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Cognitive and Noncognitive Measures as Predictors of Student Success at an Independent School

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Philadelphia College of Osteopathic Medicine

Department of Psychology

COGNITIVE AND NONCOGNITIVE MEASURES AS PREDICTORS OF
STUDENT SUCCESS AT AN INDEPENDENT SCHOOL

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Submitted in Partial Fulfillment of the Requirements for the Degree of

Doctor of Psychology

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**PHILADELPHIA COLLEGE OF OSTEOPATHIC MEDICINE
DEPARTMENT OF PSYCHOLOGY**

Dissertation Approval

This is to certify that the thesis presented to us by Sharron J Russell on the 1st day of February, 2016, in partial fulfillment of the requirements for the degree of Doctor of Psychology, has been examined and is acceptable in both scholarship and literary quality.

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Abstract

Predicting academic success is an important aspect of education, but is of particular interest for educators and admissions officers at independent schools. This study, conducted using archival data at an independent school in the Philadelphia suburbs, used hierarchical regression analysis to determine whether cognitive measures could predict student GPA, whether measures of noncognitive traits (Grit, Conscientiousness, Openness, and Emotional Intelligence) could improve the prediction of GPA, and whether cognitive skills predict to any of the noncognitive traits. The most significant finding ($p < .01, f^2 = .52$) is that scores on the Wechsler scales combined with scores on noncognitive measures are good predictors of GPA. The noncognitive traits of Conscientiousness and Emotional Intelligence (as measured by the Understanding and Managing scales of the MSCEIT-YV) are the most predictive of GPA. Also of interest to those in independent schools will be that the number of years that students attend the school is a positive predictor of GPA, as well of Grit and Conscientiousness. Also of note is the negative relationship between Wechsler scores and Grit, and between Wechsler scores and Conscientiousness.

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Chapter 1: Introduction

Nonpublic schools serve a wide variety of students in the United States.

Independent schools are nonprofit private schools that are self-determining in mission and program. They are governed by independent boards and are funded primarily through tuition, charitable contribution, and endowment income (National Association of Independent Schools [NAIS], 2014). While access to a free, appropriate public education is a right under federal educational statutes, many parents choose to send their child (ren) to one of the 1,400 independent schools in the United States (NAIS, 2014) or to other private/parochial tuition-charging schools. Paying private school tuition does not waive the taxpayer responsibility to the local school district, so parents choosing private schools pay tuition in addition to their school taxes. In order to maintain enrollment, private schools must provide a product and service that warrant this type of expenditure. Independent schools must provide academically rigorous environments that attend to each student's individual interests and needs. As such, admission to these schools can be highly selective, and enrollment is often a life-changing decision for the students and families.

Ensuring that accepted students are the best candidates for the school is an essential role of admissions officers/directors of enrollment management. According to a survey conducted by the Secondary School Admission Test Board (SSATB) for their *Think Tank on the Future of Assessment* (2013), admission tools used by independent schools include current grade point average (GPA), teacher recommendations, in-person interviews, essays/writing samples, phone/Skype interview, group interaction with other students, and standardized testing. With the exception of standardized testing and GPA,

these admission tools are not typically quantifiable and are used as qualitative, though equally important, information about the applicant.

As would be expected, the literature includes a body of research on the use of standardized tests to predict academic performance. According to the SSATB Think Tank Survey, the most commonly used standardized tests for independent-school admissions are the Secondary School Admission Test (SSAT), the Independent School Entrance Exam (ISEE), and the Wechsler Intelligence Scale for Children, Fourth Edition (WISC-IV; (SSATB, 2013a). The SSAT and ISEE are group administered and have sections related to verbal reasoning, quantitative reasoning, reading comprehension, and mathematics, as well as an unscored writing sample. The WISC-IV is an independently administered test of cognitive ability that includes verbal reasoning, perceptual reasoning, working memory, and processing speed, but does not include any measure of academic achievement. The literature on the predictive validity of cognitive testing to academic achievement and academic success is strong (Hogan et al., 2010; Kuncel, Hezlett, & Ones, 2004; Spinath, Spinath, Harlaar, & Plomin, 2006; Wechsler et al., 2004); however, few scientific studies have been conducted to determine the predictive ability of the Wechsler test for independent school success.

Noncognitive Factors in Student Success

Those involved in education at any level, and particularly those involved in admissions, are becoming increasingly interested in improving, assessing, and quantifying noncognitive factors. The October 2015 edition of *Educational Leadership* (published by Association for Supervision and Curriculum Development) focused

exclusively on the topic of “Emotionally Healthy Kids,” including articles on the importance of emotions, self-control, and mindful learning. The Collaborative for Academic and Social Emotional Learning and the Yale Center for Emotional Intelligence are two examples of growing academic centers that provide training, technical assistance, cutting-edge research, and best practices in the cultivation of noncognitive traits in schools. Additionally, a search of the popular press provides copious evidence of the recent focus on the emotional health of students, including but not limited to, articles in the *New York Times* on social/emotional learning and social skills (“Teaching Social Skills to Improve Grades and Lives” [July 2015] and “Teaching Peace in Elementary School” [November 2015]) and in the *Washington Post* (“Why It’s [Long Past] Time for Social and Emotional Learning” [December 2013]).

Within independent schools, the Think Tank survey (previously noted) found that self-control, curiosity, locus of control, problem solving, creative thinking/creativity, initiative, competitiveness, ethical judgment, and self-efficacy (SSATB, 2013a) are most sought after in students. Additionally, Kiley and Gable (2013a) in their study of admissions counselors’ perceptions of student success found that independent schools are seeking students with creativity, curiosity, critical thinking, and problem solving within the cognitive domain; conscientiousness, self-awareness, awareness of and concern for others, and humor in the affective domain; and ability to listen and communicate effectively, resilience, and collaborative skills within the behavioral domain. Some work has also been done to establish the relationship between GPA, standardized testing, and noncognitive assessment in predicting academic success in an independent school

(Grigorenko et al., 2009; Ivcevic & Brackett, 2014); however, the literature is limited on this subject. The ability to understand students' noncognitive traits and to determine which are most predictive of academic and lifelong success is both timely and important for all educators.

As would be expected, the current psychological and educational literature is replete with theories, assessments, and predictors of success that are based on cognitive and noncognitive factors. Those reviewed for this study, as previewed here, include some of the most influential at present in the fields of psychology and education. Carol Dweck's (2006) approach known as *Growth Mindset*, must be included in any review of this literature. Influential on practicing educators, Dweck's work has clearly become part of the educational jargon and is becoming more widely accepted in the pedagogy. Clearly based in the tenets of cognitive therapy, Dweck's research has found that people with a growth mindset create their own success through effort and a belief in what is possible (SSATB, 2013a).

A review of the literature on success would not be complete without inclusion of Robert Sternberg's work. His approach to *Successful Intelligence* through the most recent iteration of WICS theory (wisdom, intelligence, and creativity synthesized) has influenced the work of many psychologists and educators from elementary schools to universities. He believes that schools should produce not only competent and responsible citizens, but also people who have the wisdom to use responsible reasoning and moral judgment (Grigorenko et al., 2009).

The theory of self efficacy beliefs in self-regulated learning (SESRL), based on

the work of social cognitive theorists, such as Bandura, Zimmerman, and others, has been used by at least one independent school in the development of its noncognitive assessment for admissions. The primary assumptions of SESRL are that believing in one's ability (self-efficacy) is central to learning, that students are active participants in the learning process, that students control (ideally) their ability to regulate their own thinking and behavior, that students can set goals for their own learning, and that learning environments and students interact dynamically (Grigorenko et al., 2009).

The concept of the *Big Five* personality characteristics (extraversion, agreeableness, conscientiousness, neuroticism, and openness) and whether these personality traits can predict academic success has a large body of research. Much of the data suggesting that *Big Five* traits are correlated to academic performance use GPA or standardized testing as the outcome variable and has determined that conscientiousness is the best predictor of academic success (Heaven & Ciarrochi, 2012; Nofle and Robins, 2007;).

Emotional intelligence (EQ), as defined by the work of Daniel Goleman as well as of Mayer, Salovey, Caruso, and Brackett, has been embraced by the public and the media for more than a decade. Used by *Harvard Business Review* and researched at Yale's Center for Emotional Intelligence, EQ has become a term used in the popular vernacular. EQ is most simply defined as perceiving, using, understanding, and managing emotions (Salovey & Grewal, 2005), and the application and expansion of these skills are a thriving industry. Recent studies show that students who participate in EQ programs have higher year-end grades and higher teacher ratings of social and emotional competence

(e.g., leadership, social skills, and study skills) as compared to students in a control group (Brackett, Rivers, Reyes, & Salovey, 2012).

Out of the University of Pennsylvania, Angela Duckworth's theory of *Grit* has also gained recognition in the popular press and educational literature. Defined as "trait-level perseverance and passion for long-term goals" (Duckworth & Quinn, 2009, p. 166), grit has been found to predict a wide variety of definitions of success, including retention at West Point and being a finalist in the National Spelling Bee (Duckworth & Quinn, 2009).

As will be evident from the thorough review of the literature, research that has been conducted to prove the validity of these theories has typically used student GPA or standardized test scores as the evidence that the qualities being described correlate and/or predict student success. This study will follow the literature but also attempts to determine if one can predict noncognitive traits.

Statement of the Problem

At The School (not named for the purposes of this dissertation study), success is not defined solely by academics. Recent work completed to improve branding and marketing efforts found that parents, students, teachers, administrators, and alumni of The School defined success more broadly than just academic success. While academic success is important, the studies revealed that character, individuality, creativity, confidence, and relationships are equally important in giving meaning to the concept of success. Work conducted by a marketing firm in 2011-2012 with all of the School constituencies found that three ideals emerged as central: confidence to explore,

creativity in all, and deeply rooted learning (Brownstein, 2014). These ideals are clearly related to many of the noncognitive characteristics and traits already discussed.

Purpose of the Study and Hypotheses

As has been noted several times already, much of the current research uses GPA or standardized test scores to predict academic success AND to validate the alternative theories of success. Apparently, the literature, particularly the work relevant to independent-school admissions, would benefit from some additional research in how the noncognitive skills and traits relate to cognitive ability and academic success. As such, this study aims to answer the following questions: a) Do measures of cognitive skills completed for school admission predict academic success? b) Do measures of noncognitive skills improve the prediction of academic success? c) Do measures of noncognitive skills predict academic success? d) Do measures of cognitive skills predict noncognitive skills?

For each of the research questions proposed, a hypothesis has been established. For the initial research question, “Do measures of cognitive skills completed for school admission predict academic success?” the primary hypothesis is that Wechsler tests will predict GPA. The number of years at the school (a demographic variable) is also expected to predict GPA. This is based on the theory that students who receive the foundational skills provided at The School will have stronger academic performance in their high school years than those students who did not gain those skills.

For the second question, “Do measures of noncognitive skills improve the prediction of academic success?” the addition of noncognitive measures to the

standardized test data is generally expected to not improve the robust predictive power of the Wechsler tests. Based on the literature, IQ tests are considered the best predictor of GPA.

The third question, “Do measures of noncognitive skills predict academic success?” is expected to return some predictive value. Given the findings of numerous researchers that noncognitive skills are important for success in school (and life), one would anticipate that a relationship would exist in this study between the noncognitive measures (i.e. grit, personality characteristics, EQ,) and student GPA. Specifically, it is hypothesized that higher scores on the Grit scale and Conscientiousness scale within the Big Five personality scale will predict to higher GPA.

The final question, “Do measures of cognitive skills predict noncognitive skills?” is expected to reveal that the standardized tests have little to no predictive value. In the research conducted by the authors of the WISC, a test of EQ was included to show that the constructs of intelligence as measured by the WISC were not the same as the constructs that make up emotional intelligence (Wechsler et. al., 2004). Although current schools of thought differ on this concept, it is hypothesized that there will be little to no relationship between these variables in the current study; however, it will be interesting to see if any of the variables are predictive of noncognitive skills.

Chapter 2: Review of the Literature

Introduction

The literature is scarce on the type of admissions process that is most predictive of success in independent schools. The literature reviewed for this study, therefore, will focus on the limited research related to the cognitive/academic measures included in the current admissions process and the current major theories related to noncognitive measures that are purported to predict both school and lifelong success.

The Admissions Process

The major factors in the admissions process at The School (as well as many other independent schools) include standardized testing, prior school GPA, and teacher recommendations (SSATB, 2013a). While the school also considers other factors (interview/visit to school, diversity, family legacy), these factors will not be discussed in this review as they are difficult to quantify and no literature shows that they specifically predict to student success. As discussed in the Introduction, independent schools use one of the three standardized tests: the Secondary School Admissions Test (SSAT), the Independent School Entrance Exam (ISEE), and/or one of the Wechsler tests, such as the Wechsler Intelligence Scale for Children, Fourth Edition (WISC-IV).

