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An Investigation of the Big Five and Narrow Personality Traits in Relation to Academic Performance

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To the Graduate Council:

I am submitting herewith a dissertation written by Craig Lancer Rogers entitled "An Investigation of the Big Five and Narrow Personality Traits in Relation to 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:

Richard Saudargas, Debra Baldwin, Mary Sue Younger

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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_Debra Baldwin_____

_Mary Sue Younger_____

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Vice Chancellor and Dean of
Graduate Studies

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

AN INVESTIGATION OF THE BIG FIVE AND NARROW PERSONALITY TRAITS IN RELATION TO ACADEMIC PERFORMANCE

A Dissertation

Presented for the Doctor of Philosophy

Degree

The University of Tennessee, Knoxville

Craig Lancer Rogers

December 2005

DEDICATION

This dissertation is dedicated to my family

and to my loving wife, Nicole Rogers,

and son, Jarred Rogers.

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There are many people I am deeply indebted to, either directly or indirectly, that led to the completion of this degree.

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Abstract

The present study investigated the relationship between the Big Five personality traits (*agreeableness, conscientiousness, emotional stability, extroversion,* and *openness*), as well as the relationship of more narrow personality traits, with academic performance. The issue of narrow traits adding incremental validity to the Big Five in predicting academic performance was investigated, using archival data collected from 552 university students.

Results from a correlation analysis indicated that *openness, conscientiousness, agreeableness,* and *emotional stability* were all significantly related to GPA (college grade-point average), while extroversion was not related. Due to a significant gender difference in college GPA, gender interaction terms with each of the Big Five factors were employed for regression analyses. The regression analyses indicated that GPA was related to *openness, emotional stability*, and *agreeableness.*

Bivariate correlation analyses showed that, of the five narrow traits, *aggression, self-directed learning, optimism*, and *work drive* were related to GPA. Regression analysis indicated that *aggression, self-directed learning, tough-mindedness*, and *work drive* accounted for partial effects in GPA. Significant interactions were noted between gender and *optimism* and gender and *self-directed learning*.

Finally, a sequential multiple regression revealed that the following narrow traits added incremental validity to the Big Five in explaining variance in college GPA: *conscientiousness* from the Big Five, and the narrow traits of *self-directed learning, aggression, tough-mindedness,* and *work drive*. Significant interactions were noted between gender and *optimism* and gender and *self-directed learning*. These findings were

interpreted as supporting the usefulness of both broad and narrow personality traits to predict real-world outcomes. Furthermore, these findings illuminate the relationship between personality and academic performance.

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CHAPTER 1: INTRODUCTION

A common definition of personality is a person's complex set of traits that impact behavior across both time and situation (Zimbardo & Gerrig, 1996). Typically, the explanations for behavior have been based on two ideas. The first is that behavior is the result of situational or environmental factors that influence behavior (the nurture argument). The second is that personality traits are responsible for behavior (the nature argument). The situational position fails to account for behaviorally consistent tendencies that many people exhibit.

Clinical psychology and psychiatry made initial approaches to the study of personality. Both fields attempted to address psychopathology by emphasizing the importance of the role of the personality in abnormal functioning. Sigmund Freud emphasized the importance of inner psychic forces that were unique to each individual and their relationship with behavior. After Freud, Alfred Adler, Karen Horney, and Carl Jung, among others, furthered the idea that there were individual differences in psychopathology that were contributed by each person's unique psychological makeup.

The goal of this school of thought, both Freudian and neo-Freudian, as described by Hogan and Roberts (2001) is to identify each individual's unique neurotic tendency and his or her effort to overcome this tendency. This early, limited approach emphasized that individual differences, albeit psychic ones, were contributing factors to abnormal functioning.

One shortcoming of these early theorists was that they were applied almost exclusively to abnormal functioning. However, they were challenged by the 1930's by Gordon Allport who made the revolutionary assertion that the influence of personality is

not limited to psychopathology (Allport, 1937). That is, an individual's behavior in normal functioning could be the result of individual difference variables as well. This notion was also supported by Stagner (1937).

Though not well received at the time, these initial steps were important in that they sought to quantify empirically the impact of individual personality traits on behavior. The result was considered a backlash against evidence of unique inner psychic forces that were immeasurable. Thus, the move toward quantification had a lasting impact.

After the psychodynamic school of thought began to wane in the mid 1900's, the behavioral view first espoused by Watson (Schultz & Schultz, 1996) fostered the development of ideas by Allport and Stagner. Watson favored the objective scientific investigation of observable behavior rather than subjective internal events. Consequently, using empirical methods to investigate normal personality started to gain popularity within the field of psychology.

Initially, the main area of interest was to identify and quantify individual difference variables. Raymond Cattell made great strides in this area, coming down on the side of nature in the nature/nurture debate (Hirsch, 1975). He emphasized *traits* as important determinants of behavior and that tests could measure how individuals differ in the degree of that trait, rather than the form of the trait (Cattell, 1966). As a result, common traits make individual differences less pronounced.

Cattell allowed for *unique traits,* but he focused on the traits individuals share in common. He hypothesized that individuals possess *second-order traits* and that second-order factors were "superfactors" that include the other types of traits. He dealt with two

second-order traits, *exvia-invia* and *anxiety*. *Exvia-invia* refers to personality commonly referred to as extroversion-introversion (Allen, 2000). The other second-order trait, *anxiety*, referred to feelings of tension and upset, whose cause was difficult to identify. These ideas led Cattell to construct the 16PF, a measure of personality measured in terms of 16 second-order traits (Cattell, Eber, & Tatsuoka, 1970).

Hans Eysenck agreed that traits are the best way to describe normal personality. He viewed traits as theoretical constructs related to intercorrelations among different behavioral responses (Eysenck and Eysenck, 1969). Eysenck identified three factors that tend to be repeated across different studies, *extroversion, neuroticism,* and *psychoticism* (Eysenck, 1981). Everyone possesses varying degrees of each extreme on these three dimensions. The three are *extroversion–introversion; neuroticism–stability;* and *psychoticism–superego*.

Eysenck included some of the psychodynamic dimensions that were previously discussed and, like Cattell, he was committed to an empirical approach to quantifying personality. Both of these men relied on the statistical technique of factor analysis to formulate their respective personality dimensions.

Eysenck and his three-factor theory would be succeeded later by a five-factor theory of personality, incorporating *extroversion* and *neuroticism*. Others adopted this trend and asserted that personality was the product of a limited number of traits. Leary (1957) saw personality as revolving around two dimensions, *love–hate* and *power*.

Although revolutionary at first, the trait theorists seemed to come to a standstill a few years later. Hogan and Roberts (2001) attributed the halt to a threefold reason. First, the conceptual underpinnings were not widely agreed upon. Second was the lack of

agreement on the purpose of personality assessment. Third was the question of what should be measured. Moreover, the rise of social psychology with its emphasis on the environmental contributions to behavior became an increasing impediment to personality psychology in the 1960s. Although certainly not unheard of until then, social psychology became a more prominent force in American psychology.

Situationally specific behavior had an advantage that traits did not: the situation could be manipulated. Similar ideas were amplified in the social upheaval that marked the 1960s. The question then became, why investigate a contributor to behavior that can't be manipulated (personality), when an externally manageable solution exists in looking at the context in which a behavior occurs?

With the momentum of the nurture side, Julian Rotter became the first psychologist to attack the notion of traits as determinants of behavior. He argued that the influence of a powerful situation reveals a general trend in behavior that isn't typical of other situations (Rotter, 1966). Paradoxically, Rotter did allow for individual differences, as did Cattell and Eysenck. However, he believed that individual differences were the result of the situation and not the person. Thus, for Rotter, the situation is the most powerful determinant of behavior.

One of Rotter's students took these ideas and expanded them. Walter Mischel directly challenged the notion of traits (Mischel & Shoda, 1994). He argued that cognitive and affective factors were more important than traits in determining behavior (Mischel & Shoda, 1998). In doing so, Mischel allowed for the consideration of personal variables (i.e., cognitive and affective states) that were summarily different from the traits discussed up to now.

In fact, Mischel claimed behavior is the result of an interaction between personal factors and social situations, rather than either working independent of the other (Mischel and Shoda, 1998; Mischel and Shoda, 1995; Shoda and Mischel, 1993). Mischel disagreed with the trait theorists who held that cognitive and affective states comprised personal factors. Specifically, Mischel believed personal factors are memories of previous experiences that determine an individual's behavior. By allowing for personal factors, Mischel departed from the strict behavioral ideas of Rotter, while finding himself alienated from the Freudians by emphasizing the role of the situation. His assertions illuminate the sharp contrast between Mischel's view of internal factors, as opposed to the trait models presented earlier, as well as the Freudians' ideas.

Hogan and Roberts (2001) credited the shift back to personality to industrial and organizational psychology. Industrial/organizational psychologists showed that, in a relatively homogeneous work environment, personality traits were significantly related to selection issues from hiring to promotion. Ironically, it was a situational influence—discrimination in the workplace—that returned the emphasis to traits.

For the most part, trait measures are free from biases that plague traditional measures of intellectual functioning. Consider the "Flynn effect," an increase in intellectual functioning scores over time for no apparent reason (Flynn, 1998). The Flynn effect illustrates the potential for bias when assessing cognitive ability by artificially inflating g. Consequently, interest was revived in personality assessment as it relates to normal functioning.

Renewed interest in normal functioning was aided by a seeming resolution to the nature/nurture debate. Carson (1989) was ready to sound the death knell for the nurture

side. His enthusiasm was encouraged by Kendrick and Funder (1988), who had found gaping holes in the claims of situationalists.

Another factor that influenced the popularity of personality assessment was the refinement of the "five-factor model." The five-factor model of personality suggests that five relatively independent factors comprise personality*: agreeableness, conscientiousness, extroversion, neuroticism,* and *openness*. The five-factor model became the rallying point for normal personality assessment, succeeding where trait theorists had failed. The reason for the newfound success of the five-factor model was the result of finding and agreeing on a common taxonomy for personality traits.

Originally articulated by Tupes and Christal (1961), the five-factor model was postulated at a time when personality psychology was beginning to take a back seat to social psychology. There it would lay dormant for three decades before being rediscovered.

The resurrection in the late 1980s of the trait argument led to the five-factor model being accepted as the unifying model of normal personality (McRae & Costa, 1987; Costa & McRae, 1988; McRae, 1989; Digman, 1985; Brand & Egan, 1989; John, 1990; Borkenau & Ostendorf, 1990). Digman (1990) deserves a lot of the credit for suggesting that the five-factor model is a unifying approach to the study of normal personality. In addition, meta-analytical approaches by Barrick and Mount (1991) and Tett, Jackson, and Rothstein (1991) revealed the usefulness of the five-factor model as it relates to selection issues in a real-world setting. At this point, a discussion of the five-factor model is in order.

