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Cognitive Ability, Big Five, and Narrow Personality Traits in the Prediction of Academic Performance

James Michael Loveland
University of Tennessee - Knoxville

To the Graduate Council:

I am submitting herewith a dissertation written by James Michael Loveland entitled "Cognitive Ability, Big Five, and Narrow Personality Traits in the Prediction of Academic Performance." I have examined the final electronic copy of this dissertation for form and content and recommend that it be accepted in partial fulfillment of the requirements for the degree of Doctor of Philosophy, with a major in Psychology.

John W. Lounsbury, Major Professor

We have read this dissertation and recommend its acceptance:

John Peters, Michael Johnson, Debora Baldwin

Accepted for the Council:

Carolyn R. Hodges

Vice Provost and Dean of the Graduate School

(Original signatures are on file with official student records.)

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Vice Chancellor and Dean of
Graduate Studies

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COGNITIVE ABILITY, BIG FIVE, AND NARROW PERSONALITY TRAITS IN THE PREDICTION OF ACADEMIC PERFORMANCE

A Dissertation
Presented for the
Doctor of Philosophy
Degree
The University of Tennessee, Knoxville

James Michael Loveland
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ABSTRACT

The purpose of this dissertation was to examine the degree to which the academic performance of adolescents could be predicted by cognitive ability, the Big Five personality traits, and the narrow personality traits of optimism, work drive, and aggression. The analyses were conducted using an archival sample of 542 sixth-graders and 446 ninth-graders. Results from a hierarchical regression revealed that cognitive ability produced multiple *R*'s of (.462; R^2=23.2%) and (.521, R^2=27.2%) in 6th and 9th grade samples, respectively. Entry of the Big Five in both samples produced an R^2 change of 7.2% for sixth grade and 4.4% for the ninth grade. The narrow traits aggression (R^2 change of 2.8% and work drive (R^2 change of 0.9%) predicted incrementally above cognitive ability and the Big Five in the 6th grade sample. Aggression and optimism produced R^2 changes of 4.8% and 1.2%, respectively, in the 9th grade sample. A stepwise regression, which allowed entry of all of the study variables, revealed that cognitive ability, aggression, and work drive were the best overall predictors of academic performance; the Big Five trait of extraversion gained entry into the model after these three variables in the 6th grade sample. These findings further demonstrate the validity of both cognitive ability and the Big Five in academic settings; they also indicate the improvements in validity that may be obtained through the use of narrow traits. Implications and ideas for future research are also discussed.

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CHAPTER I

INTERODUCTION AND REVIEW OF THE LITERATURE

Intelligence: A Brief Review

Research on intelligence, or cognitive ability, as it has been conceptualized in the modern literature, is typically viewed as stemming from a central factor or component typically called "g" (Spearman, 1927). This "g" factor is typically viewed as general mental ability, and this ability is highly overlapping with intelligence (Anastasi, 1980), to the extent that some even view intelligence as a composite of mental abilities (Aiken, 2000). Following this reasoning, this paper will review the literature on intelligence although the focus of this dissertation will be specifically on mental ability.

There has always been a great deal of interest in assessing cognitive ability, from both a philosophical standpoint, as well as from a more pragmatic one. For instance, in *The Republic*, Plato hypothesized that an ideal society could be obtained in part through the selection and training of those most gifted, with the more gifted being given the opportunity to ascend society's ranks to the limits of their abilities (the myth of the metals). Testing of physical and mental functioning was also considered vital to the educational process in ancient Greece (Doyle, 1974). In a similar vein, the bureaucratic examinations used in China (based in large part on being able to reproduce from memory the works of Confucius) were used to determine both eligibility for service as well as potential rank as a bureaucrat for over 2000 years (Bowman, 1989; for an extensive review of early conceptions of cognitive ability, see Peterson, 1925). However, it was not until the turn of the 20th century that cognitive ability began to develop into a scientific field (c.f. Ackerman & Heggestad, 1997). Full-fledged, scientific research

began for pragmatic reasons, namely the French Minister of Education, in his attempts to educate the populace within cost parameters, decided that there should be devised a means of assessing each pupil's potential to advance academically. From this mandate came the first systematic study of academic potential –the results were used to both come up with the now ubiquitous IQ (Intelligence Quotient) score, as well as the establishment of norms for ability acquisition by age group. The norms for mental ability as a function of age are used to determine the IQ, with the intellectual age being divided by chronological age, then this quotient is multiplied by 100. IQ was also conceived to be a measure of ability that was not contaminated by external factors such as socio-economic status (SES), upbringing, and prior academic instruction. This was the first time that intelligence was considered an innate ability, and hence the catalyst for its status as a scientific construct.

Intelligence testing rapidly caught on in the United States as well, and the testing population soon included testing the mental ability of adults. Yerkes, as part of his service to the First World War effort, tested approximately 1.7 million men (Yerkes, 1919; Van de Water, 1997) with the Army Alpha (written version) and Beta (non-verbal/illiterate version). As mentioned previously, this testing was conducted not to assess academic potential, but rather to assess mental ability –based on the premise that as job complexity increased, higher mental ability would be required, just as more advanced academic study required higher intellectual ability. After the war, intelligence testing began to be used for the prediction of academic performance in the United States, albeit not in a standardized fashion such as the SAT's or the GRE's, but rather in a purely research oriented fashion. Furthermore, the concept of IQ came under the scrutiny of

psychologists armed with the new tool of factor analysis. Spearman (1927) came up with the term "g" or general ability to describe the highest order factor of intelligence which arose from analysis of different types of intelligence (i.e. mathematical ability, verbal ability, etc.).

Modern Intelligence Research

Modern research on intelligence currently posits that there are two types of intelligence: fluid intelligence (Gf) and crystallized intelligence (Gc) (Cattell, 1987; Horn & Cattell, 1967). Gf is that intelligence which allows the individual to solve new/abstract problems, whereas Gc is that intelligence which arises from having employed fluid intelligence previously. In other words, Gc is rooted more in experience, such as reading books and learning foreign languages, while Gf acts as a moderator of the ease with which these tasks can be done. These two types of intelligence correlate approximately .80 with each other (Gottfredson, 2000); furthermore, Gf correlates with "g" .8 as well (ibid). Although this is meant as only a cursory review of intelligence, it should be noted that the relationship between acquired knowledge (Gc) and innate ability (g) is quite high. This means, for the purposes of this paper, that there will be some recursiveness in the relationship between academic ability and academic knowledge (as we measure both), because the amount of knowledge a student acquires is directly related to the academic potential of the student, and vice versa. For example, those students who know the author of, say, *Madame Bovary* are presumed to have more academic ability than those who do not, not because one needs to be intelligent to know this fact, but rather because it is likely that only more intelligent individuals would even know the answer to the question in the first place. Psychometrically, the relationship between

academic ability and academic knowledge is quite high (i.e. Gf and Gc). Tests of mental ability such as the WAIS and the Otis-Lennon are rooted in both types of intelligence and it is difficult to completely separate the two types of intelligence. However, as the research proposed for this dissertation is based on tests of cognitive ability, rather than intelligence per se, it is a straightforward assumption that tests of mental ability which are based on numerical reasoning and verbal ability (such as the ACT, GRE, SAT, and MAT) all correlate rather well with intelligence. Again, this is why researchers such as Anastasi (1988), Aiken (2000), and Spearman (1927) have consistently concluded that cognitive abilities of this nature load on a single composite factor.