Secondary School Admission Test. Since 1957, the SSAT has been offered to students who are interested in being admitted to an independent school. It is currently available for students in Grades 4 to PG (post-graduate year following senior year of high school) in the U.S., Canada, and worldwide (SSATB, 2013b). The *2013-2014 Interpretive Guide* proposes that the SSAT provides “independent school admission

professionals with meaningful information about possible academic success of potential students at their institutions, regardless of the students' background or experience” (SSATB, 2013a, p. 4).

Ultimately, the validity of the SSAT depends on how it is used by the individual school. In 1967, Schuerger and Dizney studied the ability of the first edition of the SSAT to predict ninth-grade GPA at a private boys school in Ohio. In addition to SSAT Reading, Verbal, and Quantitative scores, researchers analyzed how prior school GPA, IQ scores, and an untimed writing test correlated with and predicted the students' grades in English, Latin, algebra, and total ninth-grade GPA (Schuerger & Dizney, 1967). They concluded that eighth-grade GPA, IQ, and the Quantitative score on the SSAT were the best predictors of ninth grade GPA and that the SSAT Quantitative scores and mathematics grades more highly correlated with both Latin grades and GPA than the SSAT Verbal scores (Schuerger & Dizney, 1967). Reported in Schuerger and Dizney, a 1962 study conducted by the Educational Testing Service, the original developer of the SSAT, found strong correlations (.41 to .68) between the SSAT total score and ninth-grade GPA at two independent schools (Pitcher, 1962 as cited in Schuerger & Dizney, 1967). Thus, early data suggest that the SSAT, particularly the Quantitative score, has a solid relationship to academic outcome as measured by GPA. Additionally, the SSAT states that “the user school should conduct its own validity study whenever possible” (SSATB, 2013b, p. 24) and the SSATB currently provides a validity study service to all member schools.

In 2009, Grigorenko et al. conducted a two-part study to determine whether GPA

and SSAT scores could adequately predict academic success at an independent school, or whether additional noncognitive factors could enhance that prediction. While this work will be reviewed in greater detail in a later section relating to the noncognitive factors, the results relating to the predictive value of the SSAT are included in this section. Several regression analyses were used, the first of which included only the SSAT scores and the PACE (a noncognitive measure of psychology, abilities, competencies, and expertise) as predictors of high-school GPA. The SSAT scores explained about 15% of the variance in GPA, and the introduction of the PACE scores explained an additional 17% of the variance in GPA (Grigorenko et al., 2009). The second equation included SSAT scores and middle-school GPA, and then added the PACE indicators. This analysis found that SSAT scores and middle-school GPA explained 34% of the variance in high-school GPA and that PACE scores added about 8% more of the variance (Grigorenko, et. al., 2009). Even though the purpose of this work was not to validate the SSAT, the SSAT evidently can be considered a good predictor of high-school GPA.

More recently, Kiley and Gable (2013b) validated the SSAT using GPA, PSAT, and SAT scores. Their review of the literature found that current SSAT validity data are based on a 1985 study published by the Educational Testing Service (ETS). Through the authors' correspondence with the SSATB, they were informed that the test content has remained the same since 1985; thus, the information from the 1985 study was adopted to support the content validity of the test development process (Kiley & Gable, 2013b). The 1985 predictive validity, based on relationships between the SSAT scores and GPA for 1,182 students from 21 schools, indicated that the multiple correlation of the SSAT

scaled scores and GPA was $R = .56$ ($R^2 = .31$, effect size=large; Kiley & Gable, 2013b). In their 2013 study, Kiley and Gable found that the SSAT was highly predictive of end-of-ninth-grade GPA scores with correlations of .51 (SSAT Verbal), .54 (SSAT Quantitative), .51 (SSAT Reading), and .61 (SSAT Total) and that all relationships were associated with large effect sizes. Multiple regression analysis of the SSAT indicated that the SSAT Quantitative and SSAT Verbal tests explained a significant amount of the variation in the end-of-ninth-grade GPA ($R^2 = .366$), which was also associated with a large effect size (Kiley & Gable, 2013b). Because the SSAT Reading test was highly correlated (.75) with the SSAT Verbal test, it did not add significantly to the variance in the GPA scores. Kiley and Gable (2103b) also identified the correlations of SSAT scores to Grade 11 PSAT and Grade 12 SAT scores: The SSAT Verbal and PSAT Reading were highly correlated ($r = .76$) as were the SSAT Reading and PSAT Reading ($r = .72$), with large effect sizes. The SSAT Verbal and SSAT Reading had moderate correlations to the PSAT Quantitative ($r = .41$ and $r = .43$), while the SSAT Quantitative correlated highly to the PSAT Quantitative ($r = .79$). For Grade 12 SAT scores, the SSAT Reading and SAT Reading were highly correlated ($r = .71$), as were the SSAT Quantitative and SAT Quantitative ($r = .80$), while the SSAT Verbal and SSAT Reading had lower-than-expected correlations to the SAT Quantitative ($r = .32$, $r = .38$).

In summary, the SSAT has a more than fifty-year history as a test of admissions for independent schools. The handful of studies that have been conducted indicate that the SSAT can be used to predict academic performance, specifically high-school GPA, and performance on other standardized tests. Additionally, independent schools can

secure individual validity studies directly from the SSATB, so as to be certain that interpretations and predictions based on the test are accurate. Note that no studies compare the SSAT to any of the other standardized tests (ISEE or WISC-IV) used for independent school admission.

Independent School Entrance Examination. The ISEE is published by the Educational Records Bureau (ERB), a non-profit organization founded in 1927. The first edition was published in 1989, the second edition in 1999, and the third edition in 2009 (ERB, 2010). The third edition was revised by ERB in consultation with Measurement Incorporated and with assistance from faculty of ERB member schools (ERB, 2012). The ISEE states that it is “unique in that it is used for admission purposes only and its norms are based only on applicants to independent schools” (ERB, 2012, p. 10). The three levels of the ISEE allow students seeking admission to Grades 5 or 6 to take the Lower Level; students seeking admission to Grades 7 or 8 to take the Middle Level; and students seeking admission to Grades 9–12 to take the Upper Level (ERB, 2012).

As mentioned at the outset of this discussion, the ISEE is only one possible factor in the admissions process at an independent school; however, the ISEE allows admissions staff to compare performance on the test relative to other applicants as well as to a normative group that includes recent test takers (ERB, 2010). One published study stated that the authors were using either SSAT or ISEE to predict academic success in a secondary school, but the authors did not differentiate between the two tests and used the term SSAT in the data tables, making unclear whether or not the ISEE was actually used in the study (Grigorenko et al., 2009). If the ISEE was used, it cannot be differentiated

from the SSAT. An inquiry has been placed with one of the study's authors, and information will be included if it becomes available. A recent study, presented as part of the Association of Independent School Admission Professionals spring webinar series, that was conducted by The Bishop's School, looked at the data trends at the school and whether admitted students achieved a GPA that was commensurate with their ISEE scores (Peckham, 2014). The findings, which did not include a literature review, methodology, or formal discussion, indicate that the students who entered in high school had less fluctuation in GPA (better or worse) than did the students who entered in middle school, that students who entered the school in middle school were better able to make changes (both positive and negative), that girls were better able to make positive changes from a lower ISEE score, and that boys tended to underperform based on expectations from their ISEE scores (Peckham, 2014).

Although the ISEE has been extensively researched and validated by its publisher and widely respected by the independent schools that use it, at this time, there are no formal, independent studies of the ISEE as a predictor of academic success, no studies comparing the ISEE to the other standardized tests used in admissions, and no formal studies showing that the test is an effective predictor of independent-school success.

Wechsler Intelligence Scale for Children, Fourth Edition. The final standardized assessment used for admissions purposes is the WISC-IV. The WISC-IV, as noted previously, is an independently administered test of cognitive ability that includes verbal reasoning, perceptual reasoning, working memory, and processing speed. It is based on the theory that intelligence is a global entity, because it characterizes the

individual's behavior as a whole, and it is also comprised of specific factors, because it is composed of elements or abilities that are distinct from each other (Wechsler et al., 2004). The reliabilities of the WISC-IV subtests range from .79 to .90, while the composite scales range from .78 to .88 (Wechsler et al., 2004). There is internal consistency reliability data for special populations, such as intellectually gifted, intellectually disabled, and reading disordered. The validity of a test, as mentioned previously, relates to whether evidence supports the use of the test for the intended purposes. More than 60 years of research exists in support of the Wechsler scales' ability to predict intellectual disability and learning disabilities, to determine placement in special programs, to assist with clinical intervention, and to be used as part of neuropsychological evaluation (Wechsler et al., 2004).

Although no research has been conducted by the publishers of the WISC regarding its utility for independent-school admissions, numerous studies provide evidence for the linkage between the WISC-IV and tests of academic achievement (Wechsler et al., 2004). Wechsler believed that academic achievement, executive functioning, and motor skills may influence performance on intelligence tests but are best measured by instruments designed to measure these domains separately (Wechsler et al., 2004). The publishers of the WISC-IV report correlation coefficients between the Full Scale IQ (FSIQ) and the Total Achievement score on the Wechsler Individual Achievement Test, Second Edition (WIAT-II) as .87, while the Verbal Comprehension Index (VCI) is reported as .80 (Wechsler et al., 2004). The Perceptual Reasoning Index (PRI) and Working Memory Index (WMI) Indices each had a correlation of .71 to the

Total Achievement score, and the Processing Speed Index (PSI) is at .58 (Wechsler et al., 2004). The VCI score correlates highly with the Reading and Oral Language composites of the WIAT (.74, .75, respectively), the PRI score with the Mathematics composite (.67), the WMI with the Reading composite (.66), and the PSI with the Written Language composite (.55; Wechsler et al., 2004).

The test publishers also provide numerous correlations to other psychological tests to provide evidence of both convergent and divergent validity of the WISC-IV. Of interest to this study was the correlation with the Gifted Rating Scale School Form (GRS-S), a scale completed to assess giftedness in six domains: Intellectual Achievement, Academic Ability, Creativity, Artistic Talent, Leadership, and Motivation (Wechsler et al., 2004). The data show that each of the WISC-IV composite scores correlates more strongly with Intellectual and Academic Ability than with the other GRS-S domains, while regression analysis suggests that the GRS-S can improve the prediction of academic achievement above and beyond the FSIQ (Wechsler et al., 2004). Also of interest to this study was the correlational study of the WISC-IV and the BarOn EQ scale. The publishers found very little correlation between the composite scores of the WISC-IV and the qualities measured on the BarOn EQ scale (Intrapersonal, Interpersonal, Stress Management, Adaptability, and Total EQ), with the highest correlations between FSIQ and Adaptability ($r = .34$), PRI and Adaptability ($r = .31$), and FSIQ and Total EQ ($r = .31$; Wechsler et al., 2004). The authors report these correlations as evidence of the “divergent validity between the constructs of cognitive and emotional intelligence” (Wechsler et al., 2004, p. 72). Within the same study, some children were also

administered the WIAT-II. Regression analysis results suggest that the “BarOn EQ scales may account for some additional variance in the prediction of WIAT-II achievement scores beyond the FSIQ” (Wechsler et al., 2004, p. 72) and suggest that further research should take place in this area. The proposed study will provide some of this “further research” and will attempt to refute the concept that EQ and traditional intelligence are completely unrelated.

Independent research of the predictive validity of cognitive ability or IQ tests to academic achievement is plentiful. A 2004 meta-analysis by Kuncel et al. found that cognitive ability instruments measure abilities shared by other assessments of cognitive ability and that these abilities are good predictors of academic and vocational success. Although the focus of this meta-analysis was on the Miller Analogies Test, the authors reported that “a century of scientific research” including the work of Spearman, Gottfredson, Jensen, Carroll, and others has shown that general cognitive ability predicts academic achievement, among other life outcomes (Kuncel et al., 2004, p. 148). The most robust finding of this meta-analysis is that the Miller Analogies Test predicts to GPA ($N = 11,368$) with a true-score correlation of .39 (Kuncel et al., 2004). Although the term *intelligence* has a variety of meanings to people, most definitions of intelligence include “the ability to learn” (Spinath et al., 2006, p. 364). When studying how general cognitive ability and self-perceived ability predict school achievement (English, mathematics & science), researchers found that cognitive ability “proved to be the strongest, and, in the case of Science, the only predictor of school achievement” (Spinath et al., 2006, p. 363). Correlations between intelligence scores and achievement scores

ranged from .44 to .49, and regression analysis indicated that cognitive ability accounted for a significant portion of the variance ($R^2 = .25$) in student achievement scores (Spinath et al., 2006). Across a variety of studies, IQ has been found to be one of the best predictors of GPA, typically reported as accounting for 10 to 20% of the variance in GPA (Hogan et al., 2010). As will be documented throughout this literature review, GPA is one of the most common outcome measures of academic success, for both cognitive and noncognitive predictive variables.