The Five-Factor Model

The five-factor model, often referred to as the Big Five, has been shown to be a robust model of normal personality (Tokar, Fischer, & Subich, 1998). Numerous empirical studies have verified the factor structure and construct validity of the Big Five constructs *(openness, conscientiousness, extroversion, agreeableness,* and *neuroticism)*. Studies took place in a variety of research settings (including college), with generalizability across a range of demographic and cultural characteristics (Costa & McCrae, 1994).

McDougall (1932) is credited with being one of the first to propose a five-factor model, though his five factors differ from today's Big Five of *openness, conscientiousness, extroversion, agreeableness,* and *neuroticism*. He listed *intellect, character, temperament, disposition,* and *temper*. Thirty years later, the notion of five factors was revisited (Tupes & Christal, 1961). Additionally, Norman (1963) simplified Cattell's ideas into a more parsimonious model. During the 1960s when the social psychology movement was gaining strength, personality psychology took a 30-year sabbatical.

The five-factor model has recently been the focus of extensive research in many fields. Specifically, personality facet adjectives have been used to support the five factors. Such support is needed, in light of research that the five factors often overlap. In fact, McCrae and John (1992) support Norman's (1963) original concept as being both logical and non-random.

Norman researched the five-factor model by using adjective checklists of personality facets that were related to one of the factors in the five-factor model. Based

on the adjective ratings, Norman assigned an ordinal ranking of each factor based on the frequency with which each adjective was used. Norman found the most common factor is *extroversion*, followed by *agreeableness, conscientiousness, neuroticism,* and *openness*—a finding with which Peabody and Goldberg (1989) agreed.

Although there are many different conceptions of the five-factor model, Digman (1990) provided a list of adjectives that encompassed many of them. Each adjective is cross-referenced by other conceptions of the five-factor model. Digman uncovered that many previous conceptions of the five-factor model were called by different names. To illustrate, Eysenck's definition of *extroversion* was subsequently renamed by Tellegen (1985) as *positive emotionality*. Similarly, Tupes and Christal forwarded *agreeableness*, which ending up being called *conformity* (Fiske, 1949), *likeability* (Hogan, 1986), and *friendly compliance* (Digman, 1988).

To demonstrate the similarities in the many conceptions of the five-factor model, a meta-analysis by Barrick and Mount (1991) defined each of the five factors by using common adjectives. More importantly, this work underscores the fact that the Big Five is valid and reliable even in a variety of settings. Further, Paunonen and Jackson (2000) concluded that the five-factor model goes beyond personality psychology to other subfields such as clinical and developmental psychology.

The five-factor model's wide-reaching descriptions of personality make it very useful. As articulated by Digman (1990), the Big Five represents a hierarchy of personality traits subsumed with the five-factor structure. This idea was widely supported by other researchers (cf. Wiggins & Trapnell, 1997; John, 1990; Goldberg, 1993).

However, not all researchers have jumped on the five-factor bandwagon. McAdams (1992) criticized the five-factor model for two reasons. First, he asserted it did not adequately delineate the cause of a behavior; it merely described behavior. Second, he said the model didn't take into account occasional deviations. Additionally, Loevinger (1994) asserted that the five-factor model did little to address personality development. Along with Block (1995), Loevinger claimed it was too simplistic to adequately analyze personality.

Real-World Outcomes

The five-factor model attempts to condense personality into five relatively independent categories. While critics decry the five-factor model as too simplistic, the five-factor model does summarize personality from a global standpoint and validate it against important real-world outcomes.

The five-factor model has been found to be consistently related to academic performance. (Paunonen & Ashton, 2001a). For example, academic performance, quantified as GPA or course grades, has been found to be related to *agreeableness* (Rothstein, Paunonen, Rush, & King, 1994); *openness* (Paunonen & Ashton, 2001b); both *agreeableness* and *conscientiousness* (Fritzche, McIntire, & Yost, 2002); and, most of all, *conscientiousness* (Goff & Ackerman, 1992; Musgrave-Marquart, Bromley, & Dalley, 1997; Paunonen & Ashton, 2001b, Wolfe & Johnson, 1995; Bustato, Prins, Elshout, & Hamaker, 2000).

These findings are supported by Hojat, Gonnella, Erdmann, and Vogel (2003), who reported that *neuroticism* was significantly related to GPA in medical school students. Along similar lines, Furnham, Chamorro-Premuzic, and McDougall (2003)

found that *extroversion* was negatively correlated to exam scores, whereas *conscientiousness* was positively related. Other researchers—Lievens, Coetsier, DeFruyt, and DeMaeseneer (2002), as well as Ferguson, Sanders, O'Heir, and James (2000)—would agree that, among medical school students, *conscientiousness* was significantly related to final scores. Sneed, Carlson, and Little (1994) found that *openness* was significantly related to academic success.

Thus, as a broad measure, the five-factor model is a sound framework for describing personality. Given the complexity of human behavior, however, five factors fail to adequately address behavior across a spectrum of behavior. This dilemma is commonly referred to as the bandwidth-fidelity problem.

The Bandwidth-Fidelity Dilemma

The more clearly defined a construct is—that is, the higher the fidelity of the construct—the more limited its application becomes, referred to as the construct's bandwidth. Such a criticism applies to the five-factor model, in that the global nature of the five dimensions loses descriptive ability as the bandwidth of behavior narrows.

The bandwidth–fidelity dilemma has been addressed by Stewart (1999) as the next step in the refinement of personality. Spector (1996) points out that it is customary to discuss this dilemma in terms of broad or narrow traits. Broad traits are more general in nature (Ones & Viswesvaran, 1996; Schneider, Hough, & Dunnette, 1996). On the other hand, narrow traits are more specific (Judge, Erez, Bono, & Thoresen, 2002; Judge, Locke, Durham, & Kluger, 1997).

At this point a hierarchy of traits is worth revisiting. An important function of the concept of traits is to classify and describe a person's observable behaviors and internal

experiences (John, Hampson, & Goldberg, 1991). Thus, a given structure may reflect a hierarchy of traits.

Cattell and Eysenck both viewed personality traits as a hierarchy. For Cattell, trait subsidiation was an idea borrowed from Murray. Subsidiation infers that some traits are included under others. The result is a hierarchy of traits. The examples mentioned earlier of common and unique traits illustrate the broad vs. narrow dilemma, in that common traits are widely shared or broad, whereas unique traits vary among individuals and are narrow.

According to Cattell, second-order traits reside at the apex of the trait hierarchy and subsume all other traits. Second-order traits can be thought of as lower-order traits that relate to the second-order trait's label. To illustrate, Cattell articulated two second-order factors. The first is *exvia–invia*, which he defined as a broad dimension within the parameters of *extroversion–introversion* (Cattell, 1966). The other second-order trait is *anxiety,* defined as feelings of tension and upset (Cattell, 1966).

Cattell also articulated source traits, which are homogeneous in nature. They refer to behaviors that are very similar to one another. Source traits can be further broken down into three categories. The first category is ability traits, which are, for the most part, related to intelligence.

The second category is temperament traits. Temperament traits are more stylistic and illustrated by Wiggins (1984) as being emotional vs. stable. Thus, temperament traits reflect our tendency to act in a consistent manner across situations.

Cattell called the third category of source traits dynamic traits, referring to motivations and interests (Cattell, 1966). To further the hierarchy concept, Cattell posited

that three subordinate categories were subsumed under dynamic traits. The first of those three categories was the most basic, referred to as an erg. For the most part, ergs were defined as basic drives or instincts. The erg is subsumed in the second category, attitudes. Attitudes are expressions of ergs.

Furthermore, the third dynamic trait category is sentiments. Attitudes are subsumed within sentiments. Much as attitudes are expressions of ergs, attitudes are expressions of sentiment. Given the hierarchical nature of dynamic traits, summing the relationship would yield: sentiments organize and coordinate attitudes, which, in turn, are manifestations of an erg. Collectively, the dynamic traits illustrate the hierarchical nature of Cattell's trait theory.

Eysenck further divided traits into types. According to him, types are second-order dimensions made up of related primary traits. They are similar to superfactors, although Eysenck (1984) preferred to call them second-order. As mentioned earlier, Eysenck (1981) has identified three types: *extroversion, neuroticism,* and *psychoticism,* which are like Cattell's second-order factors of *exvia-invia* and *anxiety* and his primary factor of *superego strength,* respectively (Eysenck, 1984).

Integrating the hierarchy from Cattell and Eysenck can be done rather easily. Both agreed with Murray's notion of subsidiation. For Eysenck, the most basic unit is a specific response, everyday behaviors that may or may not be characteristic of an individual. Moving up to the next level of the hierarchy are habitual responses, including those that occur repeatedly under specific conditions. Habitual responses are most akin to Cattell's notion of surface traits. Habitual response is contained within primary factors or

traits. Finally, traits are subsumed within secondary factors or types (Eysenck & Eysenck, 1969).

The five-factor model has hierarchy as well, with five broad and distinct categories that consume many specific adjectives. Digman (1997) pointed out that Eysenck thought that two factors *(conscientiousness* and *agreeableness)* were less abstract than his basic *psychoticism, neuroticism*, and *extroversion*. However, the five-factor model ignores Eysenck's observations and includes those two factors at the same hierarchical level as Eysenck's basic factors, *neuroticism* and *extroversion*.

Based on Eysenck's ideas and data from other studies, Digman postulated a hierarchical order for the five-factor model. One factor consisted of *agreeableness, conscientiousness*, and *neuroticism*, while the lower-second factor was made up of *extroversion* and *intellect*.

There is yet to be a consensus on the exact nature of the five-factor model. Most researchers agree on the general nature of the five-factor model but tend to disagree on the specificity of the model (mirroring the broad versus narrow trait conundrum). John et al. (1991) provide the best insight, that broad traits cover a wide range of behavior, while narrow traits are narrower, which is also evocative of the bandwidth-fidelity dilemma.

The bandwidth-fidelity dilemma has been the subject of much research. One of the earliest views was that it represents a tradeoff (Shannon & Weaver, 1949). Murphy (1993) articulated the overriding consensus, that precision is inversely related to breadth of information relayed.

Ones and Viswesvaran (1996) formed the idea of the bandwidth-fidelity dilemma in terms of the precise measurement of a narrowly defined construct against the breadth

of less clearly defined constructs. To illustrate, consider the following anecdote offered by Hogan and Roberts (1996). In measurement you can use either a microscope or a pair of binoculars. The former allows clarity and detail, but you may lose sight of the general characteristics. On the other hand, binoculars allow the broad swatch, but you will miss the details.

