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Abstract: General intelligence, Big Five personality traits, and the construct Work Drive were studied in relation to two measures of collegiate academic performance: a single course grade received by undergraduate students in an introductory psychology course, and self-reported GPA. General intelligence and Work Drive were found to be significantly positively related to both course grade and GPA, while one Big Five trait (Emotional Stability) was related to course grade only. Hierarchical multiple regression analysis revealed the incremental validity of Work Drive beyond Emotional Stability and over and above general intelligence: Work Drive accounted for 7% and 14% of unique course grade and GPA variance, respectively, when Emotional Stability was entered last; and Work Drive accounted for 6% and 13% of unique course grade and GPA variance, respectively, when Work Drive was entered last. In both cases, Emotional Stability did not provide significant unique variance. Findings are presented and discussed in the context of examining how cognitive and non-cognitive variables predict academic performance, and in terms of implications for using course grade versus GPA as a criterion for collegiate academic performance. Reprinted by permission of the publisher.

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PREDICTING ACADEMIC SUCCESS: GENERAL INTELLIGENCE, "BIG FIVE" PERSONALITY TRAITS, AND WORK DRIVE

General intelligence, Big Five personality traits, and the construct Work Drive were studied in relation to two measures of collegiate academic performance: a single course grade received by undergraduate students in an introductory psychology course, and self-reported GPA. General intelligence and Work Drive were found to be significantly positively related to both course grade and GPA, while one Big Five trait (Emotional Stability) was related to course grade only. Hierarchical multiple regression analysis revealed the incremental validity of Work Drive beyond Emotional Stability and over and above general intelligence: Work Drive accounted for 7% and 14% of unique course grade and GPA variance, respectively, when Emotional Stability was entered last; and Work Drive accounted for 6% and 13% of unique course grade and GPA variance, respectively, when Work Drive was entered last. In both cases, Emotional Stability did not provide

significant unique variance. Findings are presented and discussed in the context of examining how cognitive and non-cognitive variables predict academic performance, and in terms of implications for using course grade versus GPA as a criterion for collegiate academic performance.

During the last several decades, researchers have investigated relationships between numerous predictors and academic performance. Mouw and Khanna (1993) indicate that the prediction of academic success in college has become "a large scale operation." Important within the educational system, similar predictions are important in industrial research, as recent studies indicate the predictive ability of grades vis-à-vis job performance (Roth, BeVier, Switzer, & Schippman, 1996). Many employers screen job applicants based on a minimum grade point average threshold, or consider grades as a heavily weighted criterion when analyzing resumes (Reilly & Warech, 1993).

Academic success predictors usually consist of cognitive measures, pertaining to mental ability or intelligence; and non-cognitive measures, especially personality traits. Results, while occasionally varied, have continued to support the conclusion that both cognitive ability factors and certain personality traits consistently predict academic performance (Dyer, 1987; Hoschl & Kozeny, 1997; Mount & Barrick, 1991; Mouw & Khanna, 1993; Paunonem, Rush, & King, 1994; Rau & Durand, 2000; Rothstein, Paunonem, Rush, & King, 1994; Wolfe & Johnson, 1995). Most researchers have studied high school grades, ACT scores, and SAT scores as cognitive predictors (Chemers, 2001; Dyer, 1987). "Academic success" has generally been operationalized as collegiate cumulative grade-point-average (GPA), averaged across courses. However, as discussed by Lounsbury, Sundstrom, Loveland, and Gibson (2003), there are several concerns about these measures. The Educational Testing Service does not claim that it measures general intelligence, but that the SAT measures verbal and mathematical reasoning abilities. In addition, cumulative GPA incorporates variability among instructors and courses as uncontrolled sources of variance. Lounsbury et al. (ibid) contend that the grade in a single course would avoid such variability and might serve as a better validity criterion for research on cognitive and personality predictors. Their research, however, measured only course grade as a criterion and did not compare predictor validities with GPA. This formed a main rationale for the present study.