The most important question which arises from this is not the degree to which intelligence predicts academic performance, as this has been well-established in the literature, but the degree to which alternate measures can be used to augment (and even replace) mental ability in the prediction of academic performance. There is an extensive research literature which documents that there is a strong correlation between academic performance and mental ability : typically in the r= .4-.6 range (c.f. Hunt, 1995). However, given the current education system in the US, there is little need for school systems to assess the academic ability of their secondary students, because secondary education is guaranteed to all students. Instead, the emphasis has switched from the original intent of Binet, to the assessment of potential to succeed in post-secondary education. As there are strong relationships between years of education and income (Ceci & Williams, 1997), post-secondary education is extremely important, and as a result, it is also somewhat competitive. Thus, mental ability becomes more of a determinant of income and SES potential than other factors. Of course, there are also

strong links between SES and mental ability and academic ability (Jensen, 1968). Additionally, a large degree of mental ability appears to be determined by genetic factors (Jensen, 1968; 1969). Because of these confounding relationships, some have argued that the use of mental ability testing in academic settings is racially biased, as there are well-documented differences, at the group level, between different ethnic groups on measures of mental ability and SES (see Jensen, 1968; for an extensive review of this research). Some, such as Sternberg et al., (2000) have argued that the concept of "g" is fundamentally flawed and overly narrow to be useful in predicting broad behavior, and overall success. There have also been court cases (e.g. *Larry P. v. Wilson Riles*) which have all argued and questioned the overall value of "g" in academic settings. They have argued that there are also issues of practical intelligence (Sternberg, et al., 2000), wherein individuals with less intelligence are able to be successful through hard work and accumulation of practical information, rather than the recondite information acquired through formal education (ibid).

Litigation in this arena has also led to the requirement that students be placed in special education courses only when they have demonstrated an impairment in other aspects of school life –that is, a low IQ is no longer the only requirement to be diagnosed as developmentally disabled (*Larry P. v. Wilson Riles*). This is in part in deference to the idea that intelligence per se is not the only indicant of ability to succeed in school. Although it is beyond our scope to review this literature, it is important to note that the controversy over intelligence has served as the basis for a movement to find alternate predictors of academic performance which are less discriminatory and more oriented towards the traits and dispositions which lead to academic success. Thus, while we know

that there is a strong relationship between mental ability and academic performance, one could argue that there still must be a more direct link between ability and performance, or at the very least, a more proximal one. In fact, Stanger (1933) had already observed that "…the energy output of the individual student…varies independently of ability" (p. 648), pointing to the idea that there is a mediating link between raw intelligence and performance. Personality, or the tendency/disposition to behave in accordance with a trait structure, provides such a intermediary link. Some have even argued that personality might predict academic performance better than intelligence (c.f. Lounsbury, Sundstrom, Loveland & Gibson, 2003a), because personality acts as the moderator between the two (Ackerman & Heggestad, 1997). Personality attributes such as the Big Five are relatively consistent across race and sex. As noted by Hogan, Hogan, and Roberts (1996), "there is no evidence whatsoever that well-constructed personality inventories systematically discriminate against any ethnic or national group" (p. 473)., and personality could serve as a possible supplement in the prediction of academic performance, while also reducing the risk of racial discrimination. Thus, it might also represent a more accurate means to predict ability.

Personality and Broad Traits

Personality research also began in earnest with the development of factor analysis, but it also developed somewhat atheoretically (Ackerman & Heggestad, 1997). There has been a considerable amount of personality research devoted to cataloguing personality factors (traits) for specific uses rather than to developing traits for theoretical predictions. Initially, personality research focused exclusively on clinical populations, which meant that the traits themselves were related to clinical symptoms and diagnoses

rather than personological theory per se . Personality inventories like the MMPI based its taxonomy of traits on the different symptoms which indicated psychological illnesses. However, researchers soon tried to apply clinically oriented tests such as the MMPI to non-clinical populations, and in general, these attempts did not produce much success (e.g. Wright, Chylinski, & Sisler, 1967). This led to the proliferation of personality instruments which focused on specific traits which were typically related (via factor analysis) to a word or term which seemed to describe a relevant trait. As Ackerman and Heggestad (1997) note, "…the literature is rife with isolated personality measures of varying levels of breadth, often with no linkage to any personality theory" (p. 222). A serious attempt was made, over thirty years ago, to unify the field of personality traits, to essentially "tidy" the latent space; the attempt met with very limited success (e.g. Tupes & Christal, 1961). In the late 80's, researchers converged on the Five Factor model of personality, or the Big Five (see Goldberg, 1990 for a review of the development of the Big Five model) personality traits of Openness, Conscientiousness, Extraversion, Agreeableness, and Neuroticism. The Big Five represented a sort of "grand unified theory of personality", because personality traits as well as trait adjectives could all be loaded on one of the Big Five traits (De Raad, 2000; Digman, 1990; Digman, 1997; Wiggins & Trapnell, 1997). Furthermore, the Big Five have been validated in many different settings and also in many different languages and cultures (Costa & McCrae, 1994; DeRaad, 2000). In short, the Big Five personality traits represent the most parsimonious, comprehensive, and robust model of personality capable of adequately cataloguing and predicting behavior across settings (Chamorro-Premuzic & Furnham, 2003).