A more empirical approach was offered by Lee Cronbach (1960), when he took the works of Shannon and Weaver and reached four conclusions regarding the relationship of bandwidth to fidelity. (1) Increasing precision in measurement (fidelity) would decrease the complexity of the measurement (bandwidth).

(2) Too much precision is limiting and impractical, unless the research question is toward a narrowly defined construct. However, doing so can sometimes make the research seem impractical and even trivial. On the other hand, research that is too broad can be problematic, leading to spurious, insignificant findings that vary from replication to replication, and thus are unreliable. Without reliability, validity suffers.

(3) Bandwidth must be increased for multiple questions, though it lowers the precision of the measurement.

(4) Finally, even if precision is lost by increasing bandwidth, problems are not created until or unless a costly and irreversible error is made. Both ideas support the notion that it would be wise to match the criterion to appropriate predictors, in scope as well as precision.

Thus, according to Cronbach, the dilemma may not be one of fidelity and bandwidth; rather, of optimal balance between assessments. Accordingly, Cronbach

proposes carefully matching criterion and predictor. However, the problem still remains that it is not an easy task.

Furthermore, not everyone agrees with this approach. Consider the personality theory forwarded by Judge, Locke, Durham, and Kluger (1997). They contend that most researchers consider four personality dimensions: *generalized self-efficacy, neuroticism, locus of control,* and *self-esteem*. They view these four as subsumed under a factor labeled *core self-evaluation* (CSE), a construct that has been empirically tested and validated. Erez and Judge (2001) demonstrated that CSE was a higher-order factor consisting of the four hypothesized dimensions.

Following up on this result, Judge, Erez, Bono, and Thoresen (2002) conducted a meta-analysis that indicated that the four dimensions of CSE are highly correlated. Additionally, the other aspects of CSE revealed that the four constituent dimensions display little discriminant validity. Their meta-analysis concluded that each of the four personality dimensions accounted for relatively little incremental validity relative to the combination of the four in the higher-order factor.

Finally, they noted that CSE accounted for about 13.25% of the variance in the five-factor traits. Individually, the traits accounted for only about an additional 2% of the variance in the five-factor traits. In summary, Judge et al., come down on the bandwidth side of the bandwidth–fidelity dilemma.

Where is the happy medium between bandwidth and fidelity? Schneider et al. (1996) note that many researchers use the five-factor model as a benchmark for making a broad versus narrow determination. Traits wider than the five-factor model result in a broad classification. On the other hand, if the traits are smaller in breadth, they are

considered narrow. What makes this distinction noteworthy is the overwhelming theoretical and empirical support for the five-factor model.

However, using the five-factor model as a benchmark is limiting, due to its being broad to begin with. Classifying something as narrow that it is only slightly narrower than the five-factor model doesn't resolve the question of broad versus narrow.

An additional conundrum arises in that the five-factor model doesn't consist of five equally broad factors. Saucier and Goldberg (1996) concluded that *agreeableness, conscientiousness,* and *extroversion* are described by more adjectives than are *neuroticism* and *openness*. A similar observation was made by Digman, whose earlier cited discussion argued for two factors within the five-factor model.

It should also be noted that not all researchers agree that broader conceptualizations are better. Studies using only narrow traits have yielded predictive validity (cf. Paunonen et al., 1999; Paunonen & Ashton, 2001a; Paunonen & Nicol, 2001; Jang, McCrae, Angleitner, Riemann, & Livesley, 1998; Mershon & Gorsuch, 1988; Borman & Penner, 2001).

Augmenting this position, Moon, Hollenbeck, Humphrey, and Maue (2003) compared the predictive validity of broad and narrow traits. They found that traits considered individually had predictive validity; however, when combined into a higher order factor, their predictive validity shrank. In addition, narrow traits added incremental validity to the much broader five-factor model, indicating the important role that narrow traits play in the bandwidth-fidelity dilemma. The discussion now turns to predicting outcomes, specifically academic performance, using both broad and narrow traits.

Narrow Personality Traits

There is a fair amount of evidence that supports the proposition that narrow traits may, in fact, account for significant proportions of variance. Narrow traits address a more specific slice of behavior and consequently are narrower in scope than their broad counterparts. As pointed out by Hogan and Roberts (1996), narrow traits allow for a more precise definition, although their generalizability is limited by their very specific definition.

The question of whether narrow traits would add incremental validity to the relationship of the Big Five with academic performance has not been adequately answered. In addressing the relationship of narrow traits with GPA, first we must determine which narrow traits to investigate.

The first criterion for a narrow trait would be whether it would be subsumed under one of the broader Big Five. Secondly, the narrow trait should have at least a rational relation to GPA. Employing those two criteria, the five narrow traits listed below will be considered to account for additional variance in GPA above and beyond the Big Five. Additionally, the narrow traits should be distinct, at least on a conceptual level. The five narrow traits that satisfy these criteria are *optimism, aggression, tough-mindedness, work drive,* and *self-directed learning*.

Optimism refers to the tendency to expect good outcomes (Scheier and Carver, 1985). The relationship between *optimism* and GPA has been documented. Prola and Stern (1984) found a positive correlation between *optimism* and GPA in high school students, while Chemers, Hu, and Garcia (2001); Robbins, Spence, and Clark (1992); and Stoecker (1999) found similar, positive correlations in college students. Therefore,

optimism satisfies the two criteria set out for selection as a narrow trait to be investigated in this study.

Aggression refers to the tendency to become physically confrontational with other people. Edwards (1977) found that *aggression* was negatively related to academic performance in high school students. Orpinas and Fankowski (2001) found that *aggression* was negatively related to self-reported grades in middle school students, whereas Feshbach (1984) found a similar relationship between *aggression* and GPA for primary school students.

Tough-mindedness refers to the tendency to make decisions based on logic and fact, rather than emotion. *Tough-mindedness* is one of the 16 personality factors assessed by the 16PF (Cattell et al., 1970) and similar to the thinking–feeling dimension on the Myers–Briggs Type Indicator (Myers & McCaulley, 1985), which also found that among college students, thinkers had lower college GPAs than feelers.

Barton, Dielman, and Cattell (1972) discovered a positive relationship between *tough-mindedness* and math and science achievement scores for middle school students, whereas Gillespie (1999) found that high school males who had lower thinking scores on the Myers–Briggs also had higher mathematics achievement scores.

Work drive refers to industriousness and willingness to spend extra time and effort to meet achievement-related goals (Lounsbury & Gibson, 2002). Lounsbury and Gibson (2002) demonstrated *work drive* to be significantly related to college GPA. In fact, Lounsbury et al. (2003a) found *work drive* to be a better predictor of overall job satisfaction than *conscientiousness, emotional stability,* and *openness*.

Self-directed learning combines self-management and self-monitoring into the learning process (Bolhuis, 1996; Garrison, 1997) and acknowledges that each individual is responsible for his own education. Previous research has found that *self-directed learning* is positively correlated with college and life satisfaction (Lounsbury, Saudargas, Gibson, & Leong, in press).

These five narrow traits seem suitable for investigation in relation to academic performance. Specifically, the relationship of these narrow traits with college GPA is an area worth investigating.

Personality and Academic Performance

Traditionally, the role of intellectual ability has been well documented in relation to academic performance. Mouw and Khana (1993) and Mathiasen (1984) found a strong correlation between grades and cognitive ability. Teachman (1996) too demonstrated a similar positive relationship between academic performance and cognitive ability. Moreover, Lange (1974) showed that the relationship between grades and cognitive ability is stronger than other subjective measures of academic performance, such as teacher evaluation.

Barnes, Potter, and Fiedler (1983) demonstrated that other variables predict academic achievement too. They found that stress was significantly related to academic performance, but in an inverse manner. Also, McCann and Meen (1984) found that anxiety significantly affected performance, with anxiety enhancing the performance of intellectual individuals but impairing that of less intellectual persons. These studies also illustrate that other factors might play an important role in academic performance, either as moderator variables or direct predictors.

In this vein, investigators have examined the role of non-cognitive predictors of academic performance—notably, personality traits. Rothstein, Paunonen, Rush, and King (1994) found that several personality traits are related to academic performance. They demonstrated that *openness* and *agreeableness* were positively related to GPA. Additionally, they employed a measure of classroom performance to represent the student's verbal skills and ability to articulate various types of problems encountered in the business world everyday.

Rothstein and his colleagues found that *extroversion, agreeableness,* and *openness* were all positively related to classroom performance. Taken together, the results of this study indicate that the five-factor personality traits are related to various measures of academic performance.

The relationship between academic performance and personality variables has been investigated and well established by other researchers. Chamorro-Premuzic and Furnham (2003) used two longitudinal samples to show that personality is significantly related to academic performance. Specifically, their study employed the NEO-PI-R to determine the relationship between the Big Five, Eysenck Personality Questionnaire (Eysenck & Eysenck, 1976), and academic performance as assessed by exam performance. They found that *neuroticism* was negatively related to academic performance, while *conscientiousness* was positively related.

Furnham and Medhurst (1995) supported the validity of the EPQ concept of *psychoticism* when they reported that it was negatively related to academic performance (written and oral course work), much as was *neuroticism* from the NEO.

Further, King (1998) demonstrated that GPA was negatively related to the Millon Clinical Multiaxial Inventory–II anti-social variable (Millon, 1987). The above studies indicate that, regardless of the method of operation, the *psycho-neurotic* aspect of personality encompassed by the three constructs is consistently negatively related to GPA.

In addition, McKenzie and Gow (2004) examined the reasons for attrition among college students during the first two semesters and demonstrated that personality traits were related to another indicator of academic performance—*retention*. Specifically, the first semester GPA was positively correlated with *agreeableness, conscientiousness,* and *openness*, while negatively related to *extroversion*. In the second semester, the variables related to GPA fell to only *agreeableness* and *conscientiousness,* reinforcing the notion that these two Big Five variables are significantly related to retention.

Similarly, McIlroy and Bunting (2002) found that *conscientiousness* was significantly and positively related to academic performance. Several other researchers have supported that position (cf. Fritzche, McIntire, & Yost, 2002; Goff & Ackerman, 1992; Bustato, Prins, Elshout & Hamaker, 2000; Paunonen & Ashton, 2001b).

In a similar vein, Furnham, Chamorro-Premuzic, and McDougall (2003) found that *conscientiousness* accounted for 19% of the variance in academic performance, a finding that underscores the predictive nature of the Big Five trait of *conscientiousness* to academic performance.