Additional Factors Used in Admissions. As mentioned in the Introduction, independent schools use a variety of factors in the admissions process - grades or transcript (98%), teacher recommendations (96%), in-person interviews (94%), essays/writing samples (89%), phone or Skype interviews (67%), and group interaction with other students (51%; SSATB, 2013a). The research, albeit minimal, on the most commonly used standardized tests as predictive of student success in the independent-school admissions process has been discussed in the previous section of this review; however, research on the other factors as they predict to student success in independent-school admissions is even more scarce. One study was found that used prior year GPA as a factor in predicting academic success in an independent secondary school (Grigorenko et al., 2009); however, its primary research question was whether or not noncognitive factors could improve the prediction of success at an independent school. The authors noted that although the students applying to the school submit middle-school GPAs, SSATs, and teacher recommendations that are very similar, the students' subsequent performance at the school can be quite diverse. Their general findings indicate that the

prior year GPA was a significant predictor of first-trimester GPA ($p < .001$) but that the “predictive validity of middle-school GPA and standardized tests can be enhanced by the introduction of additional noncognitive measures” (Grigorenko et al., 2009, p. 980). These noncognitive measures will be discussed in the definitions of success later in this review.

Many researchers have used the construct of GPA as a measure of academic success. As reported in Hogan et al. (2010), a relationship exists between GPA and life success, in addition to well-being in adolescence and adulthood. High GPA has been found to predict academic attainment, employment rates, and employment success, while low GPA has been correlated to substance abuse, suicide risk, psychological disorders, and generally poor adult outcomes (Hogan et al, 2010). As such, independent schools obviously would be interested in GPA.

The other quantifiable factor used in independent school admission, teacher recommendations, has not been formally studied as to whether it provides any predictive value in the success of students. This study had planned to include data on teacher recommendations and how they might correlate or predict to student success; however, these documents are shredded by The School 1 year after the student is admitted, and thus were not available to this researcher.

Defining and Predicting Success

The next conundrum for admissions officers at independent schools is determining the noncognitive variables that contribute to and define student success. As noted in the Introduction, numerous theories of personality and character traits have been

linked to improved academic achievement and success. The theories that will be reviewed here are as follows: growth mindset (based on the work of Carol Dweck), successful intelligence/WICS (based on the work of Robert Sternberg), self efficacy beliefs in self-regulated learning (based on the theories of Alfred Bandura), grit (based on the theory of Angela Duckworth), Big Five personality characteristics (based on the work of Lewis Goldberg), and emotional intelligence (based on the works of Daniel Goleman, as well as of Mayer, Salovey, Caruso and Brackett).

Growth Mindset. Dweck's theory of the growth mindset is well documented in her book, *Mindset, The New Psychology of Success* (2006). Dweck has studied the fixed mindset, under which people believe that their skills and capacities are unchanging and innate; therefore, success or lack of success comes from their natural ability. On the other hand, the growth mindset purports that innate ability is one part of the equation, but that success is created through effort and the perception of what is possible (SSATB, 2013a). According to Dweck, "success is about being your best self, not about being better than others; failure is an opportunity, not a condemnation; (and) effort is the key to success" (Dweck, 2006, p. 44). The growth mindset clearly is part of The School's definition of success. Particularly for adolescents, students with a growth mindset take advantage of the opportunities to learn new subjects to find out what they like and do not like and to think about what they might do in the future (Dweck, 2006).

The mindset approach is similar to many of the tenets of cognitive-behavioral therapy in that thoughts impact feelings, feelings impact thoughts, and thoughts and feelings impact behavior. Dweck's work provides the backdrop for how other researchers

have conceptualized their own work and how independent schools and their admissions officers are beginning to view the noncognitive aspects of potential students. Two researchers, Dr. Camille Farrington and Dr. Carissa Romero, are building on the work of Dweck. Farrington, at the University of Chicago, is developing an assessment for each of the *academic mindsets*, which she defines as “social skills, academic perseverance, and learning strategies” (SSATB, 2014, p. 4). Romero, at Stanford University, is the associate director of the Project for Education Research That Scales (PERTS) program, “an applied research center which promotes academic motivation to raise student achievement on a large scale” (SSATB, 2014, p. 5). The PERTS program offers both a free, online program to schools that surveys how students think about school and a program of study about the brain and the concept of the growth mindset. PERTS then uses student performance data to determine whether the instruction in the growth mindset influenced academic performance (SSATB, 2014). Neither researcher conceptualizes either of these cutting-edge assessments as part of an admissions process and both are “wary of using academic mindsets as selection criteria for school” (SSATB, 2014, p. 5). As such, the growth mindset and subsequent assessment approaches are included here as foundational information but will not be part of the noncognitive variables collected in this study.

Successful Intelligence. Sternberg’s work on human intelligence has spanned 3 decades and his work on *successful intelligence* and the WICS model are the most relevant for this review. As defined by Sternberg and a frequent collaborator, Elena Grigorenko, successful intelligence is “the use of an integrated set of abilities needed to attain success in life, however an individual defines it, within his or her sociocultural

context” (Sternberg & Grigorenko, 2004, p. 274). The path to intelligence is shaped individually, and people with successful intelligence “adapt to, shape, and select environments” (Sternberg & Grigorenko, 2004, p. 274). However, a psychological theory or construct does not become part of the vernacular until it can be measured. Sternberg’s Triarchic Abilities Test (STAT), first published in 1996, attempts to measure analytical, creative, and practical abilities, which are the key factors in successful intelligence (Sternberg & Grigorenko, 2004). Additional research and refinement led Sternberg to propose the WICS theory (Grigorenko et al. 2009). Schools that utilize the WICS theory “provide a basis for turning out competent and responsible citizens” (Grigorenko et al., 2009) who have well-developed cognitive abilities but also demonstrate the responsible reasoning and moral judgment that are essential to wisdom.

As a parent of a student at an independent school, Sternberg along with Yale’s PACE (Psychology, Abilities, Competencies, Expertise) Center assisted Choate Rosemary Hall in Wallingford, CT, in developing its own tool for measuring the noncognitive attributes of its applicants. Known as the Choate Self-Assessment, the 40-item, self-report questionnaire focuses on self-efficacy, locus of control, and intrinsic or extrinsic academic motivation (SSATB, 2013a). The school has been using the new assessment (which is optional for applicants, although 90% complete it voluntarily) for 2 years and is still sifting through the results of their efforts. Now partnered with the Yale Child Study Center and Dr. Grigorenko, Choate is tracking the long-term achievement of the students. One finding they have noted is that both international students and students of color score lower than other students on the self-efficacy scales, which has led them to

analyze the overall battery using demographic subgroups (SSATB, 2013a). Sternberg has also worked with Phillips Academy in Massachusetts to develop an admissions test and to help the admissions committee better utilize the essay questions required for admissions (Grace, 2011). Sternberg believes that “independent schools are places where educators have the freedom and the flexibility to do things that will matter” and thus should be leading the charge on “measuring what matters” (Grace, 2011, p. 68).

Also of interest is the work of Dr. William Sedlacek and colleagues that operationalizes Dr. Sternberg’s theoretical concepts into the Noncognitive Questionnaire (NCQ). In a variety of studies, Sedlacek has established the predictive value of the variables represented in the NCQ to academic performance, particularly for nontraditional or minority students (Sedlacek & Adams-Gaston, 1992). One of the eight variables included in the NCQ is Successful Leadership Experience, which was planned to be included in the non-traditional definitions of success measured in this study, but left out due to difficulty collecting the necessary data. Sedlacek’s studies have shown that “students who are most successful in higher education have shown an ability to organize and influence others” (Sedlacek, 2005, p. 184). As with Dweck’s work noted previously, direct measures of Sternberg’s or Sedlacek’s work were not used in this study but included as important foundational theories for the measures used.

Self-Efficacy. Self-efficacy beliefs in self-regulated learning (SESRL) is based on the work of social cognitive theorists, including Bandura, Zimmerman, and others. In the validation study for the SESRL scale, self-regulated learning is defined as a “metacognitive process that requires students to explore their own thought processes so

as to evaluate the results of their actions and plan alternative pathways to success” (Usher & Pajaras, 2009, p. 443). The belief that one has these capabilities and can use them effectively is the self-efficacy part of the concept (Usher & Pajaras, 2009). Various studies (as cited in Garavalia & Gredler, 2002) have established the relationship between the self-regulatory capabilities of college students and their academic achievement. Garavalia and Gredler (2002) added to the research literature by examining the extent to which learning strategies, previous level of achievement (GPA), and aptitude (SAT score) predict academic achievement. Learning strategies as measured through the SESRL and additional questions related to *external regulation* (defined as the learner’s reliance on external sources for sequencing and organizing his or her studies) were grouped into five factors: General Organization and Planning, Environmental Restructuring, External Regulation, Recall Ability, and Typical Study Strategies (Garavalia & Gredler, 2002). The findings of Garavalia & Gredler (2002) indicate that all predictor variables were significantly related to course achievement; however, only General Organization and Planning, GPA, and SAT score were correlated in the moderate range to the students’ grade earned in the psychology course in which they were enrolled (Garavalia & Gredler, 2002).

Subsequent work using this theory found that the SESRL can predict academic achievement “above and beyond previous academic achievement, gender, SES, intelligence, personality traits, and self esteem” (Zuffiano et al., 2013, p. 160). Academic achievement was defined in this study using a composite measure of grades from all of the academic subjects, which is the equivalent of GPA in other studies. Although the

constructs of self-efficacy and self-regulated learning are important for academic achievement, they are included here for the purpose of reviewing the seminal works in the field of noncognitive factors in academic achievement; however, SESRL will not be used as a variable in this research study, as many of the concepts were measured through other variables and assessment tools.

Grit. While perseverance has been studied as an important character trait, not until 2007 did Duckworth, Peterson, Matthews, and Kelly introduce the concept of grit – “trait-level perseverance and passion for long-term goals” – and then demonstrate that grit predicted achievement better than measures of talent (Duckworth & Quinn, 2009, p. 166). One of the relevant applications of grit was in a study conducted at the U.S. Military Academy, West Point. Even after controlling for SAT scores, high-school GPA/rank, and Conscientiousness (from the Big Five framework), cadets with higher grit scores were less likely to drop out than peers with lower grit (Duckworth & Quinn, 2009). Grit was also found, in four separate samples, to be slightly inversely correlated with intelligence, meaning that as intelligence increases, grit decreases (Duckworth & Quinn, 2009). Although the original tool to measure grit (the 12-item Grit-O) had good validity, Duckworth and colleagues developed a shorter, more efficient measure of grit in the Grit-S: an 8-item scale that continues to validly measure grit along two factors: Consistency of Interest and Perseverance of Effort (Duckworth & Quinn, 2009). The Perseverance of Effort factor has been found to be the stronger predictor of GPA, extracurricular activities, and (inversely) television watching, while the total Grit-S score was a better predictor of retention of West Point cadets and of the finalists in the National

Spelling Bee (Duckworth & Quinn, 2009). In an application of the Grit scale to a progressive charter school and a competitive private school, Duckworth used the Grit scale with middle-school students along with a variety of psychological and IQ tests. At both schools, IQ better predicted scores on the statewide academic achievement tests, while measures of self-control were better indicators of GPA (Tough, 2011). Again, GPA was used as the outcome variable that could be predicted by the character or personality trait. This study used the Grit scale as developed by Duckworth.

Big Five Personality. Personality characteristics, specifically those posited by the Big Five theory of personality, have also been studied in relation to academic outcomes and standardized test scores. Although the idea of a factor structure of personality has been theorized since the early 1900s, Lewis Goldberg was first credited with using the term *Big Five* (Digman, 1990). The five factors now included in the Big Five are Extraversion, Agreeableness, Conscientiousness, Neuroticism, and Openness. A large amount of research has been conducted on the correlation between personality and academic outcomes, specifically as it relates to college students. In their 2007 article, Nofle and Robins conducted a search of the literature and identified 20 studies that utilized the Big Five in a correlation or regression study to predict academic performance via GPA. Their meta-analysis showed that Conscientiousness, defined as having self-discipline, organization, and a drive to achieve, was the best predictor of academic success and grades in college (Nofle & Robins, 2007). In conducting their own research, Nofle and Robins then analyzed whether the Big Five personality traits could be correlated to SAT scores, in addition to college and high-school GPA. Their findings

again demonstrate a positive correlation between Conscientiousness and college GPA, as well as a positive relationship between Openness (often referred to as Openness to Experience) and SAT verbal scores (Nofle & Robins, 2007).