Narrow Traits

Despite their power in predicting behavior, there is still some debate over the degree to which traits narrower in conceptual scope than the Big Five should be used to predict behavior. Some have argued that the breadth of the behavior should be the basis of the traits used to predict the relevant behaviors. Following this logic, Ones and Viswesvaran (1996) and Hogan and Roberts (1996) among others, have argued that for broad behaviors like job performance, broad traits (the Big Five) are adequate, and even preferable to narrow personality traits. Given the strong evidence that virtually all personality factors load on at least one of the Big Five factors, we can safely say that all narrow traits are, at some level, a facet of a Big Five trait, or, like integrity, a combination of Big Five traits. However, despite their parsimony and breadth, some have argued that while the Big Five are adequate in predicting behavior, their predictive value can (and should) be augmented by the use of logically-related narrow traits (Ashton, 1998; Paunonen, 1998; Schneider, Hough, & Dunnette, 1996). Several arguments have been levied against the use of the Big Five as the sole set of predictors. First, it has been found that facets of traits are often better predictors than the traits themselves. For instance, Conscientiousness is comprised of facets of dutifulness, achievement striving, and order (among others); these facets are not always measured because of their length, although they all load on the trait of Conscientiousness. Typically, a Conscientiousness measure will be based on an amalgam of all of these facets for pragmatic reasons –the NEO-PI-R has 240 items devoted to measuring the Big Five and its facets, while typical inventories used in personnel settings are much shorter (c.f. Lounsbury & Gibson, 2001: Lounsbury, Tatum, Gibson, Park, Sundstrom, Hamrick,

& Wilburn, 2003;). Following this notion of looking at narrow facets, Stewart (1999) found that while Conscientiousness predicted overall job performance quite well in a sample of sales representative, he also found that the facet of Order predicted level of success in the early training period, while Achievement Striving did not. However, after time for adequate skill acquisition, the facet of achievement striving predicted performance behavior, while Order did not. It should be noted that these comparisons are made against the broad predictor of Conscientiousness, so, while Conscientiousness predicted behavior equally well at both periods, different personality-behavior mechanisms were responsible for the predictor/criterion relationship. Specifically, differences at the narrow trait level of Conscientiousness were causing the effects for the broad trait of Conscientiousness. Using this same method of using narrow traits which are subsumed by Big Five traits, Ashton (1998) and Ashton, Jackson, Helmes, and Paunonen (1998), and Paunonen and Ashton (2001) have demonstrated that the same methodology may be used to predict specific, trait-related behaviors, such as delinquency and fun-seeking behaviors by using narrow facets of Big Five traits. In fact, the aforementioned research studies all demonstrated that the narrow traits subsumed by Big Five also provide incremental prediction above the Big Five. The most compelling explanation for this is that the traits that are most related to specific behaviors are going to be the most important for predicting those behaviors.

Following this logic, some have argued that even if broad traits are adequate for predicting broad behaviors, it does not necessarily follow that it is the breadth of the traits and the predictor which provide the basis for the relationship. Research in the area of performance appraisal has already demonstrated that the personality-performance

relationship can be influenced by other variables, such as when the criteria variables are evaluated (Stewart, 1999), the strength of the job (such as jobs in the military) (Barrick & Mount, 1993), and job complexity (Ones, Viswesvaran, & Schmidt, 1993). As Schneider, Hough, and Dunnette (1996) state: "…one sacrifices a great deal of knowledge by bowing down to the false idol of generality" (p.650). Furthermore, broad behavioral dispositions do not necessarily imply that the specific relevant behaviors necessary for success will result. For instance, a meta-analysis by Barrick and Mount (1994), based on military data, showed that the estimated true correlations between conscientiousness and both broad and narrow performance criteria were comparable to the correlations between the same criteria and the narrow traits of achievement and dependability. Although the differences between the correlations were negligible, broad conscientiousness predicted narrow criteria (r=.40) better than it did the broad criteria (r=.31). Although this paper is not designed to answer this question, it seems clear that the ultimate determinant of any predictor's value is going to be the degree to which it can be logically and statistically related to a valued outcome. This outcome should also be broken down in terms of its related behaviors, hierarchically, the same way that personality measures are hierarchically arranged (Schneider & Hough, 1996). In this vein then, the validity of a predictor depends on the degree to which it can logically account for the dispositional factors which cause a person to behave in ways that lead to the outcome in question should then be the most important factor which loads on the overall criterion in question. Broad criteria are much more complicated and less straightforward than this, but the summation of behaviors that lead to summed outcomes

(like GPA's) can and should be improved by either adding narrow criteria or by adding narrow traits which load conceptually on those factors that lead to overall performance.

Predicting Academic Performance

As mentioned before, there has been considerable interest in the prediction of academic performance, and the degree to which performance has been predicted by intellectual and personality factors. Academic performance, as measured by GPA, is a very complex and multiply determined criterion (Paunonen & Nicol, 2001) and is also "complex and ill defined" (Kuncel, Hezlett, & Ones, 2004, p. 151). One could easily conceptualize many attributes or actions that might be related to academic performance, but the extant research has focused primarily on academic ability variables such as IQ, or more typically the SAT, ACT, and GRE. However, some research has focused on potential behaviors in the classroom setting which might link disposition to academic performance. Although this dissertation did not examine specific behaviors of students, research in this domain is important to make an argument as to how personality is linked to academic performance. Furthermore, pervious research in this domain provides a baseline from which to begin, and future research will have to address these links in greater detail, if the results of this dissertation so warrant. .

Cognitive Ability. As noted previously, cognitive ability measures were initially designed to predict academic success in schoolchildren. The 20th century has seen much more intelligence research devoted to predicting the academic success of students in college and professional schools. However, research in academic success and intelligence has moved from the study of intelligence to the study of cognitive ability. This is in part because of the movement towards conceptualizing intelligence as a

function of cognitive abilities (Aiken, 2000; Anastasi, 1980). It is also because tests like the SAT's and ACT's clearly stipulate that they are not tests of intelligence, but of cognitive ability. The general findings on the relationship between academic performance and cognitive ability are, as mentioned previously, in the r=.4 to .6 range (Hunt, 1995), but these are based on large samples with significant adjustments for factors such as attenuation, range restriction, and sample size, which tend to increase the estimate somewhat. These adjustments are then made at both the criterion and predictor levels. To further complicate things, post-secondary institutions typically use factors such as previous grades (i.e. high school) to predict future (college) grades. This is problematic for intelligence research, because whatever influence intelligence exerts on previous academic performance is already being partialled out, so adding intelligence to the equation is both redundant and confounded. Furthermore, there will likely be restriction of range problems with post-secondary education samples, because there is a much narrower range in the ability levels of students, because it is typically the students with higher cognitive ability who go to college, and universities are typically stratified in terms of the ability of their typical students compared to students at other universities. Bearing all of these potential issues in mind, recent research has shown that the Miller Analogies Test (MAT) had a corrected correlation of .29 with first year GPA, .27 with overall graduate GPA, and .47 with comprehensive exam scores (Kuncel, Hezlett, & Ones, 2004). King (2000) examined the relationship between mental ability and high school GPA and found a .36 correlation for boys and a .20 correlation for girls. However, in an elite school sample, Furnham, Chamorro-Premuzic, & McDougall (2003) found no significant relationship between mental ability and annual exam scores. In