Further emphasizing that notion was Chamorro-Premuzic and Furnham (2003) who revealed a zero-order correlation of .29 for *conscientiousness* and academic performance, accounting for roughly 9% of the variance in academic performance.

Additionally, Paunonen, and Ashton (2001b) found *openness* to be significantly and positively related to academic performance. The five-factor model, being a somewhat broad measure, has proven to be related to academic performance. However, could narrow traits add incremental validity above and beyond the Big Five in relation to academic performance?

Paunonen and Ashton (2001b) addressed whether sub-factors of the Big Five were related to academic performance. Specifically, two of the broad Big Five traits, *conscientiousness* and *openness*, were examined in comparison with two narrow sub-factors of the Big Five. The two narrow sub-factors were hypothesized to be nested within two of the broader five factors. First, *need for achievement* was found to assess *conscientiousness* within a narrower domain, while *need for understanding* was found to be nested within *openness*. The finding was that these two narrow traits predicted academic performance better than their respective broader traits, which argues for using narrower traits.

In terms of predictors of academic performance, the Big Five have been demonstrated to significantly predict GPA in high school and middle school students (e.g., Lounsbury, Sundstrom, Loveland, & Gibson, 2003a; Lounsbury, Sundstrom, Loveland, & Gibson, 2003b, Lounsbury, Tatum, Gibson, Park, Sundstrom, Hamrick, & Wilburn, in press). These studies demonstrated that the Big Five concept of personality predicted cumulative GPA for adolescents. However, they did not address the question of whether narrow traits and abilities added incremental validity to the Big Five traits in the prediction of college GPA.

Given the utility of the Big Five in predicting real-world criterion, the bandwidth-fidelity dilemma suggests that other, narrower traits may also be valid predictors of real-world outcomes.

A good illustration of the validity of narrow traits comes from Paunonen and Ashton (2001b). In investigating the Big Five and other narrower traits in their predictability of real-world outcomes, Paunonen and Ashton used three measures: the Personality Research Form–E (PRF; Jackson, 1984); the Jackson Personality Inventory (JPI; Jackson, 1976); and the NEO-PI-R (Costa & McRae, 1992). The PRF and JPI assess collectively 34 narrow traits.

Paunonen and Ashton compared the Big Five against facets of the Big Five in an attempt to assess the predictive validity of broad vs. narrow traits. They had a group of judges rate the PRF, JPI, and NEO-PI-R to determine the degree to which each of the 40 criterion were representative of each Big Five facet. The PRF-JPI broad-factor scales accounted for at least 10% of the variance in real-world variables, such as tobacco consumption, willingness to share money, parties attended, driving habits, and alcohol consumption.

These five broad-factor scales also accounted for 9.6% of the variance in peer-rated intelligence and 7.4% of the variance in GPA. What makes Paunonen and Ashton's study different is that they also looked at other narrow traits in relation to the real-world criterion, setting up a head-to-head comparison related to the bandwidth-fidelity dilemma. Now the research question became: Can other narrower traits demonstrate criterion validity, given the validity of the broader five predictors? The answer to this question was a definite yes.

The five narrower traits accounted for a larger proportion of variance than the five broader factor scales. The narrow traits accounted for an average of 10.2% of the variance in 20 of the 40 criteria, whereas the Big Five on average accounted for only 9.7% of the variance in 17 out of the 40. Of particular relevance to the current discussion, the narrow traits of *achievement, endurance, understanding, complexity,* and *organization,* as defined by both the PRF and JPI, were significantly related to GPA. The five narrow traits from Jackson accounted for 6.7% of the variance in GPA.

Paunonen and Ashton have demonstrated that five narrow traits accounted for almost as much variance in GPA as did the broader factor scales (7.4% vs. 6.7%), underscoring the utility of narrow traits as they relate to predicting GPA.

To further demonstrate the broad vs. narrow trait dichotomy, Paunonen and Ashton also conducted similar analyses using the NEO-PI-R. The Big Five predictor variables accounted for a significant proportion of the variation in 15 out of the 40 criteria that were used. The average variance accounted for over those 15 criteria was 9.2%. Based on this, it appears that the PRF-JPI and NEO-PI-R concur with respect to the amount of variance accounted for by broad domain scales. Of particular relevance to the current discussion, the Big Five domain scales accounted for 11.1% of the variation in GPA.

For the NEO-PI-R, the narrower facets of *achievement striving, self-discipline, ideas, competence,* and *dutifulness* accounted for 15.3% of the GPA variance. Comparing the broader domain scales that accounted for only 11.1% of the variance in GPA, the narrow collection of facets accounted for an even higher proportion of variation in GPA.

Therefore, the plausibility of using narrow traits to predict criterion such as GPA seems reasonable.

Much of the research in this area has focused on if and how narrow personality traits add incremental validity to the Big Five. Several studies show that they do. The Big Five traits comprise a global approach to personality. Narrow traits, on the other hand, tap into more narrowly defined personality aspects. Thus, Paunonen and Nicol (2001) found that the narrow traits of *straightforwardness* and *self-discipline* added significant incremental variance—above and beyond the Big Five—in the prediction of academic performance as measured by GPA.

Paunonen and Nicol's findings further strengthen the relationship between personality and academic performance by illustrating the validity of the claim that narrow personality traits add incremental validity in accounting for that variance found in GPAs.

CHAPTER 2: EXAMINATION OF THE BIG FIVE AND NARROW TRAITS IN RELATION TO ACADEMIC PERFORMANCE

Objectives

The first goal of this study was to examine the criterion-related validity of the Big Five in relation to college GPA by using scores obtained on each of the five factors. The next goal was to determine, through correlation and regression analyses, the relationship of five narrow traits *(aggression, work drive, tough-mindedness, optimism,* and *self-directed learning)* with college GPA.

Owing to a lack of research in the area, the next step was to determine if the narrow traits add incremental validity above and beyond the Big Five in accounting for variation in college GPA. Previous research has examined this correlation, and a few studies have even employed regression analyses to determine partial relationship.

On the other hand, narrow traits have not been widely investigated in relation to GPA. The few studies that do exist in this area have not been examined with respect to college students. Furthermore, the proposed investigation is a novel and unique research question. Therefore, the purpose of this study is not only to examine the relations of the Big Five and narrow traits with college GPA through both correlation and regression analyses, but also to examine the extent to which narrow traits account for additional variance above and beyond the Big Five in relation to college GPA.

Hypotheses

1. The Big Five explain academic performance as assessed by college grade-point average.

Based on a review of the literature of the Big Five and academic performance, the following hypotheses will be employed for this study:

a. *Agreeableness will be positively related to college grade-point average*. This factor measures how well a student can work with others, both instructors and peers. Students who can work more cooperatively with fellow students are likely to benefit from study groups, borrowing notes, talking about assignments, and many other collaborative activities that facilitate academic performance.

b. *Conscientiousness will be positively related to college grade-point average.* This factor assesses the student's disposition to be orderly and organized, diligently persist on goals, and to strive to meet behavioral expectations and performance standards – which will lead to higher levels of academic performance.

c. *Extroversion will be positively related to college grade-point average*. This factor assesses a student's outgoingness, gregariousness, and propensity to talk with other people and focus attention on the external environment. More extroverted students should perform better academically because they more frequently engage in activities such as talking to professors in and outside of class, asking others for assistance, and sharing ideas.

d. *Emotional stability will be positively related to college grade-point average.* Emotional stability refers to a person's overall level of adjustment and resilience. High scorers on this factor will perform better

academically because they are better able to handle ongoing stress and pressure while pursuing their studies, studying, and taking exams.

e. *Openness will be positively related to college grade-point average.* Openness refers to the disposition to seek out and embrace new learning, ideas, change, etc., and thus better performance in courses.

2. Other facets of personality will also predict college grade-point average

Based on a review of the literature, the following narrow personality traits will be examined in relation to college grade-point average:

a. A*ggression will be negatively related to college grade-point average.* A high level of aggression would be indicative of an inability to deal effectively with frustration and with people who they perceive as disagreeing with or opposing them. Students with higher levels of aggression are likely to have lower tolerance for frustration which, in turn, could impede their ability to study, stay focused on goals, complete assignments, and overall do less well academically than students who have lower levels of aggression.

b. *Self-directed learning will be positively related to college grade-point average.* Self-directed learning refers to the ability to take the initiative and assume responsibility for one's own learning education, which should lead to higher levels of seeking out and using course-related resources (e.g., Internet, meeting with graduate assistants, locating other students who have taken the course) and learning autonomously which will lead to higher levels of academic performance.

c. *Optimism will be positively related to college grade-point average.* This trait refers a propensity to view and approach the future with a positive outlook. Optimistic students should have a more positive stance toward education and life in college. This positive mindset could facilitate academic performance by allowing the students to have the enthusiasm to study and learn, as well as bounce back from setbacks and problems.

d. *Work drive will be positively related to college grade-point average.* Work drive refers to a student's willingness to devote extra time and effort into schoolwork, especially on long, demanding activities like studying for an exam, thus work drive should directly benefit academic performance.

e. *Tough-mindedness will be positively related to college grade-point average.* This trait refers to the tendency for a student to appraise information and make decisions based on logic and facts rather than emotions, intuitions, and values. Previous research has indicated that students with higher levels of tough-mindedness perform better academically, perhaps because they spend more time focusing on studying and learning while spending less time attending and responding to emotional cues and processing their own feelings.

3. An attempt will be made to assess whether or not the narrow traits will add incremental validity to the Big Five when accounting for variance in college GPA.

Based on a review of the literature, it is predicted that the narrow traits will account for additional variance in college GPA above and beyond the Big Five.

Method

Sample

The participants for this study were college students from data that was archived by Resource Associates, Inc. University of Tennessee Institutional Review Board approval was secured for the data collection. The data was collected from undergraduate students at the University of Tennessee. The total number of participants was 550. The sample consisted of 217 males and 333 females.

Instrumentation

Big-Five Personality Measures

The Adolescent Personal Style Inventory (APSI) was developed to measure personality traits for the specific population of adolescents: ages 11-18. The inventory consists of a series of items related to the Big Five personality dimensions—Agreeableness, Conscientiousness, Emotional Stability, Extroversion, and Openness – as well as five other personality dimensions not used in this study. Each of the Big Five personality dimensions has 10 items and utilizes a five-point Likert scale: 1= Strongly Disagree, 2 = Disagree, 3= In-between, 4= Agree, and 5= Strongly Agree. The APSI has been shown to have acceptable reliability and validity (Lounsbury, et al., 2003).

Narrow Personality Traits

All narrow traits were assessed on a five-point Likert type response scale. Each of the five narrow traits was collected on scale that was rationally derived to assess the five narrow traits. The following is a description of each of the five narrow traits.