Before turning to the specific objectives of the current investigation, the role of personality measures in research on academic performance will be considered. Barrick and Mount's (1991) seminal work established a taxonomy of personality traits known as the "Big Five": Extraversion, Emotional Stability, Agreeableness, Conscientiousness, and Openness to Experience. These factors are often studied in relation to various outcomes, and research during the past decade has found several Big Five predictors of academic success: Agreeableness and Conscientiousness (Fritzche, McIntire, & Yost, 2002); Conscientiousness (Busato, Prins, Elshout, & Hamaker, 2000; Musgrave-Marquart, Bromley, & Dalley, 1997; Paunonen & Ashton, 2001) and Openness (Paunonen & Ashton, 2001). In addition, there is growing interest in the role of a dispositional construct developed by Lounsbury et al. that appears to be predictive of academic and job performance - work drive: "an enduring motivation to expend time and effort to finish projects, meet deadlines, be productive, and achieve success" (Lounsbury & Gibson, 2002; Lounsbury, Sundstrom, Loveland, & Gibson, 2003). Rau and Durand (2000) studied a similar construct, academic ethic, and also found that it predicted college grades. Rau and Durand's (2000) definition of Academic Ethic:

Students with a well-developed academic ethic place their studies above leisure activities; study on a daily or near-daily basis; and study in a disciplined, intense, and sober fashion.

Lounsbury, et al. (2003) concluded that Work Drive accounted for significant variance in predicting course grades beyond both cognitive ability and Big Five measures. Using hierarchical multiple regression analysis, Lounsbury, et al. (2003) found that after considering cognitive ability, Work Drive is a significant predictor before or after considering Big Five constructs, but that Big Five constructs are not significant predictors if

entered after Work Drive. This work called for more research to support the growing, but still small, body of knowledge related to more specific, contextualized personality constructs such as Work Drive.

The present study recognized several key issues in recent research, such as the difficulty in identifying variance in academic performance when using cumulative GPA as criterion. In addition, we noted that previously-used ACT scores, SAT scores, or high school grades as predictors might not lend to drawing valid conclusions regarding intelligence. Therefore, we decided to use a measure of general intelligence as a predictor of academic performance, and to use both GPA and the grade received in a single college course as measures of academic success. We also studied the relationship between Big Five personality traits and GPA and the single college course grade; additionally, we included the Lounsbury and Gibson (2002) measure for Work Drive trait to determine if we could replicate the Lounsbury, et al. (2003) findings regarding Work Drive's prediction of academic success. In particular, this study's examination of the relationship between Work Drive and academic success responds to calls for more specific or narrow-band personality constructs than the Big Five in predicting college grades (McIntire & Levine, 1984; Paunonen & Ashton, 2001).

Specifically, the present study had four objectives:

(1) To evaluate the validity of general intelligence for predicting collegiate academic performance operationalized as GPA and a single course grade;

(2) To evaluate the validity of the Big Five personality traits for predicting GPA and course grade, both individually and uniquely in relation to general intelligence;

(3) To evaluate the validity of Work Drive in relation to GPA and course grade, both individually and uniquely in relation to general intelligence and Big Five personality traits; and

(4) To compare the validities obtained above for course grade versus GPA to see if there were similar or different patterns of results for these two criteria of academic performance.

Method

Research Design

This research was a field study of college undergraduate students at a large southeastern state university, and it measured the course grade received by each participant, self-reported GPA, general intelligence, the "Big Five" personality traits, and Work Drive.

Participants

Participants were 140 college undergraduate students enrolled in an introductory psychology course. The students received extra course credit in return for their voluntary completion of the measures included in this study. (The extra course credit received was nominal in relation to their academic performance measure for this study's purposes.) Forty-six percent of the sample were women, and 54% were men; the average age was 19.18 years. The participants' year in school was predominantly freshman (73%); sophomores comprised 20% of the sample; juniors and seniors totaled 3% and 4%, respectively.

Measures

General Intelligence. We used a general intelligence scale developed by Resource Associates (Lounsbury & Gibson, 2002) measuring verbal reasoning (15 items) and numerical reasoning (15 items). This is an untimed test. Each item has 4 to 5 answer choices with scoring as l=correct, 0=incorrect. The total score represents an unweighted linear composite of all items. Coefficient alpha for this scale is .90. Scores on this

test correlate .70 with overall intelligence scores on the Otis-Lennon Test of Mental Maturity, a group-administered test of general intelligence which has been extensively normed and researched (Anastasi & Urbina, 1997; Otis & Lennon, 1969).