terms of behaviors such as absenteeism, and appropriate behavior in class, there does seem to be a positive relationship with intelligence. Furnham et al., (2003) found that the beta weight for cognitive ability predicting appropriate classroom behavior in class was .19, although it was not significantly related to absenteeism or grades on essays. This implies that perhaps cognitive ability might influence overall grades in a less direct manner. For instance, at the level of grade in a single course, Lounsbury et al. (2003a) reported a multiple *R* of .401 (R^2=16.1%) for cognitive ability predicting course grade for a single course. Kuncel et al (2004) found that MAT score was positively related to time taken to finish degree (*r*=..25) and creativity (*r*=.25). In short, the general pattern of behavioral findings in the literature demonstrates that there is a relatively consistent, but moderate, relationship between cognitive ability and behavioral patterns that lead to academic performance. This leaves room, on theoretical grounds, for incorporating other predictors into the set of predictors being used. Even though this study will not address the narrow behaviors which link cognitive ability to academic performance, these findings support the idea that cognitive ability itself, while a good predictor of academic performance at a broad level, does not suffice in the prediction of those behaviors which lead to academic success.. Instead, personality, at both the broad and narrow level, might be a significant predictor of academic success independent of mental ability.

Personality: Broad and Narrow Traits. Broad personality traits have been shown to be useful in predicting both specific and broad behaviors. Furthermore, one sacrifices the breadth that Big Five traits offer by relying too heavily on narrow traits –but to be useful, these broader traits need to also predict more "narrow" behaviors. Using this tack, Chamorro-Premuzic and Furnham (2003) assessed that the relationship between

Extraversion and course work was .27, while the correlation between Psychoticism and course-work was -.27. However, the broad traits (they used the Big Three, Extraversion, Psychoticism, and Neuroticism) did not significantly predict absenteeism, seminar behavior, or essay grades.(Chamorro-Premuzic & Furnham, 2003), although the broad traits of Neuroticism and Psychoticism did predict overall exam scores quite well, (r=-.37 and -.29, respectively). Furnham et al. (2003) also examined the same narrow indicants and the Big Five, and found that they (especially Conscientiousness) predicted these behavioral criteria quite well. Using only the broad trait of Conscientiousness, McIlroy and Bunting (2002) examined the more narrow outcomes of test scores and course work and found that Conscientiousness correlated at .35 and .31 (respectively) with the two narrow criteria. In a sample of medical students, Lievens, Coetsier, DeFruyt, and DeMaessneer (2002) found that Conscientiousness and Extraversion were the only successful predictors of medical school performance the first year, but by the third year, Conscientiousness and Openness to experience were the only significant predictors. The multiple R for the Big Five was actually modest , (R=.25 and .22, respectively). In another sample of medical students, however, Ferguson, Sanders, O"Hehir, and James (2000) found that Conscientiousness had a multiple R of .58 with medical school performance, and was significant even when controlling for previous academic performance.

Narrow traits have also been used to predict academic performance, but not to the same extent as broad traits. Lounsbury et al. (2003a) found that the narrow trait of work drive predicted incremental variance in a single course grade of 4.1%, after controlling for both intelligence and the Big Five. In a similar study comparing broad traits to

narrow traits in a sample of high school students, Lounsbury et al., (2003b) found that the narrow traits of work drive and aggression predicted incremental variance above the Big Five. Lievens et al., (2002) found that the Conscientiousness facets of competence (r=.17) and self discipline (r=.23) were significantly correlated with first-year medical school performance, and also that self discipline was correlated relatively equally for the following two years, while other facets were not. As noted previously, narrow traits are typically conceptualized as facets of the Big Five, because of evidence from factor analysis (c.f. Saucier & Goldberg, 1998). However, some have argued that there are some traits that do not necessarily load on any of the Big Five factors, such as religiosity, thriftiness, and dishonesty (Paunonen & Jackson, 2000; Paunonen & Ashton, 2001). However, these studies did not address the degree to which narrow personality traits might predict academic success beyond cognitive ability.

CHAPTER II

COGNITIVE ABILITY AND PERSONALITY IN THE PREDICTION OF ACADEMIC PFERFORMANCE

Rationale

Taking the constructs of cognitive ability, broad traits, and narrow traits together, it seems evident that these factors together should encompass a significant amount of the potential behaviors and dispositions which lead to academic success. Cognitive ability provides the most parsimonious and direct explanation for academic performance, both by design and by empirical support. It also has the longest history of use in predicting academic performance. The Big Five personality traits follow cognitive ability in terms of empirical validation and amount of time that they have been used to predict performance, within the context of paradigmatic research (Kuhn, 1970), although narrow traits were used sporadically and without any theoretical guidance for some time. Finally, narrow traits then should be used when the logical relationship between them and the criteria are relatively clear, and as a means of increasing validity (Schmit, Ryan, Stierwalt, & Powell, 1995). So, within the broad criterion, there are areas which are predicted well by both broad and narrow traits, although the usage of narrow traits would be to increase the predictive validity of the broad traits, just as order and achievement striving were used to predict sales performance above conscientiousness (Stewart, 1999) The narrow traits of work drive, optimism, and tough mindedness should be entered last, to determine whether they have incremental or unique validity in relation to the Big Five, and their stepwise entry indicates that there are no a priori hypotheses concerning the relative predictive value of each of the narrow traits.

Research Questions

Based on previous research, and these conclusions, there are several hypotheses which will provide the basis for this dissertation:

H1. Cognitive ability will predict a significant amount of the variance in academic performance, as measured by GPA, in high-school students. This will partially replicate the findings of Lounsbury et al. (2003a) and will also replicate previous research on cognitive ability and academic performance.

H2. The Big Five personality markers will provide incremental validity beyond cognitive ability. This will also partially replicate Lounsbury et al. (2003a) and extend the potential validity of their research by using GPA, rather than a single course grade. This will also further extend the validity of the Big Five personality traits in academic settings..

H3. The narrow traits of work drive, optimism, and optimism will predict incremental variance beyond both the Big Five and cognitive ability. These narrow traits have not previously been studied in terms of their incremental validity after controlling for both cognitive ability and the Big Five.

Research Question 1. Following the recommendation of Lounsbury et al. (2003a) that researchers consider using "both broad traits…and narrow personality measures to maximize the predictive validity of complex criteria", it was decided to investigate the overall validity of both narrow and broad traits. To address this research question, a stepwise regression was conducted. In this "overall" regression model, all traits would have the opportunity to enter the model based solely on predictive value. As Ones and Viswesvaran (1996) and Schneider, Dunnette, and Hough (1996) point out, the

identification of narrow traits which have predictive value represents a significant contribution to the development of personality theory.