A meta-analysis conducted by Poropat in 2009 found that Agreeableness, Conscientiousness, and Openness are significantly correlated to academic performance; however, Conscientiousness correlated to academic performance even when controlling for intelligence, leading the researchers to conclude that Conscientiousness is the strongest personality factor for predicting academic achievement. Another study (pertinent to this examiner, as it was based on middle- and high-school-age adolescents) examining the interaction between intelligence and personality found that although intelligence was the strongest predictor of future school performance, Conscientiousness was a significant predictor of GPA (Heaven & Ciarrochi, 2012). Findings also indicate that the interaction between Openness (defined as creative, curious, and flexible) and intelligence was a significant predictor of academic achievement, but only for those with higher intelligence (Heaven & Ciarrochi, 2012). Based on the literature and The School's interest in cultivating creativity, the personality constructs of Conscientiousness and Openness will be included in the analysis of whether noncognitive skills and traits can predict student success in the current study.

Emotional Intelligence (EQ). The concept of EQ is an attempt to combine the study of emotions and intelligence. Salovey and Mayer (1990) first defined EQ as “the ability to monitor one's own and others' feelings, to discriminate among them, and to use this information to guide one's thinking and action” (p. 189). The definition was later

revised to “the ability to perceive accurately, appraise, and express emotion; the ability to access and/or generate feelings when they facilitate thought; the ability to understand emotion and emotional knowledge; and the ability to regulate emotions to promote emotional and intellectual growth” (Mayer & Salovey, 1997, p. 10). This definition has been operationalized into a measurement tool called the Mayer-Salovey-Caruso Emotional Intelligence Test (MSCEIT), an ability test of EQ that goes beyond the typical self-report scales used by many measures of personality (Salovey & Grewal, 2005). The MSCEIT Youth Version (YV) was then developed for individuals younger than 17 years old, which is the version used in this research.

The MSCEIT-YV has four branches (Perceiving Emotion, Using Emotion, Understanding Emotion, and Managing Emotion), which are divided, into two areas: Experiential (Perceiving and Using Emotion) and Strategic (Understanding and Managing Emotion). The Strategic area was used in the current study. Understanding Emotion is assessed by asking the student to identify the definitions or causes of emotions (Rivers, Brackett, & Salovey, 2008). An example of this task is as follows: “When you worry that something awful and dangerous is about to happen, you feel...a. sadness, b. envy, c. fear, d. frustration, or e. jealousy” (Rivers et al., 2008). Managing Emotion is assessed by asking respondents to determine the effectiveness of a group of actions in making someone feel a certain way (Rivers et al., 2008). Students read a short story in which the character feels one way but needs to feel a different way, followed by several actions that are evaluated using a 5-point scale (e.g., Li is excited about a party but needs to study, she could...a. think about the importance of the grade on the test; b.

watch TV; c. call a friend to talk; each option is rated as 1 (*not at all helpful*) to 5 (*very helpful*; Rivers et al., 2008). Scores on each of the scales are converted into standard scores with a mean of 100 and a standard deviation of 15. Total score reliability has been established as acceptable ($r = 0.89$), with the Experiential area within the same range ($r = 0.88$), and the Strategic area lower ($r = 0.62$ to 0.64 ; Rivers et al., 2008). Validity was established using a comparison of scores on the MSCEIT-YV to student and teacher ratings on the Behavior Assessment System for Children as published by Reynolds and Kamphaus in 1992. Students with higher scores on the MSCEIT-YV were less likely to be rated by themselves and teachers as having externalizing, internalizing, or school problems and more likely to be rated as having positive adaptive skills (Rivers et al., 2008). Additionally, students with high scores on the MSCEIT-YV were less likely to have negative attitudes towards school and teachers and more likely to have positive social and parental relationships and higher self-reliance (Rivers et al., 2008).

Researchers at Yale, who assisted with collecting the noncognitive data used in this study, recently published “Predicting School Success: Comparing Conscientiousness, Grit, and Emotional Regulation Ability” (Ivcevic & Brackett, 2014). Conducted at an independent school in New England, this study is the most similar to this researcher’s work to date, which makes sense given the shared source of noncognitive data collection. Conscientiousness, Grit, and Emotion Regulation Ability (measured by the Managing Emotion branch of the MSCEIT-YV) were used as the predictor variables, while school outcomes were defined using rule violation behavior (based on points assigned for each infringement of school rules), recognitions (based on faculty surveys), academic honors

(level of courses taken), and GPA (computed as the average at the end of each trimester). Using hierarchical regression analysis, Ivcevic and Brackett (2014) found that Conscientiousness predicted all outcomes (rule violation behavior, recognitions, academic honors, and GPA), that Grit did not explain additional variance in the outcomes, and that Emotion Regulation Ability was also a significant independent predictor of school outcomes. While some clear differences exist between the Ivcevic and Brackett study and this research, the similarities are numerous and will be addressed in the discussion of the results.

Summary and Thesis

As has been demonstrated throughout this review, the admissions process to a selective school is based on several factors. Some of the standardized tests, used by all independent schools, have been shown to be reliable measures, but whether or not they have predictive validity to success at an independent school is not clear. Many studies have demonstrated the validity of standardized tests using the outcome variable of academic achievement as summarized by GPA. Simultaneous to the movement in the direction of evidence-based assessment has been the push for noncognitive assessment of personality and character. This study will use traditional measures of academic potential (standardized IQ testing) as well as noncognitive measures (Grit, Big Five personality, and EQ) and demographics (gender, race, number of years at the school, financial aid status) to predict to a traditional measure of academic success (GPA) and then determine whether traditional measures can predict any of the noncognitive traits. Providing

excellent information for The School's admissions process as well as filling a gap in the literature related to predicting and measuring student success at an independent school.

Chapter 3: Method

Overview

The main objective of this study was to determine whether typical admissions practices (i.e., testing cognitive skills) and/or nonstandard measures (i.e., noncognitive skills) can predict student success (academic and noncognitive).

Participants & Setting

The entire population from which the samples were drawn included the graduating classes of 2011 to 2017, which totaled 607 students, 479 Caucasian (78.9%) and 128 students of color (21.1%). The 128 students of color self-identified as African American (53%), Asian or Asian American (18%), Hispanic (7%), International (7%), Middle Eastern (3%) and Multiracial (9%). The population included 306 male students (50.4%) and 301 female students (49.6%). The number of years students attended The School ranged from 1 to 14, and the average number of years attended was 6.9. The percentage of students who received financial aid was 36.6, and the average GPA was 3.80. Throughout the study, the demographic variables are defined as follows: race as Caucasian and non-Caucasian, gender as male and female, and receipt of financial aid as either no or yes, and each will be provided in terms of only one of the two variables. Descriptive statistics for the total data set are included in Table 1 in Chapter 4.

The students who participated in each of the research questions depended on the availability of the relevant data. The participants for the first research question included any student from the graduating classes of 2011 through 2017 who had taken a Wechsler test for admissions purposes. For the second and third research questions, a score on a

Wechsler test and completion of the surveys of noncognitive skills were required for inclusion. Data were collected in The School during 2014-2015; therefore, only students in the graduating classes of 2015, 2016, and 2017 were in attendance at that time. Participation in the noncognitive testing required both parental consent and student assent; thus, not all students participated in the surveys, and those students who did participate did not complete every survey. The fourth research question included all students who had completed the noncognitive surveys, regardless of the test taken for admissions. The number of students used for each research question, along with the descriptive statistics for each data set, can be found in Table 1 of Chapter 4.

The setting for this study is an independent school in the Philadelphia suburbs. With approximately 830 students enrolled in grades PreK through 12, this college preparatory school includes in its mission statement a commitment to educational excellence and dedication to developing in each student a love of learning and a compassionate participation in the world. The School has provided this researcher with access to all records related to this research with the understanding that all identifying information will be removed prior to data analysis.

Procedure

Data collected in this study were obtained from archival records of student admissions held at The School and from the records provided by the Yale Center for Emotional Intelligence through The School's program and research partnership with that center. Records related to student demographics are housed in the School's database (Education Edge by Blackbaud) and were retrieved through a simple query. Each of the

student records was queried for the attributes needed (race, gender, number of years in attendance, financial aid status, and admission test data). Student GPAs for those who had already graduated (classes of 2011 through 2014) were queried along with the previously listed data. GPAs for current students (graduation classes of 2015, 2016, and 2017) were calculated as of January 2015. Data collected on students' noncognitive skills and traits were collected using the Qualtrics platform through the Yale Center for Emotional Intelligence. Students used an assigned code when answering surveys and a master list of student codes and names was retained by The School's database coordinator. Yale researchers returned the data to The School with only student codes, which were matched to the student data by the School's database coordinator and then exported into a spreadsheet that also included the demographic, standardized test, and GPA data that had been previously queried from The School's database.

Measures. The demographic data utilized for this study included race, gender, number of years at the school, and financial aid status. Measures of cognitive ability, noncognitive factors, and achievement are described in the following sections.

Traditional measures of academic ability and achievement. Although the ISEE and SSAT tests are used for admissions purposes, not enough students in the sample set had taken either test to allow for a robust study. Additionally, given the range of graduation dates and times of entrance into the school (e.g. Kindergarten, first grade, eleventh grade), students had been tested using multiple versions of the WISC, WPPSI, and WAIS. Therefore, the standardized test data for this study were comprised of student scores on any of the Wechsler tests, including the Wechsler Intelligence Scale for

Children, Third and Fourth Editions (WISC-III, WISC-IV), the Wechsler Preschool and Primary Scale of Intelligence, Revised and Third Editions (WPPSI-R, WPPSI-III), and the Wechsler Adult Intelligence Scale, Fourth Edition (WAIS-IV). Given the high correlation among the Wechsler family of tests, particularly the Full Scale IQ score (FSIQ; .89) they were used interchangeably (Wechsler et al., 2004).

The most common Wechsler measure included in the study was the Wechsler Intelligence Scale for Children (WISC-IV, $N = 149$, WISC-III, $N = 11$). The WISC is a nationally norm-referenced test given to children ages 6 to 16 years. It is comprised of the Verbal Comprehension Index (VCI), Perceptual Reasoning Index (PRI), Working Memory Index (WMI), and Processing Speed Index (PSI), which combine to produce the FSIQ score. The second most common Wechsler measure was the Wechsler Preschool and Primary Scale of Intelligence (WPPSI-R, $N = 74$, WPPSI-III, $N = 26$). The WPPSI is similar to the WISC but is administered to children ages 2 years 6 months to 7 years 3 months. It is comprised of the Verbal Index (VIQ), Performance Index (PIQ), and Processing Speed Index (PSQ), which combine to produce the FSIQ score. One student in the study was administered the Wechsler Adult Intelligence Scale, Fourth Edition (WAIS -V). The WAIS can be given to people ages 16 to 90 years 11 months. Similar to the WISC, the WAIS is comprised of the Verbal Comprehension Index (VCI), Perceptual Reasoning Index (PRI), Working Memory Index (WMI), and Processing Speed Index (PSI), which again combine to produce the FSIQ score. For this study, the FSIQ standard score was used for all statistical analyses because it was the only score that was common to all of the tests used. Standard scores on the indices range from 50 to 150, with an

average of 100 and standard deviation of 15 (Wechsler et al., 2004). Only Wechsler scores obtained as part of the admissions process were used for this study, as student scores on Wechsler tests obtained during diagnostic or psychoeducational testing are not recorded in The School's archived database.

GPA was calculated using the student's grades earned from the beginning of the ninth-grade year through the completion of the senior year for the classes of 2014, 2013, 2012, and 2011. For the classes of 2015, 2016 and 2017 the GPA was calculated from the beginning of the ninth-grade year up to January 2015. GPA was reported on a 4-point scale, with a possible score range of 0 to 5.3 given the practice of greater weight (1.25) applied to courses carrying an honors designation and The School's practice of assigning a 4.3 for the grade of an A+. As evidenced by the review of the literature, GPA has been found to be a robust predictor of academic success, as well as of success in life (Grigorenko et al., 2009; Hogan et al., 2010).

Noncognitive skills associated with success. The other set of measures used in this study were the noncognitive skills and traits defined by the body of research in Grit, Big Five personality and Emotional Intelligence. The surveys that collected student data in each of these areas were administered (May 2014 and January 2015) by the Yale Center for Emotional Intelligence as part of the research partnership with the School.

The first noncognitive measure that was used in this study was the Grit scale, as published by Duckworth, Peterson, Matthews, and Kelly in 2007. This 12-item scale measures trait-level perseverance and passion for long-term goals, the definition of Grit (Duckworth & Quinn, 2009). Scores range from 0 to 12. Previous research has

established this scale to be both reliable and valid for use in adolescents (Duckworth & Quinn, 2009).