Work Drive

Lounsbury and Gibson (2002) developed a measure of work drive which reflects a person's level of devotion to a particular task. This dimension is best illustrated by an individual who will put extra time and effort into his/her work, exhibits great task commitment, is highly productive, and motivated to complete assigned tasks in a successful manner. In the present study, work drive was assessed on an 11-item scale tailored for students with the responses placed in a Likert-type format ranging from 1 "Strongly Disagree" to 5 "Strongly Agree." Two sample items are: (1) I always try to do more than I have to in my classes. (2) I don't mind staying up late to finish a school assignment.

Aggression

Aggression refers to an inclination to fight, attack, and physically assault another person, especially if provoked, frustrated, or aggravated by that person; disposition to become angry and engage in violent behavior. Aggression was assessed using a five-item scale that was developed specifically for this study. Sample items include "I will fight another person who makes me mad" and "I sometimes feel like hitting other people."

Optimism

Optimism refers to having generalized positive expectancies or outlook concerning people, problems, situations, and future possibilities even in the face of difficulty and adversity. (e.g., "When bad things happen, I tend to look on the bright side.") Optimism will be measured using a seven-item developed by Lounsbury et al. (2003b). Another sample item is, "I like to take classes where I learn something I never knew before."

Tough-Mindedness

Tough-mindedness refers to the tendency to rely on facts and data to appraise information and make decisions; being analytical, realistic, objective, and unsentimental. Tough-mindedness was assessed using an 11-item scale. Sample items were, "It bothers me to see an animal suffering" and "I never show my feelings to other people."

Self-Directed Learning

Self-directed learning is an inclination to learn new materials and find answers to questions on one's own rather than relying on a teacher; setting one's own learning goals; and initiating and following through on learning without being required to for a course or prompted to by a teacher. Sample items include, "I would rather have a teacher show me how to do a difficult problem than do it on my own" and "I would like to take some college courses over the Internet rather than in a classroom."

CHAPTER 3: RESULTS

Initially, potential gender differences in GPA were tested for. The results revealed that a significant difference existed between males and females with respect to GPA (t = 3.40, $p < .001$), with females reporting higher GPAs than males. (See Table 1). Given this difference, further analyses included a gender interaction with every variable, both the Big Five and narrow traits, to examine how the effects of the broad and narrow traits differ for males and females.

Hypothesis 1

The result of the first phase of analyses, bivariate correlations of GPA with the Big Five, is presented in Table 2. This analysis indicated that GPA was positively related to four of the Big Five factors: *agreeableness* (r = .18, $p < .001$); *conscientiousness* (r = .14, $p < .01$); *emotional stability* (r = .20, $p < .001$); and *openness* (r = .21, $p < .001$). The exception was *extroversion* (r = .05, ns). Additionally, a test was performed to determine any differences between the bivariate correlations for males and females between each of the Big Five and GPA. The results are displayed in the last column of Table 2. The results revealed that the correlation for males and females was not different on any of the Big Five factors.

To determine each variable's contribution to the variation in GPA over and above that of the other variables, a multiple linear regression was performed, using GPA as the criterion variable and the Big Five as predictors. The results of the regression analysis, that at least one of the Big Five predicts GPA (F = 8.515, $p < .001$), is displayed in Table 3.

Table 1

Summary of Means and t test for Gender on GPA

	Mean	SD	*t test*
Male	5.02	1.54	$t(418) = 3.40^{**}$
Female	5.53	1.53	

Note: ** $p < .001$

Table 2

Big Five and GPA Bivariate Correlations

	r	r_{males}	$r_{females}$	$z(r_{males} - r_{females})$
Agreeableness	.18***	.11	.16*	-.58
Conscientiousness	.14**	.09	.15*	-.70
Emotional Stability	.20***	.19*	.23**	-.49
Extroversion	.05	.04	.00	.46
Openness	.21***	.16*	.23**	-.83

Note: * $p < .05$; ** $p < .01$; *** $p < .001$; r_{males} and $r_{females}$ refer to Pearson Product Moment Correlations for males and females respectively; $z(r_{males} - r_{females})$ refers to testing the hypothesis, H_0: $r_{males} = r_{females}$

Table 3

Model Summary for Multiple Regression of GPA on the Big Five

Source	*SS*	*df*	*MS*	*F*	R^2
Regression	94.335	5	18.867	8.515^{***}	$.093^{***}$
Residual	917.272	414	2.216		
Total	1011.607	419			

Note: $^{***}p < .001$; *F* refers to test of whether at least one of the Big Five is related to GPA; R^2 refers to the coefficient of multiple determination between GPA and the set of Big Five predictors

In addition to the bivariate correlations presented previously, the partial correlations for each of the Big Five were tested to reveal the contribution of each variable in the variation in GPA above the other variables. Based on the partial correlations between the Big Five and GPA presented in Table 4, *openness* and *emotional stability* accounted for partial variance in GPA while *agreeableness, conscientiousness, and extroversion* did not. Because not all of the Big Five contribute to the explanatory power of the others, a backward elimination was performed to identify the Big Five factors that explain variation in GPA (see Table 5). Based on the backward elimination, *openness, emotional stability,* and *agreeableness* all explain variation in GPA.

Given the gender differences in GPA, that females on average have a higher GPA, the next analysis was conducted to determine if gender and the interactions of gender with each of the Big Five accounted for additional variance above and beyond the Big Five. Overall, the full model, including the Big Five, gender, and the interactions of gender, contained predictors of GPA ($F = 4.686$, $p < .001$). The result of this analysis in contained in Table 6.

However, the full model did not account for additional variance above and beyond the Big Five ($F = 1.449$, *ns*, see Table 7). Therefore, gender and the interactions of gender with each of the Big Five did not account for additional variance above and beyond the Big Five.

A backward elimination conducted on the full model, using GPA as the criterion to determine which of the Big Five, gender, and the interactions of gender was most related to GPA, yielded a reduced model related to GPA ($F = 15.947$, $p < .001$; see Table 8). The reduced model included the Big Five factors of *emotional stability* and *openness*

Table 4

Partial Correlation Coefficients Between the Big Five and GPA

Big Five Factor	*pr*	*p-value*[*]
Agreeableness	.09	.055
Conscientiousness	.07	.134
Emotional Stability	.15	.002
Extroversion	.01	.817
Openness	.17	.000

Note: *pr* indicates the partial correlation coefficient between each Big Five factor and GPA; [*] testing H_0: $pr = 0$

Table 5

Model Summary for Backward Elimination on the Big Five

Model	Variable	*b*	*t*
Full	Agreeableness	.233	1.921
	Conscientiousness	.166	1.501
	Emotional Stability	.310	3.089**
	Extroversion	.023	.231
	Openness	.421	3.564***
Reduced	Agreeableness	.275	2.323*
	Emotional Stability	.326	3.307**
	Openness	.437	3.714***

Note: * $p < .05$; ** $p < .01$; *** $p < .001$; b refers to the regression coefficient for the model relating the Big Five to GPA; t is testing H_0: $b = 0$

Table 6

Summary Table for Full Model of Big Five, Gender, and Interactions of Gender with Each of the Big Five on GPA

Source	*SS*	*df*	*MS*	*F*	R^2
Regression	113.477	11	10.316	4.686^{***}	$.11^{***}$
Residual	898.131	408	2.201		
Total	1011.607	419			

Note: *** $p < .001$; *F* refers to test of whether at least one of the Big Five, Gender, and Gender by Big Five Interactions is related to GPA; R^2 refers to the coefficient of multiple determination between GPA and the set of Big Five, Gender, and Gender by Big Five Interactions.

Table 7

Summary Table for Model Testing if Gender and the Big Five Gender Interactions Account for Additional Variance in GPA Above and Beyond the Big Five

Source	*SS*	*df*	*MS*	*F*	ΔR^2
Regression	19.142	6	3.19	1.449	.019
Residual	898.131	408	2.201		
Total	917.273	414			

Note: *F* refers to test of whether gender and gender interactions account for additional variance in GPA above and beyond the Big Five; ΔR^2 refers to the change in the coefficient of multiple determination after adding gender and gender interactions as predictors along with the Big Five

Table 8

Model Summary for Backward Elimination for the Big Five and Gender Interactions

Model	Variable	*b*	*t*
Full	Agreeableness	.111	.275
	Conscientiousness	.109	.295
	Emotional Stability	.325	.957
	Extroversion	.117	.342
	Openness	.130	.351
	Gender	.016	.011
	Gender x Agreeableness	.017	.069
	Gender x Conscientiousness	.018	.082
	Gender x Emotional Stability	.026	.124
	Gender x Extroversion	-.111	-.525
	Gender x Openness	.181	.764
Reduced	Openness	.398	4.154***
	Emotional Stability	.226	1.664
	Gender x Openness	.139	3.523***

Note: *** $p < .001$; *b* refers to the regression coefficient for each predictor in the model; *t* refers to the test of H_0: $b = 0$

and included a *gender by openness* interaction.

To accommodate the interaction term, another model was constructed that included the three predictors that the backward elimination indicated were related to GPA (i.e., *emotional stability, openness,* and *the gender by openness interaction*), as well as the main effect for gender. The resulting model indicated that GPA was related to at least one predictor ($F = 11.956$, $p < .001$; see Table 9). The regression coefficients for the resulting model are displayed in Table 10. Examining the significant *gender by openness* interaction, the regression coefficients for females and males are displayed in Tables 11 and 12 respectively. For the model for females, the *openness* term is not significant, whereas in the model for males, the coefficient for the *openness* term is significantly different from zero. The implication of the interaction is that for males *openness* is related to GPA but not for females.

Hypothesis 2

The first phase of analyses for the second hypothesis was a bivariate correlation analysis performed among GPA and the five narrow traits of this study: *aggression, optimism, self-directed learning, tough-mindedness,* and *work drive.* Table 13 displays the results.

Three of the narrow traits were positively related to GPA, whereas one was negatively related. Specifically, *aggression* ($r = -.17$, $p < .001$) was negatively related, while *self–directed learning* ($r = .26$, $p < .001$); *work drive* ($r = .44$, $p < .001$); and *optimism* ($r = .28$, $p < .001$) were positively related to GPA.