Method

Participants. The data for this study were obtained from an archival source. The data were previously collected as part of a school to work transition program that was instituted by Resource Associates, Inc. at a middle school and high school in the southeastern United States. The data were collected as part of an ongoing study to examine personality in adolescents as well as to examine their preparedness for entry into the workforce. Demographic information was not recorded for individual participants. However, the schools which participated in this study are approximately 98% Caucasian and 2% African-American.

Measures. The personality scales used by this organization, the Adolescent Personal Style Inventory (APSI) are, in part, a modified version of a Big Five inventory which has been contextualized to the school setting and has been adjusted to be at a 6th grade reading level. The APSI also includes narrow personality traits as well, which are also contextualized for the school setting and adjusted to a 6th grade reading level. These scales have been validated extensively both through private sector validation studies (the tests have been used for employee selection) and also through extensive academic research (c.f. Lounsbury & Gibson, 2001; Lounsbury, Loveland, & Gibson, 2002; Lounsbury et al. 2003a; Lounsbury et al. 2003b) To measure cognitive ability, a standardized composite was formed of two timed aptitude tests: a verbal reasoning test and a numerical reasoning test developed by the first and second authors and used extensively in a variety of organizational settings (Lounsbury & Gibson, 2002). After

converting scores on each test to T scores with mean = 50 and standard deviation = 10, the two scores were averaged to form a composite cognitive aptitude score for each individual. Based on college student samples (*ibid*), we found that this composite cognitive ability score correlated .65 with the Otis-Lennon Test of Mental Maturity--a group-administered test of general intelligence (Otis & Lennon, 1969, Anastasi & Urbina, 1997)--and it correlated .60 with factor B of the 16 PF (Cattell, Cattell, & Cattell, 1993), which the authors describe as "a brief measure of reasoning or intelligence" (p. 43).

CHAPTER III

RESULTS AND DISCUSSION

Results

Results were assessed using a hierarchical regression followed by a stepwise regression (Cohen & Cohen, 1983) procedure with the tests of cognitive aptitude entered first as a block, followed by addition of the Big Five as a block, followed by the stepwise entry of optimism, work drive, and aggression (based on significance). In view of the widespread practice among adolescent researchers of studying construct relations in different age groupings (e.g. Muuss, 1996), the above relationships for adolescents were examined in two groups: middle school and high school samples. This permitted the examination of not only similarity in relationships, but also systematic changes across age groups. The results were assessed for the 6^{th} and 9^{th} graders separately. Results were also assessed using a stepwise regression procedure, which selects the independent variable which most highly correlates with the dependent variable, then selects the next independent variable whose partial correlation is the highest from the remaining independent variables. This procedure is typically performed when no a priori hypotheses can be formulated. In this case it was done to assess the potential for all the traits used in this study to be evaluated for their contribution to the prediction of GPA.

Sixth Graders. For the 6^{th} graders, entry of the tests of cognitive ability produced a multiple *R* of .482 ($p<.001$). Entry of the Big Five increased the multiple *R* to .551 ($p<.001$), which represents an R^2 change of 7.2% ($p<.001$). The narrow traits of optimism, work drive, and aggression were allowed to enter in stepwise fashion. Only those narrow traits contributing significantly to the prediction of GPA were allowed to

enter at each subsequent step. The first of the narrow traits to enter the model was aggression, raising the multiple *R* to .576 ($p<.001$), representing an R^2 change of 2.8%. Next, work drive entered, raising the multiple *R* to .584 ($p<.05$), representing an R^2 change of 1%. Optimism did not enter the model. The complete regression results for the sixth grade sample are shown in Table 1 (Table 1, as well as all future tables, are found in the Appendix at the end of this document). Intercorrelations between the variables used are shown in Table 2.

In order to assess the amount of variance that could be accounted for by using the minimum number of variables, a stepwise multiple regression procedure was also performed. The first variable to enter the model was cognitive ability, which produced a multiple *R* of .482 ($p<.001$). Aggression was the next variable to attain entry, with a multiple *R* of .547 ($p<.001$), representing an R^2 change of 6.7%. The last variable to produce a significant change was work drive ($R=.567$, $p<.001$), $R^2=2.2\%$. Overall, the variables entered accounted for 34.1% of the variance in GPA. These data are reported as Table 3.

Ninth Graders. For the 9th graders, entry of the tests of cognitive ability produced a multiple *R* of .521 ($p<.001$). Entry of the Big Five increased the multiple *R* to .562 ($p<.001$), which represents an R^2 change of 4.4% ($p<.001$). The narrow traits of optimism, work drive, and aggression were then allowed to enter in stepwise fashion. Only those narrow traits contributing significantly to the prediction of GPA were allowed to enter at each subsequent step. The first trait to enter was aggression, which raised the multiple *R* to .603, which represents an R^2 change of 4.8% ($p<.01$). Next, optimism entered the model, raising the multiple *R* to .613. This represents an R^2 change of 1.2%.

The final R^2 for the overall model was 37.6%. Detailed hierarchical regression data for the 9th grade sample are listed as Table 4. Intercorrelations between 9th grade test variables are listed as Table 5.

A stepwise multiple regression analysis was also performed for the 9th grade sample. The first variable to attain entry into the model was cognitive ability, R=.521, p<.001, which represents an R^2 of 27.2%. Next, aggression was entered into the model (R=.595, p<.001), which represents an R^2 change of 8.2%. Finally, work drive entered the model, R=.611, p<.001; the R^2 change for work drive was 1.9%. Data for the stepwise regressions (with all variables competing for entry) for both grades are reported in Table 6.

Discussion

Of the three research hypotheses, the first was that cognitive ability would predict academic performance; this hypothesis was confirmed. These results also confirm the results of Lounsbury et al. (2003b). Furthermore, the results of the stepwise regression indicate that when all variables are competing for entry into the model, cognitive ability provides the most robust and valid predictor of academic ability. Although there has been much research in the use of cognitive ability predicting academic performance, there is little research which focuses on the pre-secondary level. Typically, research instead focuses on education at the post-secondary level or on performance in the work setting.

The second research hypothesis was that the Big Five personality traits would predict above the measure of cognitive ability. This hypothesis was also confirmed, supporting the similar conclusion made by Lounsbury et al. (2003b). The Big Five

personality traits are good predictors of academic performance. What is more interesting is that the Big Five did not gain entry into the stepwise regression model, which suggests that other measures might be predicting the same variance as the Big Five. Furthermore, in the hierarchical regression, there was some inconsistency in the degree to which individual Big Five measures were related to academic performance as a function of grade.