The second variable, the Big Five personality theory, has been extensively studied as a predictor of academic performance. Researchers from the Yale Center for Emotional Intelligence used the version of the Big Five Inventory that was validated by Soto, John, Gosling and Potter in 2008. The questionnaire measured the students' self-reported evaluation of a set of 44 statements, each reflecting one of the five personality characteristics. Scoring provides an average of the responses 1 (*not at all like me*) to 5 (*very much like me*) for each of the five characteristics, with high scores indicating a strong characteristic and low scores indicating a weak characteristic. Scores entered ranged from 1 to 5 for each characteristic. Given that the literature has consistently shown positive correlations between the characteristics of Conscientiousness and Openness to academic performance, only the student scores on these traits were included in this study.

Emotional Intelligence, defined as perceiving, using, understanding, and managing emotions, was assessed using the Mayer-Salovey-Caruso Emotional Intelligence Test, Youth Version (MSCEIT-YV). The MSCEIT-YV, available for youth ages 12 to 18 years, has four branches, each measuring how the respondent perceives, uses, understands, and manages emotions. Yale researchers used Branches 3 and 4 of the MSCEIT-YV, which measured the student's ability to understand and manage emotions. They combine to form a standard score, which ranges from 0 to 130, with a mean of 100

and standard deviation of 15. The MSCEIT has been validated through work by the publisher and independent researchers (Brackett & Salovey, 2006; Schutte et al., 1998).

Data Analysis. In order to answer the first research question “Do measures of cognitive skills completed for school admission predict academic success?” the predictor variables were demographic data and Wechsler test scores, with GPA as the outcome variable. Data analysis for the first research question was conducted using hierarchical multiple regression procedures. Demographic variables were entered first to determine how well they predict GPA. Then, Wechsler test scores were added to the model to determine if they contribute to the prediction of GPA above and beyond the demographic data. As previously noted, all standardized test scores were entered as standard scores. A second research question stemming from the first, “Do measures of noncognitive skills improve the prediction of academic success?” used the same method just described with the addition of the noncognitive measures (Grit, Conscientiousness, Openness, and MSCEIT) in Step 3.

The third research question, “Do measures of noncognitive skills predict academic success?” was answered by using the noncognitive skills as the predictor variables and GPA as the outcome. Again, hierarchical multiple regression procedures were used in order to determine whether the noncognitive skills predicted academic success above and beyond the demographic factors. The model included demographics (race, gender, number of years attended, and financial aid) as predictors of GPA in Step 1, and the noncognitive factors (Grit, Conscientiousness, Openness, and MSCEIT) as predictors of GPA in Step 2.

In order to answer the fourth research question, “Do measures of cognitive skills predict noncognitive skills?” the demographic and Wechsler test scores used in the previous question were again used as predictors; however, the outcome variables were the noncognitive skills and traits as measured on the Grit scale, Big Five Inventory Conscientiousness and Openness scales, and the MSCEIT score. Data analysis for this question used hierarchical multiple regression and required four models to analyze the predictor variables (demographics and Wechsler test scores) and outcome variables (Grit, Conscientiousness, Openness, and MSCEIT). The first model included demographics (race, gender, number of years attended, and financial aid) as a predictor of Grit in Step 1 and the Wechsler test scores in Step 2. The second, third, and fourth models were identical, with the exception of Conscientiousness, Openness, and MSCEIT scores substituted in each as the outcome variable.

Chapter 4: Results

Overview

As noted previously, several hierarchical regression analyses were performed to answer the research questions. The first three questions examined a prediction of GPA while the fourth question predicted to the noncognitive measures. For each question, a summary of the data, including correlation and regression analysis, will be presented. The descriptive statistics for all data sets is presented first in Table 1.

Cognitive Skills as Predictors of GPA

The participants used to answer the first research question, “Do measures of cognitive skills completed for school admission predict academic success?” included 261 students from the available data set who had taken a Wechsler test for admission to The School. The demographics of the 261 students were similar to those identified from the total data set (See Table 1).

Several correlations were evident among the variables included in the first research question. Positive, significant correlations with medium effect sizes were found between GPA and Wechsler score (.38), between the number of years attended and Wechsler score (.37), and between race and financial aid (.39). Significant correlations were also evident between GPA and race as well as GPA and financial aid. Table 2 details the correlations between the variables included in the first question.

Table 1

Descriptive Statistics

Variables	Classes of 2011-17 (<i>N</i> = 607)			Cognitive to GPA (<i>N</i> = 261)			Cog/NonCog to GPA (<i>N</i> = 111)			NonCognitive to GPA (<i>N</i> = 181)		
	%	<i>M</i>	<i>SD</i>	%	<i>M</i>	<i>SD</i>	%	<i>M</i>	<i>SD</i>	%	<i>M</i>	<i>SD</i>
Grade point average		3.80	.72		3.79	.75		3.89	.75		3.80	.77
Caucasian	79			84			83			81		
Male	50			55			44			45		
Years attended		6.90	3.97		8.18	3.99		8.63	4.15		6.9	4.2
Rec'd financial aid	37			24			28			39		
Wechsler score				120.6	12.2			122.4	10.6			
Grit								3.24	.62		3.24	.60
Conscientiousness								3.77	.74		3.68	.76
Openness								4.43	.82		4.38	.78
MSCEIT								111.7	13.6		110.7	13.3

Variables	Cognitive to Grit (<i>N</i> = 115)			Conscientiousness (<i>N</i> = 119)			Openness (<i>N</i> = 119)			MSCEIT (<i>N</i> = 116)		
	%	<i>M</i>	<i>SD</i>	%	<i>M</i>	<i>SD</i>	%	<i>M</i>	<i>SD</i>	%	<i>M</i>	<i>SD</i>
Caucasian	83			83			83			84		
Male	46			46			46			46		
Years attended		8.71	4.15		8.66	4.18		8.66	4.18		8.59	4.13
Rec'd financial aid	28			29			29			28		
Wechsler score		122.3	10.8		122.1	10.6		122.1	10.6		122.0	10.7
Grit		3.24	.62									
Conscientiousness					3.74	.75						
Openness								4.43	.81			
MSCEIT											111.8	13.5

Table 2

Intercorrelations for Prediction of Cognitive Skills to GPA

	Intercorrelations					
	GPA	Race	Gender	Years	Fin. aid	Wechsler
GPA	1	-.15**	.01	.25**	-.18**	.38**
Race		1	.05	-.17*	.39**	-.09
Gender			1	.12*	.001	.15*
Years				1	-.12*	.37**
Fin. Aid					1	-.02*
Wechsler						1

Note: $N = 261$, * $p < .05$, ** $p < .01$

To discover whether cognitive skills could predict GPA, a hierarchical regression analysis was conducted using the demographic data and Wechsler test scores as predictor variables and GPA as the outcome variable. The base model including race, gender, number of years attended, and financial aid was found to be statistically significant, $F(4, 256) = 6.34$, $p < .01$; $R^2 = 0.09$. The addition of Wechsler test scores in the second step also resulted in a statistically significant model, $F(5, 255) = 11.91$, $p < .01$; $R^2 = .19$, and demonstrated a significant improvement in fit over the base model ($\Delta F(1, 255) = 31.17$, $p < .01$; $\Delta R^2 = .099$). The effect size, using Cohen's *fsquared*, was small for the first model ($f^2 = .09$) and medium for the second model ($f^2 = .23$).

Statistically significant beta coefficients in the base model were found for years attended ($p < .01$) and financial aid ($p < .05$). In the final model, the significant beta values were financial aid ($p < .05$) and Wechsler test scores ($p < .01$). Financial aid was

found to be negatively associated with the criterion measure while Wechsler test scores had a positive standardized beta coefficient. Thus, higher GPA was predicted by higher Wechsler test scores. Financial aid predicted lower GPA, and posthoc *t* tests were conducted to further analyze this relationship. This analysis found that, on average, students who received financial aid earned lower GPA scores ($M=3.56$) than those earned by students who did not receive financial aid ($M = 3.87$). The difference between GPA scores, .31, was significant, $t(259) = 2.99, p < .05$; however, the effect size was small, $d = .18$. The standardized beta coefficients for all indicators in each of the two steps are listed in Table 3.

Assumption testing was conducted, and the Durbin-Watson score for the regression analysis was 1.88; therefore, the assumption is likely met that errors are independent. Collinearity statistics (variance inflation factor [VIF] and tolerance statistics) indicated no collinearity in these data. Review of plots of standardized predicted values against standardized residuals indicated no violations in the assumption of homogeneity of variance. There was a normal distribution of the standardized residuals and normal P-P plot of expected-to-observed cumulative probability. Examination of casewise diagnostics showed ten cases with standardized residuals with absolute values greater than 2, with four cases greater than 2.5 (approximately 1.5% of the sample). Ideally, only 1% of cases should have standardized residuals with absolute values greater than 2.5 (Field, 2013). All assumptions regarding bias in the data were met, indicating that the model was not unduly influenced by a subset of cases.

Table 3

Summary of Regression Analysis for Prediction of Grade Point Average from Demographics and Wechsler Test Scores

Model	Predictor	β for GPA	R^2	F	ΔR^2
Base model			.09	6.34**	-
	Race	-.06			
	Gender	-.01			
	Years attended	.23**			
	Financial aid	-.13*			
Step 2			.19	11.91**	.10**
	Race	-.03			
	Gender	-.05			
	Years attended	.11			
	Financial aid	-.15*			
	Wechsler Score	.34**			

* $p < .05$; ** $p < .01$

Cognitive and Noncognitive Skills as Predictors of GPA

For the second research question, “Do measures of noncognitive skills improve the prediction of academic success?” the participants included 111 students from the available data set who had taken a Wechsler test for admission to The School and completed all surveys of noncognitive skills (Grit, Big Five - Conscientiousness, Big Five - Openness, and MSCEIT). The demographics and Wechsler scores of the 111 students included in this analysis were similar to those identified from the total data set available

to this examiner (See Table 1). The mean scores on the noncognitive tests were as follows: Grit 3.24 ($SD = .62$); Conscientiousness 3.77 ($SD = .74$); Openness 4.43 ($SD = .82$); and MSCEIT 111.69 ($SD = 13.6$).

Several significant correlations were evident among the variables included in the second research question. The positive relationship (.61) between scores on the Grit scale and the Conscientiousness scale was significant and had a large effect size. Other significant correlations with medium effect sizes were the positive correlations between GPA and Conscientiousness (.41), GPA and Grit (.32), Conscientiousness and MSCEIT (.35), and Openness and MSCEIT (.34). Table 4 details the intercorrelations between the variables included in the second research questions.

Table 4

Intercorrelations for Prediction of GPA from Cognitive and Noncognitive Skills

	Intercorrelations									
	GPA	RA	GN	YA	FA	WS	GR	CO	OP	MS
GPA	1	-.11	.06	.24*	-.08	.31**	.32**	.41**	.11	.29**
Race (RA)		1	.07	-.21	.25*	-.15	.01	-.05	.04	-.18
Gender			1	.14	-.01	-.02	.07	.18*	.17*	.22*
Years				1	-.16	.33**	.19	.23*	-.10	.15
Fin Aid					1	.02	-.01	.04	.04	.07
Wechsler						1	-.14	-.08	-.03	.02
Grit Score							1	.61**	-.001	.11
Cont-ness								1	.20*	.35**
Openness									1	.34**
MSCEIT										1

* $p < .05$; ** $p < .01$. *Note:* Cont-ness = Conscientiousness.

In order to discover whether noncognitive variables provided additional predictive value to academic achievement, hierarchical regression was again used to predict GPA from the demographic variables, Wechsler test scores, and noncognitive skills. Using the students' GPA as the outcome variable, the base model including race, gender, number of years attended and financial aid was not found to be statistically significant, $F(4, 106) = 1.73, p > .05; R^2 = .06$ and had a small effect size ($f^2 = .06$). The addition of Wechsler test scores in the second step resulted in a statistically significant model, $F(1, 105) = 7.29, p < .05; R^2 = .12$; however, the effect size remained small ($f^2 = .12$). Finally, the addition of

noncognitive test scores (Grit, Conscientiousness, Openness, MSCEIT) also resulted in a statistically significant model and demonstrated a significant improvement in fit over the base model $\Delta F(4, 101) = 8.23, p < .01; \Delta R^2 = .22$. The effect size for the third model was large ($f^2 = .52$).

Statistically significant, positive beta coefficients in the final model were found for Conscientiousness and the MSCEIT scores ($p < .05$) and Wechsler test scores ($p < .01$). Thus, higher GPA was predicted by higher Wechsler test scores, as well as by higher scores in Conscientiousness and on the MSCEIT. The standardized beta coefficients for all indicators in each of the two steps are listed in Table 5.