Big Five Personality Measures. We used the Personal Style Inventory (PSI), a 136-item general personality inventory developed by Lounsbury and Gibson (2002) and validated in a study of predictors of career decidedness of college students (Lounsbury, Tatum, Chambers, Owens, & Gibson, 1999) and a study of predictors of career satisfaction for a sample of 5,932 individuals in a variety of occupations going through career transition (Lounsbury, Loveland, et at., 2003). Each item in the PSI, with wording tailored for student populations, is presented with responses placed on a five-point Likert scale ranging from "Strongly Disagree" (1) to "Strongly Agree" (5). The following Cronbach coefficient alphas were observed: Extraversion -- .90; Emotional Stability -- .77; Agreeableness -- .69; Conscientiousness -- .78; and Openness to Experience -- .78.

Work Drive. We used Lounsbury and Gibson's Work Drive measure, an 11-item scale that has been extensively validated in various settings (Lounsbury & Gibson, 2002; Lounsbury et al., 2003). The scale's items included wording tailored for student populations, and the items were presented with responses placed on a five-point Likert scale ranging from "Strongly Disagree" (1) to "Strongly Agree" (5). The following are three sample Work Drive items: "I always try to do more than I have to in my classes", "Being a good student means a lot to me", and "I would keep going to school even if I didn't have to." Cronbach's coefficient alpha for the Work Drive scale was .82.

Grade Point Average (GPA). Concurrent with administering the PSI, Work Drive, and general intelligence scales, we collected various demographic data (age, gender, year in school, etc.). Within this demographic section, participants were asked to indicate their overall (cumulative) GPA by selecting one of the following seven choices: less than 1.50; 1.50-2.00; 2.00-2.49; 2.50-2.99; 3.00-3.49; 3.50-3.99, and 4.00. Data for this study were collected during a spring semester session; participants had been enrolled at the university during the previous fall semester, providing a basis for their knowledge (in the case of freshmen) of their cumulative GPA.

Results

Descriptive statistics and the correlation matrix for this study's variables are presented in Table 1. Three variables significantly correlated with the course grade and with GPA: general intelligence ($r=.41$, $p<.01$; and $r=.39$, $p<.01$; respectively) and Work Drive ($r=.30$, $p<.01$; and $r=.40$, $p<.01$; respectively). Emotional Stability significantly correlated with course grade only ($r=.18$, $p<.05$). The course grade and GPA also correlated significantly ($r=.51$, $p<.01$).

Using hierarchical multiple regression analyses, we assessed the incremental validity of the Emotional Stability and Work Drive traits above and beyond general intelligence with results summarized in Tables 2 and 3 for the criteria of course grade and GPA, respectively. The following order of entry was used for these hierarchical regressions: Step 1 - general intelligence; Step 2 - Work Drive. The results are shown in Part 1 of Tables 2 and 3. Unique variance contributed at each step is represented by the incremental variance or the squared semi-partial correlation coefficient (Cohen & Cohen, 1983). In both cases, Work Drive added significant unique variance: for course grade, Work Drive added 7% of unique variance above and beyond general intelligence; and for GPA, Work Drive added 14% of unique variance above and beyond general intelligence.

Owing to the significant portion of variance accounted for by Work Drive, we conducted further hierarchical multiple regression analysis to determine the influence of Emotional Stability. In Parts 2 and 3 of Tables 2 and 3, we first added (following general intelligence) Work Drive, and then Emotional Stability (Part 2); then

we reversed the order and added (following general intelligence) Emotional Stability and then Work Drive (Part 3). In both cases, Work Drive added significant unique variance; and in both cases, the contribution of Emotional Stability was not significant. In Part 2 of each table, when we added Work Drive before Emotional Stability, Work Drive accounted for 7% and 14% of unique variance for course grade and GPA, respectively; and the amount of Emotional Stability variance was not significant for both course grade and GPA. In Part 3 of each table, when we added Work Drive after Emotional Stability, Work Drive still accounted for 6% and 13% of unique variance for course grade and GPA, respectively; and the amount of Emotional Stability variance, even when considered before Work Drive, was not significant for both course grade and GPA.