The third hypothesis was that the narrow traits of optimism, work drive, and aggression would add incremental validity to the prediction of GPA above both the Big Five and cognitive ability. This hypothesis was only partially confirmed, as the narrow trait of optimism did not gain entry into the model above cognitive ability and the Big Five in the 6th grade sample, and work drive did not gain entry in the 9th grade sample. However, the narrow trait of aggression was successful in predicting academic performance at both grade levels. Its predictive value is demonstrated not only by the prediction of academic performance above the Big Five and cognitive ability, but also by the fact that aggression gained entry into the stepwise regression model in both samples (when all variables competed for entry). The robustness and consistency of the validity of aggression strengthens the argument that more attention should be given to narrow traits, even when predicting broad, multiply determined outcomes. The consistency of the narrow trait of aggression is important because part of the logic of using the Big Five and other broad traits is simply their parsimony and their perceived influence across a wide spectrum of behaviors and settings. What these results show, however, is that the Big Five might not be able to consistently predict grades which represent broad behaviors in the same way across different groups. Furthermore, of the narrow traits used,

aggression and work drive were able to consistently predict the broad, multiply determined outcome of academic achievement above all of the other variables, with the exception of cognitive ability, when all traits were assessed with a stepwise regression.. Although the explanation for the relationship between aggression has not yet been proffered, it will likely be the same for both 6th and 9th graders. In order to attempt to further explain the overall results, we will discuss each of the traits individually.

Cognitive Ability. In both the 6th grade and the 9th grade samples, the measure of cognitive ability was a strong predictor of performance. In the 6th grade sample, 23.2% of GPA was explained by cognitive ability, in the 9th grade, it predicted 27.2% of academic performance. These cognitive tests, as well as the personality measures, were designed to be appropriate for middle and high school students. Thus, the tests might be a better indicant of overall academic knowledge and performance, compared to more symbolic and general tests such as the WAIS and the Otis-Lennon Test of Mental Ability. Tests of this nature typically include tasks such as puzzle arrangement, block design, and pattern recognition which, although predictive of academic performance, are not as clearly contextualized to the school setting as the tests used in this study. The results of the stepwise regression indicate that the measure of cognitive ability is likely the best overall predictor of academic performance among the variables examined. It is also interesting to note that the measure of cognitive ability correlated modestly but significantly with all of the Big Five traits in both samples, and all of the narrow traits as well (except aggression in the 6th grade sample). Some have argued that intelligence is independent of and unrelated to personality (c.f. Collis & Messick, 2001; Saklofske &

Zeldner, 1995). The present results are at variance with such a proposition. Further research should be conducted to verify and explain such personality-ability relationships.

Big Five Overall. In terms of their overall predictive value, the Big Five personality traits provided 7.2% of incremental validity beyond intelligence in the 6th grade sample, while predicting 4.4% in the 9th grade sample. It was decided to further assess each of the Big Five traits individually by entering each one after cognitive ability, rather than as a block. This allows for more detailed investigation of the potential predictive value of each Big Five trait. The results obtained comprise Table 7 (6th grade data) and Table 8 (9th grade data). Although the Big Five trait extraversion was the only trait to enter the stepwise regression model, it should be borne in mind that the Big Five, entered first, consumed much of the variance which narrow traits accounted for in the overall stepwise model. This result demonstrates the breadth of the Big Five –although the Big Five are not designed to measure narrow traits of aggression and work drive, they were still able to predict some of the narrow traits' variance. It also supports the argument that, in the absence of theoretical justifications for individual narrow traits, the Big Five provide a good place to start looking for relationships with academic performance and perhaps other broad criteria.

Agreeableness. This trait is typically defined as the degree to which one is courteous, flexible, good-natured, and easygoing. Following cognitive ability, agreeableness alone would produce an R^2 change of 4.2% ($p<.001$) in the 6th grade sample, and an R^2 change of 3.6% ($p<.001$) in the 9th grade sample. This means that agreeableness alone could account for slightly more than half of the variance accounted for by the Big Five in the 6th grade sample, whereas it accounts for all but 0.8% of this

variance in the 9th grade sample. This implies that agreeableness is a relatively stable and valid predictor for both grades. It is also highly (negatively) correlated with the narrow trait of aggression, which entered the overall stepwise model whereas agreeableness did not. Thus, agreeableness is likely capturing some, but not all, of the variance for which aggression might account. Examination of Table 6 shows that, based on partial correlations (which dictate entry into the stepwise model), agreeableness enters last in the 6th grade sample and first to last in the 9th grade sample. This result might in part be due to the degree to which the Big Five traits seemed to be supplanted by the narrow traits, once cognitive ability is accounted for.

Conscientiousness. A measure of the degree to which one is responsible, achievement striving, and organized, conscientiousness accounted for an R^2 change of 4.1% ($p<.001$) in the 6th grade sample, and an R^2 change of 2.0% ($p<.001$) in the 9th grade sample. Half of the Big Five's variance for both the 6th grade and 9th grade samples is being accounted for by conscientiousness; furthermore, this trait also correlates very highly ($r=.6$, $p<.001$) with work drive in both samples. The higher correlation that work drive has with GPA, along with these results, might partially explain why conscientiousness did not enter the model when a stepwise procedure was used. As conscientiousness is comprised of many facets, while work drive is centered more on goal-oriented behavior, perhaps this goal orientation is what is most responsible for academic achievement. So, while organization and responsibility are valuable traits, perhaps they are partially driven by the higher-order trait of goal-directed behavior. In other words, one could argue that a person who is more motivated to succeed might be

more likely to meet deadlines (responsibility) and have well articulated plans for attaining important goals (organization).

Extraversion. This trait is a measure of gregariousness, assertiveness, talkativeness, and sociability. Extraversion accounted for an additional 4.0% of the variance in the 6th grade sample and 1.2% of the variance in the 9th grade sample. For the 9th grade sample, the relationship seems rather modest; however, one should also bear in mind that extraversion was the only one of the Big Five variables to significantly predict variance in the stepwise regression procedure (in the 9th grade sample only). Future research could examine this relationship further, but one possibility is that as students move into larger schools where there are many more students (i.e. from middle schools to high-schools), the ability to make friends and adapt to an ever-changing social environment is more vital to academic success. It is also worth noting that this trait correlates highly with optimism, suggesting that perhaps part of the value of sociability is that helps create a positive outlook, or that perhaps a positive outlook attracts others socially.

Openness. This trait, sometimes called intellect, is designed to measure the degree to which one is imaginative, original, and broad minded. Of all of the Big Five traits, this one typically correlates the highest with intelligence. In the 6th grade sample, this correlation was only r=.12, (p<.001), and it was r=.24 (p<.001) in the 9th grade sample. Both of these correlations are rather modest. This trait predicted only a small amount of variance beyond cognitive ability: 1.6% (p<.001) and 1.3% (p<.05) in the 6th and 9th grade samples, respectively. This result is somewhat surprising, as one might assume that the more varied curriculum of high-school would require a higher degree of

openness. Even at the college level, this relationship is actually quite low: Lounsbury et al. (2003b) reported a correlation of r=.12 (p<.05) in a sample of college students. The implication is that perhaps this construct is simply not as important as other Big Five traits in the academic setting.