Assumption testing was conducted, and the Durbin-Watson score was 1.86; therefore, the assumption is likely met that errors are independent. Collinearity statistics (VIF and tolerance statistics) indicate that there is no collinearity in these data. Review of plots of standardized predicted values against standardized residuals indicated no violations in the assumption of homogeneity of variance. There was a normal distribution of the standardized residuals and normal P-P plot of expected-to-observed cumulative probability. Examination of casewise diagnostics showed two cases with standardized residuals with absolute values greater than 2, with one case greater than 3 (approximately 1% of the sample). Ideally, only 1% of cases should have standardized residuals with absolute values greater than 2.5 (Field, 2013). All assumptions regarding bias in the data were met, indicating that the model was not unduly influenced by a subset of cases.

Table 5

Summary of Hierarchical Regression Analysis for Prediction of GPA

Model	Predictor	β for GPA	R^2	F	ΔR^2
Base model			.06	1.73	-
	Race	-.06			
	Gender	.03			
	Years attended	.21*			
	Financial aid	-.03			
Step 2			.12	2.92*	.06*
	Race	-.04			
	Gender	.05			
	Years attended	.12			
	Financial aid	-.05			
	Wechsler test score	.27*			
Step 3			.34	5.73**	.22**
	Race	.01			
	Gender	-.03			
	Years attended	-.03			
	Financial aid	-.11			
	Wechsler test score	.36**			
	Grit	.19			
	Conscientiousness	.28*			
	Openness	-.01			
	MSCEIT	.19*			

* $p < .05$; ** $p < .01$

Noncognitive Skills as Predictors of GPA

For the third research question, “Do measures of noncognitive skills predict academic success?” the participants included 181 students from the available data set who had completed all surveys of noncognitive skills. Students in this sample were not

required to have taken a Wechsler test for admission to The School; thus, a broader range of students was included in this grouping. The demographics of the 181 students included in this analysis were similar to those identified from the total data set available to this examiner (See Table 1). On the noncognitive tests, the following scores were average: Grit 3.24, Conscientiousness 3.68, Openness 4.38, and MSCEIT 110.71. There is not a comparison average to the data set because noncognitive scores were required in order to be included in this sample.

Several significant correlations were evident among the variables included in the third research question. The positive relationship (.61) between scores on the Grit scale and the Conscientiousness scale was significant and had a large effect size. Other significant correlations with medium effect sizes were the positive correlations between GPA and Conscientiousness (.38), Openness and MSCEIT (.31), Conscientiousness and MSCEIT (.28), and GPA and number of years attended (.26). There were also less significant correlations ($p < .05$) between GPA and Grit (.22), GPA and Openness (.20), and GPA and MSCEIT (.23). Table 6 details the intercorrelations between the variables included in Question 3.

Table 6

Intercorrelations for Prediction of GPA from Noncognitive Skills

	Intercorrelations								
	GPA	RA	GN	YA	FA	GR	CO	OP	MS
GPA	1	-.12	.11	.26**	-.10	.22*	.38**	.20*	.23*
Race		1	.15	-.18*	.29**	-.04	-.08	-.04	-.14
Gender			1	.07	-.05	.07	.18*	.12	.19*
Years				1	-.26**	.10	.22*	-.00	.17*
Financial aid					1	-.04	-.06	.01	.01
Grit						1	.61**	-.01	.08
Cont-ness							1	.16*	.28**
Openness								1	.31**
MSCEIT									1

* $p < .05$; ** $p < .01$. Note: Cont-ness = Conscientiousness.

Hierarchical regression was conducted using the students' GPA as the outcome variable with demographic information and noncognitive test scores as the predictors. The base model including race, gender, number of years attended, and financial aid was found to be statistically significant, $F(4, 176) = 3.99, p < .05; R^2 = .08$. The addition of four noncognitive Test scores (Grit, Conscientiousness, Openness, MSCEIT) in the second step also resulted in a statistically significant model, $F(8, 172) = 5.59, p < .01; R^2 = .17$, and demonstrated a significant improvement in fit over the base model $\Delta F(4, 172) = 6.67, p < .01; \Delta R^2 = .12$. The effect size for the base model was small ($f^2 = .08$) and was medium for the second model ($f^2 = .27$).

Statistically significant beta coefficients in the final model were found for number of years attended ($p < .05$) and Conscientiousness scores ($p < .05$). Both were found to be positively associated with GPA. Thus, higher GPA was predicted by greater number of years attended and higher Conscientiousness scores. The standardized beta coefficients for all indicators in each of the two steps are listed in Table 7.

Assumption testing was conducted, and the Durbin-Watson score was 2.05; therefore, the assumption is likely met that errors are independent. Collinearity statistics (VIF and tolerance statistics) indicate that there is no collinearity in these data. Review of plots of standardized predicted values against standardized residuals indicated no violations in the assumption of homogeneity of variance. There was a normal distribution of the standardized residuals and normal P-P plot of expected-to-observed cumulative probability. Examination of casewise diagnostics showed six cases with standardized residuals with absolute values greater than 2, with one case greater than 3 (approximately 1% of the sample). Ideally, only 1% of cases should have standardized residuals with absolute values greater than 2.5 (Field, 2013). There were nine cases with Mahalanobis distance scores greater than 15, indicating that the model may be unduly influenced by a subset of cases.

Table 7

Summary of Regression Analysis for Prediction of Grade Point Average by Noncognitive Variables

Model	Predictor	β for GPA	R^2	F	ΔR^2
Base model			.08	3.99*	-
	Race	-.09			
	Gender	.11			
	Years attended	.23*			
	Financial aid	-.01			
Step 2			.21	5.59**	.12**
	Race	-.05			
	Gender	.03			
	Years attended	.17*			
	Financial aid	-.03			
	Grit	.03			
	Conscientiousness	.27*			
	Openness	.13			
	MSCEIT	.07			

* $p < .05$; ** $p < .01$

Summary of Prediction to GPA by Cognitive and Noncognitive Measures

Before moving to the final research question, a summary and brief discussion of the first three questions will be given. In each of the first three questions, the first step in the regression analysis was the entry of demographic data (race, gender, years attended,

and financial aid), and in each of these analyses, the number of years attended was a positive and significant predictor of GPA. Regardless of the other predictor variables, the number of years that the student had attended The School predicted a higher GPA.

Another factor of importance are the effect sizes for each question. While the first step (demographic data) generated a small effect size across questions, the addition of Wechsler scores generated small to medium effect sizes, and the subsequent addition of noncognitive measures led to a large effect size. These findings indicate that by using demographic data, Wechsler scores, and noncognitive scores one could predict 34% of the variance in a student's GPA, with a large effect size ($f^2 = .52$).

Predicting Cognitive Skills from Noncognitive Skills

For the fourth research question, "Do measures of cognitive skills predict to noncognitive skills?" there were four subquestions based on the four noncognitive skills. They will be referred to as Question 4.1 (prediction to the Grit scale), 4.2 (prediction to the Conscientiousness scale), 4.3 (prediction to the Openness scale), and 4.4 (prediction to the MSCEIT scale).

Predicting Scores on the Grit Scale. For the research question, "Do Wechsler test scores predict scores on the Grit Scale?" the participants included 115 students from the available data set who had taken a Wechsler test for admission to The School and completed the Grit scale. The demographics of the 115 students included in this analysis were similar to those identified from the total data set, with slightly more Caucasian (83%), slightly fewer male (46%), and fewer receiving financial aid (28%). The 115 students in the sample had attended the school for an average of 8.71 years, and the average FSIQ score was 122.26. Finally, the average score on the Grit scale was 3.24.

Several significant correlations were evident among the variables included in this question. A significant positive correlation existed between number of years attended and Grit score (.18), while the correlation between Wechsler test scores and Grit was negative (-.16). Both were significant at the $p < .05$ level and had small effect sizes. The strongest correlation was between number of years attended and Wechsler test scores. Table 9 details the descriptive statistics and intercorrelations between the variables included in question 4.1.

Table 8

Intercorrelations for Prediction of Grit

Variables	Intercorrelations					
	Grit	Race	Gender	Years	Fin aid	Wechsler
Grit	1	-.02	.07	.18*	-.04	-.16*
Race		1	.06	-.18*	.28**	-.11
Gender			1	.11	-.01	-.01
Years attended				1	-.14	.34**
Financial aid					1	.05
Wechsler score						1

* $p < .05$; ** $p < .01$.

Hierarchical regression was conducted using the students' score on the Grit scale as the outcome variable with demographic information and Wechsler test scores as the predictors. The base model including race, gender, number of years attended, and

financial aid was not found to be statistically significant, $F(4, 110) = 1.04, p > .05; R^2 = .04$, and the effect size was small ($f^2 = .04$). The addition of Wechsler test scores in the second step demonstrated a significant improvement in fit over the base model $\Delta F(1, 109) = 6.26, p < .05; \Delta R^2 = .05$, but the model was still not statistically significant and the effect size remained small ($f^2 = .09$). Since neither model was significant (See Table 9), no further discussion is warranted.

Assumption testing was conducted, and the Durbin-Watson score was 1.67; therefore, the assumption is likely met that errors are independent. Collinearity statistics (VIF and tolerance statistics) indicate that there is no collinearity in these data. Review of plots of standardized predicted values against standardized residuals indicated no violations in the assumption of homogeneity of variance. There was a normal distribution of the standardized residuals and normal P-P plot of expected-to-observed cumulative probability. Examination of casewise diagnostics showed three cases with standardized residuals with absolute values greater than 2, with no cases greater than 2.5. All assumptions regarding bias in the data were met, indicating that the model was not unduly influenced by a subset of cases.

Table 9

Summary of Regression Analysis for Prediction of Grit

Model	Predictor	β for Grit	R^2	F	ΔR^2
Base Model			.04	1.04	-
	Race	.01			
	Gender	.05			
	Years attended	.18			
	Financial aid	-.02			
Step 2			.09	2.12	.05*
	Race	-.01			
	Gender	.04			
	Years attended	.26*			
	Financial aid	.01			
	Wechsler test score	-.25*			

* $p < .05$.

Predicting Conscientiousness Scores. To answer the question, “Do Wechsler test scores predict scores on the Conscientiousness Scale?” the participants included 119 students from the available data set who had taken a Wechsler test for admission to The School and completed the Big Five Inventory Conscientiousness Scale. The demographics of the 119 students included in this analysis were similar to those identified from the total data set, with slightly more Caucasian (83%), fewer male (46%), and fewer receiving financial aid (29%). The 119 students in the sample had attended the school for an average of 8.66 years ($SD = 4.18$). The average Wechsler FSIQ score was

122.10 with a standard deviation of 10.61. Finally, the average score on the Conscientiousness Scale was 3.74 ($SD = .75$).

Several significant correlations were evident among the variables included in the Question 4.2. There were two significant ($p < .05$) correlations between gender and Conscientiousness (.18) and number of years attending and Conscientiousness (.21); however, both had small effect sizes. The only correlation with a medium effect size and stronger significance ($p < .01$) was between number of years attended and Wechsler test scores. Table 10 details the intercorrelations between the variables included in the prediction of Conscientiousness.

Table 10

Intercorrelations for the Prediction of Conscientiousness

Variables	Intercorrelations					
	CO	Race	Gender	Years	Fin Aid	Wechsler
Cont-ness	1	-.05	.18*	.21*	-.02	-.09
Race		1	.06	-.17*	.25*	-.10
Gender			1	.09	-.03	-.02
Years Attended				1	-.12	.34**
Financial Aid					1	.02
Wechsler Score						1

* $p < .05$, ** $p < .01$. *Note:* Cont-ness = Conscientiousness

Hierarchical regression was conducted using the students' score on the Conscientiousness Scale as the outcome variable with demographic information and Wechsler test scores as the predictors. The base model including race, gender, number of years attended, and financial aid was not found to be statistically significant, $F(4, 114) = 2.18, p > .05; R^2 = .07$. The addition of Wechsler test scores in the second step resulted in a statistically significant model, $F(5, 113) = 2.47, p < .05; R^2 = .098$, but did not demonstrate a significant improvement in fit over the base model $\Delta F(1, 113) = 3.44, p > .05; \Delta R^2 = .03$. As would be expected, both models showed small effect sizes ($f^2 = .07$ and $.11$, respectively). The standardized beta coefficients for all indicators in each of the two steps are listed in Table 11.

Statistically significant beta coefficients in the final model were found for number of years attended ($p < .05$). Thus, higher Conscientiousness scores were predicted by greater number of years attended, and the Wechsler test scores had no effect on this relationship.