For each significant correlation with course grade and GPA (general intelligence, Work Drive, and Emotional Stability), we tested the differences between these correlations (course grade and GPA) to determine whether they were significantly different from one another. We found that they were not significantly different. When considering the general intelligence correlations with course grade and GPA ($r=.41$, $p<.01$; and $r=.39$, $p<.01$; respectively), our z-test result was 0.227, which does not exceed the .01 cutoff of 2.56. When considering the Work Drive correlations with course grade and GPA ($r=.30$, $p<.01$; and $r=.40$, $p<.01$; respectively), our z-test result was 1.393, which does not exceed the .01 cutoff of 2.56. when considering the Emotional Stability correlations with course grade and GPA ($r=.18$, $p<.05$; and $r=.13$, not significant; respectively), our z-test result was 0.518, which does not exceed the .01 cutoff of 2.56.

Discussion

The results of the present study confirm previous findings regarding the validity of both cognitive and personality variables in relation to collegiate academic performance (Paunonen & Ashton, 2001; Wolfe & Johnson, 1995). General intelligence was found to predict significantly both course grade and GPA. These two correlations were not significantly different from each other. Additional work in continuing to compare, within a single study, the impact of general intelligence on various academic success measures could strengthen this finding.

We also found that Emotional Stability is significantly correlated with a single course grade, but not with GPA. Other Big Five personality traits were not found to be significantly related to either course grade or GPA. This was somewhat surprising, as previous studies have concluded that three other Big Five traits predict academic success: Conscientiousness, Openness, and Agreeableness (Lounsbury, et al., 2003; Musgrave-Marquart, et al., 1997; Paunonen & Ashton, 2001; Rothstein, et al., 1994). Although Emotional Stability was significantly and positively related to course grade, the hierarchical multiple regression analysis showed that Emotional Stability does not add significant variance to the prediction of course grade after general intelligence alone or after general intelligence and Work Drive had been entered into the prediction equation.

One potential explanation for other Big Five traits not surfacing as significant might be related to the composition of our sample: 93% of the participants were relatively new in their college tenure (73% were freshmen and 20% were sophomores). It is possible that course grade for them may be influenced more by other factors than personality traits, such as maturation, study habits, involvement in other activities on campus, and settling into the role of student during the first year or two at college. In contrast, although Lounsbury et al. (2003) found that Openness was positively related to course grade, participants in their study were comprised entirely of upperclassmen. In summary, although the Big Five personality traits appear to be related to academic performance, the pattern of significant relationships is inconsistent and may depend, in part, on such factors as year in school, and the type of criterion used to represent performance.

Work Drive was found to predict academic performance as represented by course grade and GPA, both individually and uniquely in relation to general intelligence and Big Five personality traits. Work Drive accounted for 7% of the variance in course grade after controlling for general intelligence. When controlling

for both general intelligence and Emotional Stability, Work Drive still accounted for 6% of the variance in course grade. Moreover, Work Drive accounted for a full 14% of the variance in GPA after considering general intelligence. After controlling for both general intelligence and Emotional Stability, Work Drive still accounted for 13% of the variance in GPA. Thus, Work Drive appears to be a good general predictor of performance that could be used in addition to intelligence and Big Five personality traits to predict academic success.

The results of the present study also indicate similar validities when either course grade or GPA served as the criterion. There were no significant differences between the common bivariate correlations for course grade versus GPA on the intelligence, Big Five personality, or Work Drive predictors.

This study begins to answer recent calls for more specific personality constructs (such as Work Drive) than the Big Five in predicting college academic success (Lounsbury, et al., 2003; Paunonen & Ashton, 2001; Paunonen & Nicol, 2001). It also adds to a growing body of knowledge regarding the influence of personality traits on academic performance. Future research should continue to study the impact of Work Drive and other more narrow constructs and their roles in adding incremental unique variance in academic success in relation to Big Five traits.

The present study also sheds light on a concern raised by Lounsbury, et al. (2003) regarding generalizability to a more global criterion of academic performance: GPA. By including both course grade and GPA in our analysis, we determined that these two different criteria produced similar validities when general intelligence, Big Five personality traits, and Work Drive were used as predictors. Future research could investigate whether differential validity patterns can be found using course grade or GPA as criteria.