Emotional Stability/Neuroticism. This trait (at the negative pole of neuroticism) measures the degree to which one is tense, nervous, and apprehensive. Although neuroticism is often a significant determinant of job and life satisfaction, it apparently does not predict GPA to any important degree. As can be seen in Tables 2 and 4, neuroticism correlates about .2 with GPA, which is somewhat modest compared with the other Big Five traits.. In the 6th grade sample, this trait accounted for an additional 2.0% of variance above cognitive ability; in the 9th grade sample it did not account for any additional variance. One possibility is that this trait is not as easily demonstrable as other traits, because of the series of profound and stressful changes which typically occur during puberty.

Optimism. Optimism was significantly correlated with GPA for both the 6th and 9th grade samples (r=.25, p<.001; and r=.31, p<.001; respectively), it did not add any incremental variance beyond cognitive ability and the Big Five in the 6th grade sample. However, in the 9th grade sample, optimism entered after aggression and accounted for an additional 1.2% (p<.05) in variance. Further examination of the relationship between optimism and other traits (in terms of its intercorrelations which are shown in Table 2) reveals that it is highly related to all of the Big Five traits, and moderately related to both IQ and GPA. For instance, it is highly correlated with conscientiousness (r=.467, p<.001; r=.407, p<.001; 6th and 9th grades, respectively), agreeableness (r=.322, p<.001;

r=.442, p<.001; 6th and 9th grades, respectively), work drive (r=.467, p<.001; r=.461, p<.001; 6th and 9th grades, respectively) and aggressiveness (r= -.346, p<.001; r= -.327, p<.001; 6th and 9th grades, respectively). This implies that much of the variance for which optimism could likely account is already being accounted for by other traits. So while optimism might not be one of the better predictors, this does suggest that optimism might potentially be used as an overall measure of general personality because it correlated with so many important traits.

Work Drive. Work drive refers to the disposition to expend extra time and effort to attain achievement related goals (Lounsbury et al. 2003b). The trait of work drive added 0.9% R^2 change in the 6th grade sample, and no R^2 change in the 9th grade sample. However, when the overall stepwise procedure was used, the trait of work drive added 1.9% variance accounted for after cognitive ability and aggression (in the 9th grade sample) and 2.2% in the 6th grade sample. This indicates that work drive might be a more useful predictor than the Big Five trait of conscientiousness.

Aggression. The trait of aggression was the first of the narrow traits which significantly entered after the Big Five and cognitive ability; it produced an R^2 change of 2.8% in the 6th grade sample and an R^2 change of 4.8% in the 9th grade sample. When the overall stepwise procedure was used, aggression entered first, after cognitive ability, in both samples. These findings support the idea that aggression is a valid predictor of academic performance. Interestingly, just as optimism correlates rather well with all of the traits used in this research, aggression correlates negatively with all of the other traits used in this study. In essence, it might be seen as the negative counterpart of optimism; so while optimism denotes well-being, aggression might indicate a lack of well-being.

Narrow Traits Overall. In terms of overall predictive validity, the narrow personality traits of aggression, work drive, and optimism were significant predictors of academic performance beyond cognitive ability. However, only aggression predicted significantly beyond the Big Five and cognitive ability in both samples. The results of the overall stepwise regression further bolster the argument that narrow traits can often be even more useful than broad traits. Knowing this, we must ask ourselves why these narrow traits have such a strong predictive value in the academic setting. Specifically, why or how does aggression, a trait not normally associated with academic success, influence academic performance? As noted earlier, the justification for using any narrow trait (or other trait, for that matter) should be its logical relationship with the dependent variable in question. While work drive is logically related to academic performance in a straightforward fashion, aggression is not. The basis for a relationship between aggression and academic performance is unclear, which represents a challenge for future research.

CHAPTER IV

CONCLUSION

Future Research

There are several unanswered questions which are raised by this research. One important question is the overall usefulness of the Big Five –future research should address the degree to which individual broad traits are useful. The incremental change for the Big Five traits was somewhat modest, and only extraversion entered the overall stepwise model in the 9th grade sample. This might suggest that caution may be warranted in applying the Big Five to prediction when cognitive ability and narrow traits are available. Another possibility, as noted before, is simply that the Big Five are broad traits, and thus their predictive capacity is predicated on this breadth. One could argue then that the value of the Big Five traits is partially their ability to guide researchers armed with more narrow traits to those areas where predictive validity can be increased. Future research could be done to attempt to link personality and disposition to the behaviors which are directly responsible for the trait-outcome relationships. In this vein, other narrow traits such as locus of control, need for achievement, and conformity might also be worthy of investigation.

Another important question is how aggression affects academic performance. Obviously, one could make arguments about aggressive students being more likely to be suspended or their being more likely to be from a lower SES background. One could also argue that perhaps aggressive students are not as well liked by or receptive to others, or that there are other dispositional factors which cause a lack of interpersonal skills. One could also argue that perhaps students high in aggression are trying to compensate for a

lack of intelligence. However, entry of aggression into the model after controlling for the Big Five drastically limits the explanations one could make in this vein. Consequently, these varied possible explanations need to be further examined in different samples. One might argue that since these data were obtained from a rural sample, they might not be generalizable to other settings. However, Loveland et al. (2004), used a sample from an urban community and found very similar results. Furthermore, their results indicated that the relationship between aggression and academic performance was almost twice as high for girls as it was for boys. Although a fuller account is beyond the scope of this paper, the relationship between aggression and academic performance, though robust and consistent, still requires further investigation.

Limitations

The main limitations of the present study stem from the fact that the sample is based on a rural population. As reported earlier, the sample is 92% Caucasian-American, and only 8% African-American, with no representation from other minority groups. Furthermore, the study was cross-sectional in design: a longitudinal study would substantially increase the generalizability of these findings. Another limitation of the present study is that some of the effects, based on the stepwise regression, were inconsistent. Cohen and Cohen (1983) caution against the use of stepwise regression to make any generalizations without further cross-validation, "and only those conclusions that hold for both samples should be drawn" (p. 125). Given these results, and the validity demonstrated in both samples and in both regression models, it is clear that cognitive ability and the narrow trait of aggression should continue to be used in the prediction of academic performance, but these results will still need to be verified in

other settings. Another limitation is that some of the relationships are still unclear – understanding the causes for relationships, like that between GPA and aggression, and it is impossible to determine with these results, even the direction of influence. Also, when the overall stepwise model was used, optimism and work drive were inconsistent in their incremental prediction. This makes it impossible to conclude whether or not these traits reflect developmental or academic issues. Further research is clearly indicated.