Table 9

Summary Table for Model containing Emotional Stability, Openness, Gender, and Gender x Openness interaction on GPA

Source	*SS*	*df*	*MS*	*F*	R^2
Regression	104.531	4	26.133	11.956^{***}	$.103^{***}$
Residual	907.076	415	2.186		
Total	1011.607	419			

Note: *** $p < .001$; F tests whether emotional stability, openness, gender, and a gender by openness interaction are related to GPA; R^2 is the coefficient of multiple determination for the relationship between GPA and emotional stability, openness, gender, and gender by openness interaction

Table 10

Regression Coefficients for Openness, Emotional Stability, Gender, and Gender x Openness Interaction on GPA

Variable	*b*	*Standard Error of b*	*t*
Regression Constant	2.325	.665	3.497***
Gender	.258	.866	.298
Emotional Stability	.396	.096	4.116***
Openness	.126	.363	.346
Gender x Openness	.208	.232	.895

Note: *** $p < .001$; *b* refers to the regression coefficient for each variable in the regression model; *Standard Error of b* is the error term for each regression coefficient; *t* refers to the test H_0: $b = 0$

Table 11

Regression Coefficients for Openness, Emotional Stability, Gender, and Gender x Openness Interaction on GPA for Females

Variable	*b*	*Standard Error of b*	*t*
Regression Constant	2.325	.665	3.497***
Emotional Stability	.396	.096	4.116***
Openness	.126	.363	.346

Note: *** $p < .001$; *b* refers to the regression coefficient for each variable in the regression model; *Standard Error of b* is the error term for each regression coefficient; *t* refers to the test H_0: $b = 0$

Table 12

Regression Coefficients for Openness, Emotional Stability, Gender, and Gender x Openness Interaction on GPA for Males

Variable	*b*	*Standard Error of b*	*t*
Regression Constant	2.637	.750	3.516***
Emotional Stability	.378	.151	2.510*
Openness	.334	.164	2.034*

Note: * $p < .05$; *** $p < .001$; *b* refers to the regression coefficient for each variable in the regression model; *Standard Error of b* is the error term for each regression coefficient; *t* refers to the test H_0: $b = 0$

Table 13

Narrow Trait and GPA Bivariate Correlations

	r	r_{males}	$r_{females}$
Aggression	-.172***	-.204**	-.098
Optimism	.279***	.195**	.328***
Self-Directed Learning	.263***	.284***	.25***
Tough-mindedness	-.078	-.013	.017
Work Drive	.438***	.418***	.432***

Note: ** $p < .01$; *** $p < .001$; r_{males} and $r_{females}$ refer to the Pearson Product Moment Correlations for males and females respectively

To determine each variable's contribution to the variation in GPA over and above that of the other variables, a multiple linear regression was performed, using GPA as the criterion variable and the narrow traits as predictors. The results indicated that at least one of the narrow traits were related to GPA ($F = 26.358$, $p < .001$). See Table 14.

In addition to the bivariate correlations presented previously, looking at the partial correlations for each of the narrow traits reveals the contribution of each variable in accounting for variation in GPA over and above that of the other variables. As outlined in Table 15, the partial correlations between the narrow traits and GPA were as follows: *aggression*, $pr = -.104$, $p < .05$; *optimism*, $pr = .188$, $p < .001$; *self-directed learning*, $pr = .037$, *ns*; *tough-mindedness*, $pr = -.078$, *ns*; *work drive*, $pr = .355$, $p < .001$. The results indicate that *aggression, optimism,* and *work drive* are related to GPA above and beyond all four other variables.

Because not all the narrow traits contribute to the explanatory power of the others, a backward elimination was performed to identify which ones did. Table 16 displays the regression results for the backward elimination—that *openness, emotional stability,* and *agreeableness* all explain the variation in GPA.

Given the fact that females on average have a higher GPA than males, the next analysis was conducted to determine if gender and the interactions of gender with each of the narrow traits accounted for additional variance above and beyond the narrow traits. Overall, the full model, including the narrow traits, gender, and the interactions of gender, was related to GPA ($F = 13.807$, $p < .001$). The result of this analysis is contained in Table 17.

Table 14

Model Summary for Multiple Regression of GPA on the Narrow Traits

Source	*SS*	*df*	*MS*	*F*	R^2
Regression	244.267	5	48.853	26.358***	.241***
Residual	767.340	414	1.853		
Total	1011.607	419			

Note: *** $p < .001$; *F* tests to see whether the set of narrow traits is related to GPA; R^2 is the coefficient of multiple determination between GPA and the set of narrow trait predictors

Table 15

Partial Correlation Coefficients between the Narrow Traits and GPA

Big Five Factor	*pr*	*p-value*[*]
Aggression	-.104	.034
Optimism	.188	.000
Self-directed Learning	.037	.456
Tough-mindedness	.02	.689
Work Drive	.355	.000

Note: *pr* refers to partial correlation coefficients between each factor and GPA; [*] refers to testing H_0: *pr*= 0

Table 16

Model Summary for Backward Elimination of Narrow Traits

Model	Variable	*b*	*t*
Full	Aggression	-.184	-2.131*
	Optimism	.082	.246
	Self-directed Learning	.043	.401
	Tough-mindedness	.822	7.734***
	Work Drive	.466	3.385***
Reduced	Optimism	.851	9.072***
	Work Drive	.482	4.091***
	Aggression	-.175	-2.082*

Note: *b* refers to the regression coefficient for each term in the regression model; *t* refers to testing H_0: $b = 0$

Table 17

Summary Table for Full Model of the Narrow Traits, Gender, and Interactions of Gender with each of the Narrow Traits on GPA

Source	*SS*	*df*	*MS*	*F*	R^2
Regression	263.843	11	23.986	13.087^{***}	$.261^{***}$
Residual	747.764	408	1.833		
Total	1011.607	419			

Note: *** $p < .001$; F tests whether the narrow traits, gender and gender by narrow trait interactions are related to GPA; R^2 is the coefficient of multiple determination for the same model

The full model did not account for additional variance above and beyond the narrow traits ($F = 1.78$, *ns*, see Table 18). Therefore, gender and the interactions of gender with each of the Big Five did not account for additional variance above and beyond the Big Five.

A backward elimination was then conducted on the full model, using GPA as the criterion, to determine which narrow traits, gender, and the interactions of gender were most likely related to GPA. The backward elimination yielded a reduced model that included the narrow traits of *self-directed learning, aggression,* and *work drive* and was related to GPA ($F = 23.794$, $p < .001$; see Table 19). The reduced model also included *gender* by *optimism* and *gender* by *self-directed learning* interactions. To accommodate the interaction terms, another model was constructed that included the four predictors related to GPA, as indicated by the backward elimination (i.e., *self-directed learning*, *work drive*, and the *gender*-by-*self-directed learning*, and *gender*-by-*optimism* interactions), as well as the main effect for *gender*, *optimism*, and *tough-mindedness*. The resulting model indicated that GPA was related to the set of predictors ($F = 15.85$, $p < .001$; see Table 20). The regression coefficients are displayed in Table 21.

In further exploring the interactions, separate models were built for females and males, shown respectively in Tables 22 and 23. The model for females indicated that the *self-directed learning* and the *optimism* regression coefficients were not significant. For males, the regression coefficients for both *optimism* and *self-directed learning* are not significant.

Table 18

Summary Table for Model Testing if Gender and the Narrow Trait-Gender Interactions Account for Additional Variance in GPA Above and Beyond the Narrow Traits

Source	*SS*	*df*	*MS*	*F*	ΔR^2
Regression	19.576	6	3.263	1.78	.019
Residual	747.764	408	1.833		
Total	767.34	414			

Note: *F* tests whether gender and gender by narrow trait interactions account for additional variance above and beyond the narrow traits; ΔR^2 is the change in the coefficient of multiple determination after adding gender and gender by narrow trait interactions

Table 19

Model Summary for Backward Elimination of Narrow Traits and Gender Interactions

Model	Variable	*b*	*t*
Full	Aggression	-.503	-1.710
	Optimism	-.243	-.622
	Self-directed Learning	.428	1.151
	Tough-mindedness	.002	.005
	Work Drive	.904	2.341*
	Gender	1.404	1.049
	Gender x Aggression	.208	1.180
	Gender x Optimism	.456	1.892
	Gender x Self-directed Learning	-.217	-.967
	Gender x Tough-mindedness	.124	.516
	Gender x Work Drive	-.062	-.276
Reduced	Self-directed Learning	.584	3.415**
	Work Drive	.791	7.524***
	Gender x Optimism	.309	4.684***
	Gender x Self-directed Learning	-.301	-3.176**

Note: * $p < .05$; ** $p < .01$; *** $p < .001$; *b* refers to the regression coefficient for each term in the regression model; *t* refers to the test H_0: $b = 0$

Table 20

Summary Table for Model Containing Self-directed Learning, Work Drive, Optimism, Gender, and Gender x Optimism, Gender x Self-directed Learning Interactions on GPA

Source	*SS*	*df*	*MS*	*F*	R^2
Regression	249.859	6	41.643	22.578***	.247***
Residual	761.749	413	1.844		
Total	1011.607	419			

Note: *** $p < .001$; *F* tests whether self-directed learning, work drive, optimism, gender, gender by optimism, gender by self-directed learning are related to GPA; R^2 refers the coefficient of multiple determination between the previously stated model and GPA

Table 21

Regression Coefficients for Self-directed Learning, Work Drive, Optimism, Gender, and Gender x Optimism, Gender x Self-Directed Learning Interactions on GPA

Variable	*b*	*Standard Error of b*	*t*
Regression Constant	.336	.701	.479
Self-directed Learning	.419	.335	1.252
Work Drive	.788	.106	7.464***
Optimism	-.034	.380	-.089
Gender x Self-directed Learning	-.2	.2	-.999
Gender x Optimism	.347	.234	1.479
Gender	.495	1.03	.48

Note: *** $p < .001$; *b* refers to the regression coefficient for each variable in the regression model; *Standard Error of b* is the error term for each regression coefficient; *t* refers to the test H_0: $b = 0$

Table 22

Regression Coefficients for Self-directed Learning, Work Drive, Optimism, Gender, and Gender x Optimism, Gender x Self-directed Learning Interactions on GPA for Females

Variable	*b*	*Standard Error of b*	*t*
Regression Constant	.336	.701	.479
Self-directed Learning	.419	.335	1.252
Work Drive	.788	.106	7.464***
Optimism	-.034	.380	-.089

Note: *** $p < .001$; *b* refers to the regression coefficient for each variable in the regression model; *Standard Error of b* is the error term for each regression coefficient; *t* refers to the test H_0: $b = 0$

Table 23

Regression Coefficients for Self-directed Learning, Work Drive, Optimism, Gender, and Gender x Optimism, Gender x Self-directed Learning Interactions on GPA for Males

Variable	*b*	*Standard Error of b*	*t*
Regression Constant	.729	.815	.894
Work Drive	.861	.184	4.666***
Optimism	.311	.177	1.763
Self-directed Learning	.188	.175	1.075

Note: *** $p < .001$; *b* refers to the regression coefficient for each variable in the regression model; *Standard Error of b* is the error term for each regression coefficient; *t* refers to the test H_0: $b = 0$

Hypothesis 3

The third hypothesis dealt with combining both the Big Five and narrow traits to determine if the combination was significantly related to GPA. More importantly, this hypothesis addressed the question of whether the narrow traits would add incremental validity to the Big Five by accounting for additional variance above and beyond the Big Five.