Assumption testing was conducted, and the Durbin-Watson score was 1.80; therefore, the assumption is likely met that errors are independent. Collinearity statistics (VIF and tolerance statistics) indicate that there is no collinearity in these data. Review of plots of standardized predicted values against standardized residuals indicated no violations in the assumption of homogeneity of variance. There was a normal distribution of the standardized residuals and normal P-P plot of expected-to-observed cumulative probability. Examination of casewise diagnostics showed three cases with standardized residuals with absolute values greater than 2, and only one case greater than 2.5 (approximately 1% of the sample). Ideally only 1% of cases should have standardized

residuals with absolute values greater than 2.5 (Field, 2013), which was met in this model. All assumptions regarding bias in the data were met, indicating that the model was not unduly influenced by a subset of cases.

Table 11

Summary of Regression Analysis for Prediction of Conscientiousness

Model	Predictor	β for Consc.	R^2	F	ΔR^2
Base model			.07	2.18	-
	Race	-.02			
	Gender	.16			
	Years attended	.20*			
	Financial aid	.01			
Step 2			.10	2.47*	.03
	Race	-.03			
	Gender	.15			
	Years attended	.26*			
	Financial aid	.02			
	Wechsler test score	-.18			

* $p < .05$

Predicting Openness Scores. In order to answer the question, “Do Wechsler test scores predict scores on the Openness Scale?” the participants included 119 students from the available data set who had taken a Wechsler test for admission to The School and

completed the Big Five Inventory Openness Scale. The demographics of the 119 students were identical to those who completed the Conscientiousness Scale as previously detailed. The average score on the Openness Scale was 4.43.

Several significant correlations were evident among the variables included in the Question 4.3. There was a significant ($p < .05$) correlation between gender and Openness (.15) with only a small effect size. The only correlation with a medium effect size and stronger significance ($p < .01$) was between number of years attended and Wechsler test scores, which was also true for the prediction of Conscientiousness. Table 12 details the intercorrelations between the variables included in the prediction of Openness.

Table 12

Intercorrelations for Prediction of Openness

Variables	Intercorrelations					
	Openness	Race	Gender	Years	Fin aid	Wechsler
Openness	1	.06	.15*	-.09	.08	-.02
Race		1	.06	-.17*	.25*	-.11
Gender			1	.09	-.03	-.02
Years				1	-.12	.34**
Fin aid					1	.02
Wechsler						1

* $p < .05$; ** $p < .01$

Hierarchical regression was conducted using the students' score on the Openness Scale as the outcome variable with demographic information and Wechsler test scores as the predictors. The base model including race, gender, number of years attended, and financial aid was not found to be statistically significant, $F(4, 114) = 1.16, p > .05; R^2 = .04$. The addition of Wechsler test scores in the second step did not demonstrate a significant improvement in fit over the base model $\Delta F(1, 113) = .05, p > .05; \Delta R^2 = .00$. The effect size for both models was small ($f^2 = .04$). The standardized beta coefficients for all indicators in each of the two steps are listed in Table 13; however, since neither model was significant, no further discussion is warranted.

Assumption testing was conducted, and the Durbin-Watson score was 1.94; therefore, the assumption is likely met that errors are independent. Collinearity statistics (VIF and tolerance statistics) indicate that there is no collinearity in these data. Review of plots of standardized predicted values against standardized residuals indicated no violations in the assumption of homogeneity of variance. There was a slightly abnormal distribution of the standardized residuals (skewed) and normal P-P plot of expected-to-observed cumulative probability. Examination of casewise diagnostics showed four cases with standardized residuals with absolute values greater than 2, with two cases greater than 2.5 (approximately 1.6% of the sample). Ideally, only 1% of cases should have standardized residuals with absolute values greater than 2.5 (Field, 2013). All assumptions regarding bias in the data were met, indicating that the model was not unduly influenced by a subset of cases.

Table 13

Summary of Regression Analysis for Prediction of Openness

Model	Predictor	β for Open.	R^2	F	ΔR^2
Base model			.04	1.16	-
	Race	.01			
	Gender	.16			
	Years attended	-.09			
	Financial aid	.07			
Step 2			.04	.93	.00
	Race	.02			
	Gender	.16			
	Years attended	-.10			
	Financial aid	.07			
	Wechsler test score	.02			

Predicting Emotional Intelligence Scores. “Do Wechsler test scores predict to scores on the MSCEIT Scale?” was answered using 116 students from the available data set who had taken a Wechsler test for admission to The School and completed the MSCEIT Scale. The demographics of the 116 students included in this analysis were similar to those identified from the total data set, with slightly more Caucasian (84%), slight fewer male (46%) and slightly fewer receiving financial aid (28%). The 116 students in the sample had attended the school for an average of 8.59 years, and the

average FSIQ score was 121.95. Finally, the average score on the MSCEIT Scale was 111.75 ($SD = 13.49$).

Several significant correlations were evident among the variables included in Question 4.4. There were two significant ($p < .05$) correlations between race and MSCEIT score (.18) and gender and MSCEIT score (.23); however, both had small effect sizes. The only correlation with a medium effect size and stronger significance ($p < .01$) was between number of years attended and Wechsler test scores, as was true for the other noncognitive variables already discussed. Table 14 details the intercorrelations between the variables included in the prediction of emotional intelligence.

Table 14

Intercorrelations for Prediction of Emotional Intelligence

Variables	Intercorrelations					
	MSCEIT	Race	Gender	Years	Fin aid	Wechsler
MSCEIT	1	-.18*	.23*	.14	.04	.02
Race		1	.08	-.20*	.24*	-.12
Gender			1	.14	-.04	.02
Years attended				1	-.13	.34**
Financial aid					1	.01
Wechsler score						1

* $p < .05$; ** $p < .01$

Hierarchical regression was conducted using the students' score on the MSCEIT Scale as the outcome variable with demographic information and Wechsler test scores as the predictors. The base model including race, gender, number of years attended, and financial aid was found to be statistically significant, $F(4, 111) = 3.20, p < .05; R^2 = .10$; however, the effect size was small ($f^2 = .11$). The addition of Wechsler test scores in the second step did not demonstrate a significant improvement in fit over the base model $\Delta F(1, 110) = .20, p > .05; \Delta R^2 = .002$ with a similarly small effect size ($f^2 = .12$).

The statistically significant beta coefficients in the base and the final model were those associated with race and gender. Race had a negative relationship, while gender was positive. Thus, a higher score on the MSCEIT was best predicted by race and gender, but the other demographic variables and Wechsler test scores had no impact on these predictions. Posthoc t tests were not conducted as the predictive relationship was not strong ($p < .05$). The standardized beta coefficients for all indicators in each of the two steps are listed in Table 15.

Assumption testing was conducted, and the Durbin-Watson score was 1.73; therefore, the assumption is likely met that errors are independent. Collinearity statistics (VIF and tolerance statistics) indicate that there is no collinearity in this data. Review of plots of standardized predicted values against standardized residuals indicated no violations in the assumption of homogeneity of variance. There was a slightly abnormal distribution of the standardized residuals (skewed) and normal P-P plot of expected-to-observed cumulative probability. Examination of casewise diagnostics showed six cases with standardized residuals with absolute values greater than 2, with two cases having

standardized residuals greater than 3 (these two cases are likely outliers). These cases could be unduly influencing the data.

Table 15

Summary of Regression Analysis for Prediction of Emotional Intelligence

Model	Predictor	β for MSCEIT	R^2	F	ΔR^2
Base model			.10	3.20*	-
	Race	-.20*			
	Gender	.24*			
	Years attended	.08			
	Financial aid	.10			
Step 2			.11	2.58*	.00
	Race	-.21*			
	Gender	.24*			
	Years attended	.09			
	Financial aid	.11			
	Wechsler test score	-.04			

* $p < .05$.

Chapter 5: Discussion

Summary of the Findings

In order to discuss the findings of this research study, each research question and its results will be evaluated using the initial hypothesis and the current literature. The clinical implications and limitations of the study will be discussed, followed by topics for future research.

Significance of the Findings

Cognitive Skills as Predictors of GPA: The hypothesis for the question, “Do measures of cognitive skills completed for school admission predict to academic success?” was that the Wechsler test scores would predict to GPA, given the large body of research showing the predictive value of IQ tests. It was also expected that the number of years at the school (a demographic variable) would predict GPA, which was based on the theory that students who receive the foundational skills provided at The School would have stronger academic performance in their high-school years. Both of these hypotheses were supported. Regression analysis of the predictive value to GPA of only the demographic variables (race, gender, years attended, and financial aid) found that both years attended ($p < .01$) and financial aid ($p < .05$) predicted to GPA. The addition of the Wechsler test scores in Step 2 decreased the predictive value of years attended; however, the predictive value of financial aid stayed the same. Correlational study of the variables indicated that years attended and Wechsler scores had a positive relationship (.37) with medium effect size, indicating that these variables may be measuring a similar construct or part of a larger construct, so that the addition of Wechsler scores in Step 2 negates the predictive value of the number of years attended. Thus, in the final model, the Wechsler

test scores were found to have significant value in predicting GPA ($p < .01$) and the model, which also included demographics, showed a medium effect size. This finding supports the well-established research in the predictive value of IQ tests to student GPA.

A finding that was not hypothesized, though not completely unexpected, was the significance of the demographic variable labeled *financial aid*. Because financial aid was entered in the regression model as a dichotomous variable (yes/no), posthoc t tests were conducted in order to provide specific information about the relationship. As noted in Chapter 4, students who received financial aid earned lower GPA scores than student who did not receive financial aid, within the sample group of 261 students who had taken a Wechsler test for admission. The difference between the GPA scores was statistically significant but only carried a small effect size. Also of note is that the average GPA of students who received financial aid was 3.56, while students not receiving financial aid averaged a 3.87.

Cognitive and Noncognitive Predictors of GPA: For the second research question, “Do measures of noncognitive skills improve the prediction of academic success?” the addition of noncognitive measures to the standardized test data was not expected to improve the predictive power of the Wechsler tests, and it was hypothesized that the Wechsler tests would predict GPA better than other variables. This hypothesis was cautiously rejected based on the three-step regression analysis that was conducted. A similar pattern to Question 1 was demonstrated in this analysis (e.g., years attended was significant in Step 1, Wechsler test scores significant in Step 2); however, with the addition of the noncognitive measures (Grit, Conscientiousness, Openness, and EQ) in Step 3, the regression model improved significantly ($p < .01$), explaining 34% of the

variance in the prediction of GPA, and had the largest effect size of any model in this study ($f^2 = .52$). In the final model, the Wechsler test score improved its predictive significance ($p < .01$); however, the Conscientiousness and MSCEIT scores also had significant beta coefficients ($p < .05$). Thus, the hypothesis was partially correct. While the Wechsler scores were the strongest predictor of GPA, the addition of the noncognitive measures improved the predictive value of the Wechsler scores, and two noncognitive measures (Conscientiousness and EQ) had predictive power. As was found in Question 1, financial aid had a negative relationship to GPA; however, it was not significant in any part of this regression model.

Noncognitive Predictors of GPA: The third question was “Do measures of noncognitive skills predict academic success?” This researcher expected the noncognitive variables to return some predictive value. Given the assertions of numerous studies that noncognitive skills are important for success in school (and life), a predictive relationship was expected to exist between the noncognitive measures (Grit, Personality Characteristics, and EQ) and student GPA. Specifically, it was hypothesized that higher scores on the Grit scale and the Conscientiousness trait on the Big Five personality Scale would predict higher GPA.

This hypothesis was supported by the data for the prediction of GPA by Conscientiousness, but none of the other noncognitive measures were as strong. There were significant, positive correlations between all noncognitive traits measured and GPA; however, Conscientiousness had the most significant correlation. As with the other research questions, number of years attended had a positive predictive relationship with GPA in both steps. Also, the overall final model, which included demographic and

noncognitive variables explained 21% of the variance in the prediction of GPA and had a medium effect size. Recent research (Ivcevic & Brackett, 2014) also found Conscientiousness to be the best predictor of GPA, although that study used hierarchical regression without demographic data, which was an important variable in this study.

In all of the models that predicted GPA, the number of years attended was a positive and significant predictor. Regardless of the other predictor variables, the number of years that the student had attended The School predicted a higher GPA.

Predicting Noncognitive Skills from Cognitive Skills: For the fourth research question, “Do measures of cognitive skills predict noncognitive skills?” four sub-questions were based on the four noncognitive skills: Question 4.1 (prediction to the Grit Scale), 4.2 (prediction to Conscientiousness Scale), 4.3 (prediction to the Openness Scale), and 4.4 (prediction to the MSCEIT Scale). The hypothesis for Question 4 was that scores on the Wechsler tests would have little to no predictive value to noncognitive traits; however, there was interest in finding out whether any of the other variables would predict to noncognitive skills. The hypothesis was rejected because statistically significant regression models were identified for the prediction of Conscientiousness and EQ; however, the significant variables in these models were demographic and not based on the Wechsler scores.