Conclusion

In conclusion, the findings of this study data strongly support the overall validity of cognitive ability, moderately support the Big Five personality traits and partially support the narrow traits of optimism and work drive, and the overall validity of aggression. In particular, the results of the stepwise regression indicate the overall usefulness of cognitive ability in combination with the narrow trait of aggression to predict academic performance. Overall, these two variables were able to account for about one-third of academic performance. Considering the time required to fill out the questionnaires and their brevity as compared to the hours of classroom attendance and studying over years that go into a cumulative grade point average, this degree of prediction is remarkable.

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APPENDIX

Table 1

Hierarchical Regression for the 6th Grade: Cognitive Ability, Big Five Traits, followed Stepwise by Aggression and Work Drive. Dependent Variable: GPA.

Step	Variable	Multiple R	R^2	R^2Change
1	Cognitive Ability	.482	.232	.232
2	Big Five traits (Agreeableness, (Conscientiousness, Emotional Stability, Extraversion, Openness)	.551	.304	.072
3	Aggression	.576	.332	.028
4	Work Drive	.584	.341	.009

n = 452

Table 2

Intercorrelations of Study Variables for 6th Grade Sample

	(1)	(2)	(3)	(4)	(5)	(6)	(7)	(8)	(9)	(10)
Cogn. (1)	(1.0)	.12	.17	.16	.17	.11	.20	.17	-.08	.48
Agree. (2)		(1.0)	.38	.45	.34	.33	.32	.42	-.68	.26
Consc. (3)			(1.0)	.26	.40	.46	.47	.62	-.27	.28
Emoti. (4)				(1.0)	.36	.23	.36	.16	-.25	.21
Extra. (5)					(1.0)	.40	.62	.33	.34	.28
Open (6)						(1.0)	.48	.45	-.36	.18
Optim.(7)							(1.0)	.47	-.35	.25
Work (8)								(1.0)	-.39	.32
Aggr (9)									(1.0)	-.30
GPA (10)										(1.0)

Note: n = 452

Table 3

Results of Overall Stepwise Regression for the 6th Grade: Cognitive Ability, Aggression, Work Drive, Optimism and each of the Big Five traits. Dependent variable: GPA.

Step	Variable	Multiple R	R^2	R^2 Change
1	Cognitive Ability	.482	.232	.232*
2	Aggression	.547	.299	.067*
3	Work Drive	.567	.322	.022*
4	Extraversion	.577	.333	.011
5	Openness	.579	.335	.002
6	Conscientiousness	.581	.338	.003
7	Optimism	.583	.331	.002
8	Emotional Stability	.584	.342	.002
9	Agreeableness	.586	.343	.002

* Significant at the .001 level, all other values not significant

n = 452

Table 4

Results of Hierarchical Multiple Regression for the 9th Grade entered in the following order: Cognitive Ability, Big Five Traits, followed Stepwise by Aggression and Optimism. Dependent Variable: GPA.

Step	Variable	Multiple R	R^2	R^2Change
1	Cognitive Ability	.521	.272	.272
2	Big Five traits (Agreeableness, (Conscientiousness, Emotional Stability, Extraversion, Openness)	.562	.316	.044
3	Aggression	.603	.364	.048
4	Optimism	.613	.376	.012

n= 287

Table 5

Intercorrelations of Study Variables for 9th Grade Sample

	(1)	(2)	(3)	(4)	(5)	(6)	(7)	(8)	(9)	(10)
Cogn. (1)	(1.0)	.15	.15	.12	.19	.22	.27	.20	-.25	.52
Agree. (2)		(1.0)	.42	.38	.35	.31	.44	.41	-.63	.26
Consc. (3)			(1.0)	.25	.31	.33	.41	.62	-.26	.22
Emoti. (4)				(1.0)	.22	.166	.48	.21	-.44	.15
Extra. (5)					(1.0)	.30	.65	.29	-.31	.21
Open (6)						(1.0)	.39	.55	-.25	.23
Optim.(7)							(1.0)	.46	-.33	.31
Work (8)								(1.0)	-.46	.35
Aggr. (9)									(1.0)	-.41
GPA (10)										(1.0)

Note: n = 287

Table 6

Results of Overall Stepwise Regression for the 9th Grade for Cognitive Ability, Aggression, Work Drive, Optimism and each of the Big Five traits added individually. Dependent Variable: GPA.

Step	Variable	Multiple R	R^2	R^2Change
1	Cognitive Ability	.521	.272	.272*
2	Aggression	.595	.354	.082*
3	Work Drive	.611	.373	.019*
4	Optimism	.613	.375	.002
5	Emotional Stability	.616	.380	.005
6	Extraversion	.617	.381	.001
7	Openness	.618	.382	.000
8	Agreeableness	.618	.382	.000
9	Conscientiousness	.618	.382	.000

* Significant at the .001 level, all other values not significant

n = 287

Table 7

Results of Hierarchical Multiple Regression for the 6th Grade for Cognitive Ability and each of the Big Five traits added individually and separately. Dependent Variable: GPA.

Step	Variable	Multiple R	R^2	R^2Change**
1	Cognitive Ability	.482	.232	.232
2	Agreeableness*	.523	.274	.042
3	Conscientiousness*	.523	.273	.020
4	Emotional Stability*	.502	.252	.020
5	Extraversion*	.521	.272	.040
6	Openness*	.498	.248	.016

* Values denote incremental validity above cognitive ability
** All values significant at the .01 level
n = 452

Table 8

Results of Hierarchical Multiple Regression for the 9th Grade for Cognitive Ability and each of the Big Five traits added individually and separately. Dependent Variable: GPA.

Step	Variable	Multiple *R*	R^2	R^2Change**
1	Cognitive Ability	.521	.272	.272
2	Agreeableness*	.555	.308	.036
3	Conscientiousness*	.540	.292	.020
4	Emotional Stability*	.528	.279	.007
5	Extraversion*	.533	.284	.012
6	Openness*	.533	.248	.013

* Values denote incremental validity above cognitive ability
** All values significant at the .05 level with the exception of Emotional Stability, which is not significant.
n = 287

VITA

James Loveland attended both private and public schools in the US and abroad. He earned a B.A. in Psychology and a minor in French from Shippensburg University, in Shippensburg, Pennsylvania. He went on to earn a M. A. in General Psychology in 2001 from Southeastern Louisiana University, Hammond, Louisiana. He is currently an Assistant Professor of Psychology at Louisiana Tech and completing his Ph.D. in Psychology, at the University of Tennessee, Knoxville.