The Big Five and the five narrow traits were included in a hierarchical multiple linear regression. Specifically, the Big Five were entered into the regression model. After controlling for the Big Five, the narrow traits were entered. The result of this analysis is displayed in Table 24.

The Big Five and narrow trait predictors were entered into the model. The full model indicated that GPA was significantly related to at least one of the Big Five or narrow traits *(F* = 14.043, p < .001). Also, it was found that the narrow traits do account for additional variance in GPA above and beyond the Big Five (*F* = 17.839, *p* < .001; see Table 25).

Next, to determine which of the narrow traits and Big Five were related to GPA, all narrow traits and the Big Five were subjected to a backward elimination. The reduced model was related to GPA (*F* = 34.218, *p* < .001; see Table 26) and included *optimism, work drive, agreeableness,* and *conscientiousness*.

The final analysis entered the remaining four personality traits (i.e., *optimism, work drive, agreeableness*, and *conscientiousness*), *gender*, and their gender interaction terms into a backward elimination to determine which of them were related to GPA. The results of this analysis are found in Table 27.

Table 24

Summary Table for Hierarchical Model of Entering Narrow Traits after controlling for the Big Five

	Source	*SS*	*df*	*MS*	*F*	R^2
Reduced[1]	Regression	94.335	5	18.867	8.515***	.093***
	Residual	917.272	414	2.216		
	Total	1011.607	419			
Full[2]	Regression	258.561	10	25.856	14.043***	.256***
	Residual	753.046	409	1.841		
	Total	1011.607	419			

Note: *** $p < .001$; [1] = reduced model containing the Big Five; [2] = full model containing both the Big Five and all narrow traits; *F* tests whether narrow traits add incremental validity to the Big Five in accounting for variance in GPA; R^2 is the coefficient of determination for the previously stated models

Table 25

Summary Table for Model Testing if Narrow Traits Account for Additional Variance in GPA Above and Beyond the Big Five

Source	*SS*	*df*	*MS*	*F*	ΔR^2
Regression	164.226	5	32.845	17.84^{***}	$.162^{***}$
Residual	753.046	409	1.841		
Total	917.272	414			

Note: *** $p < .001$; *F* tests whether the narrow traits account for additional variance in GPA above and beyond the Big Five; ΔR^2 tests whether the coefficient of multiple determination changes after the narrow traits are added to the Big Five

Table 26

Model Summary for Backward Elimination of Big Five and Narrow Traits

	Source	*SS*	*df*	*MS*	*F*	R^2
Full[1]	Regression	258.561	10	25.856	14.043***	.256***
	Residual	753.046	409	1.833		
	Total	1011.607	419			
Reduced[2]	Regression	250.890	4	62.723	34.218***	.248***
	Residual	760.717	415	1.833		
	Total	1011.607	419			

Note: *** $p < .001$; [1] = full model containing all narrow traits and the Big Five; [2] = reduced model containing optimism, work drive, conscientiousness, and agreeableness; *F* tests the suitability of the specified model; R^2 indicates the coefficient of multiple determination for the specified model

Table 27

Model Summary for Backward Elimination of Big Five, Narrow Traits, and Gender Interactions

	Source	*SS*	*df*	*MS*	*F*	R^2
Full[1]	Regression	260.253	9	28.917	15.779***	.257***
	Residual	751.354	410	1.833		
	Total	1011.607	419			
Reduced[2]	Regression	246.289	3	82.096	44.625***	.243***
	Residual	765.318	416	1.84		
	Total	1011.607	419			

Note: *** $p < .001$; [1] = full model containing work drive, optimism, agreeableness, conscientiousness, gender, gender x work drive interaction, gender x conscientiousness interaction, gender x agreeableness interaction, and gender x optimism interaction; [2] = reduced model containing gender, work drive, and a gender by optimism interaction; *F* tests the suitability of the specified model; R^2 indicates the coefficient of multiple determination for the specified model

The reduced model indicated GPA was related to the set of predictors (F = 44.625, $p < .001$). Furthermore, of the nine predictors entered into the full model, *work drive*, *gender*, and a *gender*-by-*optimism* interaction were related to GPA.

Due to the fact that the gender-*optimism* interaction was related to GPA, another model was built that included a main effect for *optimism*. This model indicated that by adding *optimism*, GPA was still related to the set of predictors ($F = 33.405$, $p < .001$); see Table 28. The regression coefficients for the resulting model are displayed in Table 29.

To further probe the *gender by optimism* interaction, separate models were constructed for both females and males. The regression coefficients for the female and male models are displayed in Tables 30 and 31 respectively. For females, the *optimism* regression coefficient is not significant. For males, the *optimism* coefficient is significantly different from zero. The implication at this point is that *optimism* affects GPA for males but not for females.

Table 28

Summary Table for Model Containing Gender, Work Drive, Optimism, and Gender x Optimism Interaction on GPA

Source	*SS*	*df*	*MS*	*F*	R^2
Regression	246.385	4	61.596	33.405***	.244***
Residual	765.222	415	1.844		
Total	1011.607	419			

Note: *** $p < .001$; *F* tests whether gender, work drive, optimism, and gender by optimism interaction are related to GPA; R^2 is the coefficient of multiple determination for that model

Table 29

Regression Coefficients for Work Drive, Optimism, Gender, and Gender x Optimism Interaction on GPA

Variable	*b*	*Standard Error of b*	*T*
Regression Constant	.301	.67	.449
Gender	.879	.949	.927
Work Drive	.828	.095	8.765***
Optimism	.084	.368	.229
Gender x Optimism	.285	.227	1.252

Note: *** $p < .001$; *b* refers to the regression coefficient for each variable in the regression model; *Standard Error of b* is the error term for each regression coefficient; *t* refers to the test H_0: $b = 0$

Table 30

Regression Coefficients for Work Drive, Optimism, Gender, and Gender x Optimism Interaction on GPA for Females

Variable	*b*	*Standard Error of b*	*T*
Regression Constant	.301	.67	.449
Work Drive	.828	.095	8.765***
Optimism	.084	.368	.229

Note: *** $p < .001$; *b* refers to the regression coefficient for each variable in the regression model; *Standard Error of b* is the error term for each regression coefficient; *t* refers to the test H_0: $b = 0$

Table 31

Regression Coefficients for Work Drive, Optimism, Gender, and Gender x Optimism Interaction on GPA for Males

Variable	*b*	*Standard Error of b*	*T*
Regression Constant	.909	.799	1.138
Optimism	.352	.173	2.039*
Work Drive	.949	.165	5.749***

Note: * $p < .05$; *** $p < .001$; *b* refers to the regression coefficient for each variable in the regression model; *Standard Error of b* is the error term for each regression coefficient; *t* refers to the test H_0: $b = 0$

CHAPTER 4: GENERAL DISCUSSION

One of the main goals of this study was to examine the relationship between an important real-world criterion—college GPA—and personality traits. In the context of the bandwidth-fidelity dilemma, both broad and narrow personality traits were examined.

The existing literature is divided on the best approach to variations of behavior, whether to use broad or narrow traits. Both sides of the argument were addressed in the review of the literature, and support for both positions was documented.

Broad Personality Measures and Academic Performance

Four of the five factors in the Big Five were significantly, positively correlated with college GPA. The lone exception was *extroversion*. These findings agree with previous research, including the work by Paunonen and Ashton (2001a) and Rothstein, Paunonen, Rush, and King (1994).

Moreover, these results align with the results reported by Lounsbury, Welsh, Gibson, and Sundstrom (2005), who found that the Big Five were related to cognitive ability. The one difference between the present study and Lounsbury et al. was that *extroversion* was not significantly related to GPA in this study, while it was related to a measure of cognitive ability in the previous study.

Furthermore, the present study supports Ridgell and Lounsbury's (2004) finding that emotional stability was related to academic performance.

On the other hand, some researchers have found fewer factors that were related to academic performance. Specifically, Fritzche, McIntire and Yost (2002) found only *agreeableness* and *conscientiousness* related to performance, whereas Goff and

Ackerman (1992) and Bustato, Prins, Elshout, and Hamaker (2000) found that *conscientiousness* was the sole Big Five factor related to performance.

Owing to the difference in mean GPA for males and females, the role of gender was also investigated. When the product moment correlations were broken down by gender, *emotional stability* and *openness* were related to academic performance only for males. For females, four of the five factors were related to academic performance, with the exception of *extroversion*.

In terms of interactions that made partial contributions in accounting for variation in GPA, the *gender by openness* interaction was unique. *Openness* was related to academic performance for males and females both individually and collectively, but the effect of *openness* on GPA differed between genders. Specifically, for males, the higher the *openness* scores, the higher the GPA; for females, the effect was stronger. Thus, the investigation of gender interactions with the Big Five predictors was a productive enterprise that could be undertaken in future studies. One possible explanation for this could be heterogeneity of variance between males and females on openness.

Narrow Personality Traits and GPA

The test of the second hypothesis indicated that college GPA was related to personality when defined in more narrow terms. Unlike the Big Five, which had bivariate correlations between .14 and .21 for the four related variables, the four related narrow traits had bivariate correlations between .17 and .44, with three out of the four correlations being .26 or higher.

When compared to the Big Five, at least in the bivariate correlation analysis, the narrow traits at this early stage seem to have a stronger relationship with GPA than the

Big Five. Moreover, this finding is in accordance with results reported by Paunonen and Ashton (2001b); Rothstein, and Jackson (1999); Paunonen and Nicol (2001) and others.

The finding that narrow traits account for more variance in GPA than do their broad counterparts is at odds with Ones and Viswesvaran (1996), who contend that broad traits are sufficient for explaining the personality and academic performance relationship. Thus, it appears that the arguments forwarded by Ones and Viswesvaran are being seriously challenged.

The present study and Lounsbury, Sundstrom, Loveland, and Gibson (2002) forward the notion that narrow traits explain more of the relationship between personality and academic performance than do broad traits alone. Lounsbury et al. found these same five narrow traits were related to GPA for a sample of junior high and high school adolescents.

Regarding gender differences in the effects of the narrow traits, the present study found that gender did not have an effect on academic performance. The narrow traits that accounted for partial variance in GPA were *work drive, self-directed learning,* and *aggression*. The finding of *work drive* accounting for significant partial variance is not surprising, given the work of Lounsbury et al. cited earlier, which evaluated the construct of *work drive*.