An interesting finding of the analyses for the Grit and Conscientiousness scales were the positive correlations between students who had attended the school longer and the negative relationship to Wechsler scores, noting that the relationship between Grit and Wechsler scores was statistically significant, while the relationship between Conscientiousness and Wechsler scores was not. As with GPA, the longer a student

attends The School, the greater his or her perseverance and passion for long-term goals may increase along with his or her self-discipline and drive to achieve. Perhaps more concerning is the negative correlational relationship between several noncognitive traits (Grit, Conscientiousness, EQ) and the Wechsler scores, which has been found in the literature but is concerning nonetheless. In addition to a correlational relationship, a higher score on the Wechsler test predicted a lower Grit score. Again, similar findings have been noted in the literature and will be discussed further in regards to clinical implications and for additional consideration by The School.

The construct of Openness, defined as creative, curious and flexible, was of particular interest since The School stresses the importance of creativity and intellectual curiosity. While no significant predictive relationships were identified through the regression analysis, there was a negative, though not strong, relationship between number of years attended and Openness. This relationship is an area of opportunity for The School to recognize that there may be a need to further cultivate the creativity of their students. This finding will be discussed further in the clinical implications.

Finally, in predicting students' ability to manage and understand emotions (measured by the MSCEIT), the variables of race and gender were significant predictors. Race had a negative relationship, while gender had a positive relationship. Because these relationships had only minimal statistical significance ($p < .05$) and the overall model had small effect size, additional analysis was not possible. This topic requires further study. Given that the Wechsler scales utilize a test of EQ to show that IQ is a separate construct from EQ, it is not surprising that student scores on the Wechsler scales have little predictive value to the MSCEIT.

Limitations

While these findings will be useful for The School and perhaps for other independent schools and admissions officers, the scope of the findings are limited by the population studied. Students included in this study attend(ed) an independent, college-preparatory school and, as such, represent the limited diversity in ability, socioeconomic status, and geography required for attendance. Additionally, this study chose to focus on the Wechsler family of tests that were used for admission to the school. As noted in the Introduction and Review of the Literature, other tests are also used for admission: the ISEE and SSAT. Owing to sample size and need to limit the scope of this study, neither the ISEE nor the SSAT test scores were included. These tests might provide further illumination and clarification of the predictive relationships in this study. Another limitation is that the Wechsler tests were grouped together and included as though they were one test. Those who work in schools are aware of the practical differences between the WPPSI, WISC, and WAIS, particularly the elevated scores often seen on the WPPSI. Students who were administered the WPPSI were also likely those who had attended the school the longest, as the WPPSI is given only to very young children. These factors were not teased out in this study.

Clinical Implications

Regardless of the limitations, there are some potential implications for those who work in independent schools, and for educators in general. The first set of issues would likely be considered only by admissions officers and admissions committees at independent schools. The most clear and definitive finding of this study is that a combination of cognitive and noncognitive measures can predict GPA. This is finding,

although important, might be difficult to implement. Noncognitive measures were collected from current students, and as seen in the literature, collecting this type of data from students during the admissions process could lack the requisite validity, as many of the measures are self-report and students would be motivated to answer more positively than might be true. A promising measure is the MSCEIT-YV, since it does not rely on self-report of the traits but attempts to measure one's ability to understand and manage emotions. After the Wechsler test and Conscientiousness, it was the next best predictor of GPA. A related topic is students who receive financial aid. In the models in which noncognitive measures were included, the predictive value of *Financial Aid* was reduced or insignificant. While additional analysis is required to understand this complex relationship, it may be that Grit, Conscientiousness, and Understanding/Managing Emotions impact socioeconomic variables. A third finding that is relevant for admissions officers is the finding throughout many of the analyses that the number of years attended is a positive predictor of GPA (regardless of IQ), Grit, and Conscientiousness; thus, those who are concerned about academic success should enroll their children early.

Other findings that have more “global” considerations for educators are related to the relationship between cognitive and noncognitive intelligence. While the authors of the Wechsler test do not believe that there are constructs shared by what is measured on the IQ test and a test of EQ, it is increasingly important that schools cultivate cognitive and noncognitive intelligence. Specific findings that such characteristics as Grit and Conscientiousness are lower in students with higher IQ is an area that should concern educators. Schools must find ways to help students learn perseverance for long-term goals, flexibility, organization, and drive to achieve. Balancing those skills with creativity

and curiosity is an even greater challenge. The drive to achieve and the traits measured by standard IQ tests appear to be at odds with the noncognitive traits previously mentioned. Balancing academic achievement and social/emotional growth must be a core concern for all schools.

Future Directions

As previously mentioned, further analysis should be conducted on the relationship between financial aid and academic achievement. At the school where this research was conducted, a committee is currently reviewing school data on sociocultural identifiers and academic achievement. That information combined with this current study should provide a path for The School and perhaps for others.

An additional area of promise for future research is the MSCEIT and the MSCEIT-YV. Use of the measure, continued research, and study will make it a better tool for everyone. With this additional research and use of the MSCEIT in admissions, additional norms could be developed and schools could identify school-specific norms and increase the chances of academic and personal success at the school.

Finally, the inclusion of other standardized tests that are frequently used for admission, the ISEE and SSAT, should be analyzed in a similar study. This analysis would assist admissions officers in understanding the strengths and limitations of each test in its predictive value to the academic success of students.

References

- Brackett, M. A., Rivers, S. E., Reyes, M. R., & Salovey, P. (2012). Enhancing academic performance and social and emotional competence with the RULER feeling words curriculum. *Learning and Individual Differences* 22, 218–224.
- Brackett, M. A., & Salovey, P. (2006). Measuring emotional intelligence with the Mayer-Salovey-Caruso Emotional Intelligence Test (MSCEIT). *Psicothema*, 18, 34-41.
- Brownstein Group. (Accessed June 3, 2014).
<http://www.brownsteingroup.com/portfolio/>.
- Digman, J. M. (1990). Personality structure: Emergence of the five-factor model. *Annual Review of Psychology*, 41, 417-440.
- Duckworth, A. L., & Quinn, P. D. (2009). Development and validation of the short grit scale (Grit-S). *Journal of Personality Assessment*, 91(2), 166-174.
doi:10.1080/00223890802634290
- Dweck, C. S. (2006). *Mindset, The New Psychology of Success: How we can learn to fulfill our potential*. New York, NY: Random House.
- Educational Records Bureau. (2010). *Independent School Entrance Exam, Third Edition: Technical Report 2009-2010*. New York, NY: Author.
- Educational Records Bureau. (2012). *What to expect on the ISEE: A preparation book for students and their parents, Upper level*. New York, NY: Author.
- Field, A. (2013). *Discovering statistics using IBM SPSS statistics*. London, England: Sage.

- Garavalia, L. S., & Gredler, M. E. (2002). Prior achievement, aptitude, and use of learning strategies as predictors of college student achievement. *College Student Journal, 36*(4), 616.
- Grace, C.O. (2011). Measuring what matters. *Independent School, 70*(4), 64-68.
- Grigorenko, E. L., Jarvin, L., Diffley, R., Goodyear, J., Shanahan, E. J., & Sternberg, R. J. (2009). Are SSATS and GPA enough? A theory-based approach to predicting academic success in secondary school. *Journal of Educational Psychology, 101*(4), 964-981. doi:10.1037/a0015906
- Heaven, P. C. L., & Ciarrochi, J. (2012). When IQ is not everything: Intelligence, personality and academic performance at school. *Personality and Individual Differences, 53*, 518-522. doi:10.1016/j.paid.2012.04.024
- Hogan, M. J., Parker, J. D. A., Watters, C., Wood, L. M., Wiener, J., & Oke, A. (2010). Academic success in adolescence: Relationships among verbal IQ, social support and emotional intelligence. *Australian Journal of Psychology, 62*(1), 30-41. doi:10.1080/00049530903312881
- Ivcevic, Z., & Brackett, M. (2014). Predicting school success: Comparing conscientiousness, grit, and emotion regulation ability. *Journal of Research in Personality, 52*, 29-36.
- Kiley, M. L., & Gable, R. K. (2013a). Admissions counselors' perceptions of cognitive, affective, and behavioral correlates of student success at an independent high school: A mixed methods study. *K-12 Education*. Paper 14.

Kiley, M. L., & Gable, R. K. (2013b). Validation of the Secondary School Admission Test (SSAT) using GPA, PSAT, and SAT scores. *K-12 Education*. Paper 19.

Kuncel, N. R., Hezlett, S. A., & Ones, D. S. (2004). Academic performance, career potential, creativity, and job performance: Can one construct predict them all? *Journal of Personality and Social Psychology*, *86*(1), 148-161.

Mayer, J. D., & Salovey, P. (1997). What is emotional intelligence?. In P. Salovey & D. Sluyter (Eds.), *Emotional development and emotional intelligence: Educational implications* (pp. 3-32). New York, NY: Basic Books.

National Association of Independent Schools (2014, June). *Introduction*. Retrieved from <http://www.nais.org>.

Noftle, E. E., & Robins, R. W. (2007). Personality predictors of academic outcomes: big five correlates of GPA and SAT scores. *Journal of personality and social psychology*, *93*(1), 116.

Peckham, K. (2014). *Using student achievement data to drive admissions and financial aid strategy*. Presented via webinar to AISAP professionals. La Jolla, CA.

Poropat, A. E. (2009). A meta-analysis of the five-factor model of personality and academic performance. *Psychological Bulletin*, *135*(2), 322-338.

Rivers, S. E., Brackett, M. A., & Salovey, P. (2008). Measuring emotional intelligence as a mental ability in adults and children. *The Sage handbook of personality theory and assessment*, *2*, 440-460.

Salovey, P., & Grewal, D. (2005). The science of emotional intelligence. *Current*

Directions in Psychological Science, 14(6), 281-285.

Salovey, P., & Mayer, J. D. (1990). Emotional intelligence. *Imagination, Cognition and Personality*, 9(3), 185-211.

Schutte, N. S., Malouff, J. M., Hall, L. E., Haggerty, D. J., Cooper, J. T., Golden, C. J., & Dornheim, L. (1998). Development and validation of a measure of emotional intelligence. *Personality and Individual Differences*, 25(2), 167-177.

Schuerger, J. M., & Dizney, H. F. (1967). The validity for ninth grade achievement of the SSAT and other admission criteria at a private secondary school. *Educational and Psychological Measurement*, 27, 433-438.

Secondary School Admission Test Board, (2013a). *2013-2014 Interpretive guide for the middle & upper level SSAT*. Princeton, NJ: Author.

Secondary School Admission Test Board. (2013b). *Think tank on the future of assessment*. Princeton, NJ: Author.

Secondary School Admission Test Board. (2014). *Think tank on the future of assessment, final report*. Princeton, NJ: Author.

Sedlacek, W. E., & Adams-Gaston, J. (1992). Predicting the academic success of student athletes using SAT and noncognitive variables. *Journal of Counseling & Development*, 70(6), 724-727.

Sedlacek, W. E. (2005). The case for noncognitive measures. *Choosing students: Higher education admission tools for the 21st century*, 177-193.

- Soto, C. J., John, O. P., Gosling, S. D., & Potter, J. (2008). The developmental psychometrics of Big Five self-reports: Acquiescence, factor structure, coherence, and differentiation from ages 10 to 20. *Journal of Personality and Social Psychology, 94*(4), 718-737.
- Spinath, B., Spinath, F. M., Harlaar, N., & Plomin, R. (2006). Predicting school achievement from general cognitive ability, self-perceived ability, and intrinsic value. *Intelligence, 34*, 363-374.
- Sternberg, R. J., & Grigorenko, E. L. (2004). Successful intelligence in the classroom. *Theory Into Practice, 43*(4), 274-280.
- Tough, P. (2011, September 14). The admission organization: What is the secret to success is failure? *The New York Times*. Retrieved from www.admission.org/news
- Usher, E. L., & Pajares, F. (2009). Self-efficacy for self-regulated learning: A validation study. *Educational and Psychological Measurement, 68*(3), 443-463. doi: 10.1177/0013164407308475
- Wechsler, D., Kaplan, E., Fein, D., Kramer, J., Morris, R., Delis, D., & Maerlender, A. (2004). *Wechsler Intelligence Scale for Children, Fourth Edition – Integrated: Technical and Interpretive Manual*. San Antonio, TX: Pearson.
- Zuffianò, A., Luengo Kanacri, B. P., Di Giunta, L., Milioni, M., Alessandri, G., Gerbino, M., & Caprara, G.V. (2013). Academic achievement: The unique contribution of self-efficacy beliefs in self-regulated learning beyond intelligence, personality traits, and self-esteem. *Learning and Individual Differences, 23*(1), 158-162.