (B-BASS)

Please rate students using a scale of 1 through 5 in each category represented on the screening form by comparing each student to classroom peers. Use the following scale for ratings:

Score	Qualitative Descriptor
1	Well Below Expectations
2	Below Expectations
3	Meets Expectations: Typical for Age/Grade
4	Above Expectations
5	Well Above Expectations

Reading Ability: student's academic ability in Reading.
Math Ability: student's academic ability in Math.
Overall Cognitive Ability: student's overall cognitive ability.
Family Involvement: student's family is involved at school (e.g., attends meetings, volunteers)
Socioeconomic Status: student's socioeconomic level based on his/her family's SES (may be determined by whether student receives free/reduced lunch)
Attendance: student's presence at school
Homework Completion: student's homework is completed and returned
Ready to Learn: student arrives at school with needs met (e.g., having taken prescribed medication, slept for an adequate time, eaten breakfast at home or at school)
Self-Regulation: student controls his or her own impulses and behavior
Flexibility: student handles change, transition easily
Initiative: student independently attends to classroom responsibilities (e.g., work initiation, morning routine)
Attention: student is able to attend to instruction and tasks
Hyperactivity: student's level of activity
Social Skills: student's interpersonal relationships
Compliance with Rules: student follows school/classroom rules
Effort: student works hard/persists on tasks

Figure 2.

Teacher Instructions for Completion of Brief Behavior, Academic, and Social Screener

Vita

Trisha Franklin graduated from the University of North Carolina, Greensboro, in May 2007, with a Bachelor of Science degree in Human Development and Family Studies. In August 2013, Trisha earned her Master of Education degree in School Psychology from The College of William & Mary in Williamsburg, Virginia. Trisha will complete her pre-doctoral internship with the Munroe-Meyer Institute Pediatric Feeding Disorders Program at the University of Nebraska Medical Center in June 2017, and will graduate from the University of Tennessee, Knoxville, with a Doctor of Philosophy degree in School Psychology in August 2017. Following her graduation, Trisha will begin a one-year postdoctoral fellowship in Pediatric Psychology at Nemours/A.I. duPont Hospital for Children in Wilmington, Delaware.