Lounsbury and associates (2003a) reported that *work drive* accounted for additional variance in academic performance above and beyond the Big Five. Given the influence of another variable (gender) on the narrow trait–academic performance relationship, the superiority of narrow traits alone over broad traits is seemingly called into question.

Narrow Traits and the Big Five

The previous analyses examined the effect of broad and narrow traits separately. The third and final hypothesis addressed whether the narrow traits would explain additional variance in GPA above and beyond the Big Five. The present investigation indicates that narrow traits do, in fact, account for additional variance in GPA above and beyond the Big Five.

It appears that the narrow traits accounted for additional variance above and beyond their broad counterparts. Of the narrow traits and Big Five predictors, the regression analysis indicated that *optimism, work drive, agreeableness,* and *conscientiousness* were significant predictors of GPA. It is noteworthy that two Big Five factors and two of the narrow traits made it into the reduced model. These results were in accord with Prola and Stern (1984); Chemers, Hu, and Garcia (2001); Robbins, Spence, and Clark (1992); and Stoecker (1999). This finding provides mixed results in determining which traits, broad or narrow, perform better in explaining variation in GPA. One possible explanation could be that there is redundancy among the predictors.

In the end, after adding gender and gender interaction terms for the four predictors of GPA identified previously *(optimism, work drive, agreeableness,* and *conscientiousness)*, the final model indicated that *work drive*, *gender*, and the *gender*-by-*optimism* interaction were the significant predictors. In a model that included the main effect for *optimism*, the only significant predictor was *work drive*. *Gender* and the *gender*-by-*optimism* interaction were eliminated from the final model. This result further amplifies the importance of *work drive* in predicting GPA. The efficacy of work drive in

explaining GPA supports previous research (Lounsbury et al., 2003; Lounsbury & Gibson, 2002)

Based on the finding that narrow traits account for nearly three times the variance of the Big Five, including narrow traits in explaining real-world outcomes is justified.

The present study was undertaken in an attempt to find common ground in the bandwidth-fidelity dilemma but is at variance with some of Cronbach's (1960) views. He suggested that a wide bandwidth (broad trait) would be suitable in most cases until it led to an error. Thus, Cronbach agrees with Ones and Viswesvaran, that broader traits are more useful than narrow.

The findings of the present study suggest the opposite, because the narrow traits accounted for more variance than did their broad counterparts. However, in fairness to Cronbach and Ones and Viswesvaran, the narrow traits themselves did not account for incremental variance; rather, the narrow trait and gender interaction accounted for the most variance.

This study was undertaken and succeeded in an attempt to find common ground in the bandwidth-fidelity debate, in that it agrees with the work of Paunonen, that when narrow traits are chosen to predict real-world outcomes, they are valid predictors.

The present study has provided support for the importance of narrow traits, but it has complicated the bandwidth-fidelity issue with the finding that at least one other variable—in this case, gender—moderates the narrow trait–personality relationship. Where there is one moderator, there may be others.

So one implication of this study is that future research should examine if other variables (for example, age, ethnicity, locus of control, self-esteem), which have been

identified as moderators in other personality research (Bauer & Liang, 2003; Duff et al., 2004; Beronsky, 1985; White & Hood, 1989) might also moderate the personality trait–academic performance relationship.

It is reasonable to use narrow traits over broader traits. As long as the narrow trait is defined in a relatively similar manner, the precision of the narrow trait may account for more variance (cf. Hogan & Roberts, 1996) in criterion-related validity. The lack of specificity of broader traits could lead to more unaccounted for variance than a narrow trait, due to the fact that the broad trait is tapping the same domain as the narrow trait and an even broader domain on top of that.

However, the current study revealed potential pitfalls in relying solely on narrow traits in relation to academic performance; i.e., the impact of gender on narrow traits. Because of their more specific definition, it would be easy to define narrow traits so narrowly that the criterion is missed by the chosen set of predictors.

Therefore, one conclusion of this study is that both broad and narrow traits are useful in predicting real-world outcomes, and one should be cautious when making assumptions about one being better. The present study indicated that broad traits are useful in explaining academic performance, supporting the work by McIlroy and Bunting (2002) and McIntire, and Yost, 2002. It also suggests that narrow traits are useful (e.g., Paunonen & Ashton, 2001b). On the surface, it appears that narrow traits do a better job of accounting for variation in GPA than do broad traits. However, that conclusion must be tempered by the effect that gender had on the narrow traits and their relationship with GPA.

On a final note, the narrow trait of *work drive* has made a significant impact in describing the relationship of personality with GPA (Lounsbury & Gibson, 2002). *Work drive* is highly related to GPA (Ridgell & Lounsbury, 2004). In fact, *work drive* uniquely accounts for variance in GPA that the other predictors do not come close to achieving.

It has been well established that cognitive or intellectual ability is related to GPA (cf. Mouw & Khana, 1993; Teachman, 1996; Lange, 1974; Barnes, Potter, & Fiedler, 1983). However, could it be more than just ability that determines grades? *Work drive* could account for the proverbial "missing link" in the determination of grades. It seems reasonable that that "missing link" would be *motivation*.

Since *work drive,* as defined by Lounsbury and Gibson (2002), appears to tap into motivation. This study provides evidence to that effect, mainly, that *work drive* and thus underlying *motivation* account for a significant proportion of variation in the relationship between personality and academic performance.

The fact that *work drive* was so predictive of academic performance relative to the other narrow traits is fully consistent with similar findings by Lounsbury et al. (2003a) and Lounsbury and Gibson (2002).

Gender and Academic Performance

Strahan (2003) found that gender was related to GPA, indicating that females tended to have higher GPAs than their male counterparts. Similarly, Duff, Boyle, Dunleavy, and Ferguson (2004) found that, as part of a model including the Big Five predictors, gender was related to GPA. However, Duff et al. stopped short of investigating the joint effects of gender and personality.

Including gender interaction terms in the equation is a novel contribution by the present study. Unfortunately, gender did not add any explanatory power to the Big Five or to the narrow traits. Three gender interactions were noted as a result of a backward elimination. Those interactions were between gender and *optimism*, *openness*, and *self-directed learning*. However, according to the principle of hierarchy, to build a model with those gender interaction terms would also require the main effects of both gender and the trait in question. When the main effects for gender and the trait were added for each of the three interactions noted previously, the main effects appear to not be significant because the interaction may be obscuring them.

Limitations

One limitation in this study was a lack of diversity in the sample, as the study was conducted in a single geographic area in the southern United States. With 84% of the sample Caucasian, the results should be interpreted cautiously and should not be used to make inferences regarding students from other ethnic groups. Other, more diverse regions may yield differing results. It would be interesting to replicate this study on a wider range of cultural diversity to see if these results are applicable to other cultural settings.

A second limitation in this study concerns the bandwidth-fidelity dilemma. Although it appeared that narrow traits accounted for far more variance than did their broad counterparts, this study was not designed to determine which was best. Thus, the broad vs. narrow traits debate is still unresolved.

Although the present study revealed the Big Five's limitations in predicting academic performance relative to narrow traits, it did support the previous finding that

the Big Five are related to academic performance. Other narrow traits would be suitable for investigation into their joint and unique relationship with GPA and the Big Five.

The final limitation was the criterion. Self–reported GPA requires the participant to give an honest evaluation of his academic performance and therefore opens up the possibility of inflated GPA. On the other hand, the findings of Lounsbury, Huffstetler, Leong, and Gibson (in press) offer some reassurance, a .77 correlation between self-reported grade and actual GPA. And, although using actual GPA would be advisable for future research, the logistical and practical difficulties associated with obtaining GPA information on a large number of participants might prove difficult as well.

Another problem with using GPA is that it is multifaceted (Paunonen & Nicol, 2001) and affected by several things. Students possess differing levels of academic ability. Some students are strong in math; others are strong in art and literature. Not only does intellectual ability contribute to GPA, but so does motivation. Future studies should consider alternative measures of academic performance (e.g., using only GPA for courses taken within the major).

In addition to using GPA as an exclusive measure of academic performance, achievement test scores or other scores on standardized tests could be used. Also, the differences in grades between instructors or institutions should be considered. One way to control the differences would be to only sample a grade from a single course that all participants had with the same instructor. More information regarding the level of academic performance might be more informative in predicting academic success or failure.

Directions for Future Research

The results of the present study do not adequately address the issue of broad vs. narrow traits. Specifically, the selection of narrow traits and the potential for other variables to interact with the narrow traits are areas that need further work. Future studies could determine the optimal conditions for using broad, narrow, or a combination of broad and narrow traits.

Also, a fuller range of narrow traits could be investigated. This study illustrated the utility of using both broad and narrow traits in predicting GPA. However, a more thorough analysis of the broad vs. narrow issue should be attempted, possibly by conducting more systematic personality-related job analyses. Based on those results, the decision should be made on which personality traits to use as predictors following the rationale laid out by Raymark, Schmit, and Guion (1997).

Future research might expand the scope of research on academic performance to include areas such as intellectual ability and motivation, absenteeism, degree of social integration into school, and so forth (cf. Mershon & Gorsuch, 1988; Paunonen, 1998; Austin, Deary, Whiteman, Fowkes, Pedersen, Rabbitt, Bent, & McInnes (2002). These areas could be combined to address areas of concern such as retention.

Around 25% of any entering freshman class will graduate in six years. National U.S. data from the American College Testing Service indicate that 26% of the freshmen at four-year colleges and 45% of the freshmen at two-year colleges drop out (Sax, Keup, Gillmarten, Stolzenberg, & Harper, 2002). Examining the factors that lead to attrition would boost the retention rate. The result would be a better educated work force, which doubtless would benefit society as a whole.

The present study was limited demographically. However, investigating the questions posed in this section upon a more diverse sample would increase the external validity of the results. A wide-scale study with samples from several different geographic and cultural regions would enhance the generalizability of results and the utility of the current research project. Additionally, incorporating independent measures of academic performance would reinforce the study's validity.

Despite limitations, the present study clearly demonstrates the relationship between personality and academic performance. Moreover, previous research involving many participants supported the conclusions of this study, emphasizing the utility of using both narrow and broad personality traits to explain academic performance. The current study not only contributes to the pertinent body of literature, but may also encourage further research.

In conclusion, the robust results of this study support the notion that narrow personality traits can predict real-world outcomes. Therefore, the present study has illustrated the utility of using personality to address real-world outcomes. Specifically, the utility of using both broad and narrow traits to explain variation in GPA has been well-documented.

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Vita

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