This study had several limitations. Participants were lower-division students in an introductory psychology class, which leaves open the question of whether these results would generalize to a more robust student sample taking courses in other fields. Also, our measure of GPA was based on self-report data using a seven-category scale, not an objective index of actual GPA using the full range of possible values for grade-point-average. In addition, the present study was conducted in a single university located in the Southeastern U.S; results may differ if other colleges and universities in other geographic regions were sampled.

To summarize, this study confirmed previous findings of significant validities for general intelligence and Work Drive in relation to academic performance. The validity of the Big Five personality traits for academic performance in the present study differed from prior findings. Finally, the present results indicated no differential validity pattern using either course grade or GPA as a criterion for collegiate academic performance. Future research could examine these issues in the context of other personality and ability measures as well as other criteria for academic performance.

Table 1 Descriptive Statistics and Intercorrelations for Study Variables

Legend for Chart:

C - (1)
D - (2)
E - (3)
F - (4)
G - (5)
H - (6)
I - (7)
J - (8)
K - (9)

A

	B	C	D	E	F
	G	H	I	J	K
Extraversion					
(1)	--				
Emotional Stability					
(2)	.22(**)	--			
Agreeableness					
(3)	.42(**)	.42(**)	--		
Conscientiousness					
(4)	.29(**)	-.02	.24(**)	--	
Openness to Experience					
(5)	.42(**)	-.05	.16	.11	
--					
Work Drive					
(6)	.13	.14	.21(**)	.52(**)	
.23(**)	--				
General Intelligence					
(7)	-.13	.10	.01	-.19(*)	
.12	.09	--			
Course Grade					
(8)	-.04	.18(*)	-.07	.06	
.06	.30(**)	.41(**)	--		
GPA					
(9)	.04	.13	.10	.15	
.06	.40(**)	.39(**)	.51(**)	--	
Mean					
	3.93	3.18	3.57	3.33	
3.51	2.80	50.41	3.92	3.92	
Standard Deviation					
	.61	.69	.55	.69	
.55	.67	16.02	1.03	1.60	

(*) p<.05 (**) p<.01 Sample sizes for correlations range between 131 and 140

Table 2 Hierarchical Mulltiple Regression Results for General Intelligence, Work Drive, and Emotional Stability Entered as a Set (Course Grade)

Part 1: Results of hierarchical multiple regression analysis with Work Drive entered last

Dependent Variable: Course Grade

Legend for Chart:

A - Step
B - Variable
C - Multiple R
D - R^2
E - R^2 Change

A	B	C	D	E
1	General Intelligence	.394(**)	.155(**)	.155(**)
2	Work Drive	.472(**)	.223(**)	.068(**)

Part 2: Results of hierarchical multiple regression analysis with Emotional Stability entered last

Dependent Variable: Course Grade

1	General Intelligence	.394(**)	.155(**)	.155(**)
2	Work Drive	.472(**)	.223(**)	.068(**)
3	Emotional Stability	.484(**)	.235(**)	.012

Part 3: Results of hierarchical multiple regression analysis with Work Drive entered last

Dependent Variable: Course Grade

1	General Intelligence	.394(**)	.155(**)	.155(**)
2	Emotional Stability	.418(**)	.175(**)	.020
3	Work Drive	.484(**)	.235(**)	.060(**)

(n) = 131 (*) p<.05 (**) p<.01

Table 3 Hierarchical Mulltiple Regression Results for General Intelligence, Work Drive, and Emotional Stability Entered as a Set (GPA)

Part 1: Results of hierarchical multiple regression analysis with Work Drive entered last

Dependent Variable: GPA

Legend for Chart:

A - Step
B - Variable
C - Multiple R
D - R^2
E - R^2 Change

A	B	C	D	E
1	General Intelligence	.382(**)	.146(**)	.146(**)
2	Work Drive	.531(**)	.282(**)	.137(**)

Part 2: Results of hierarchical multiple regression analysis with Emotional Stability entered last

Dependent Variable: GPA

1	General Intelligence	.382(**)	.146(**)	.146(**)
2	Work Drive	.531(**)	.282(**)	.137(**)
3	Emotional Stability	.534(**)	.285(**)	.003

Part 3: Results of hierarchical multiple regression analysis with Work Drive entered last

Dependent Variable: GPA

1	General Intelligence	.382(**)	.146(**)	.146(**)
2	Emotional Stability	.395(**)	.156(**)	.010
3	Work Drive	.534(**)	.285(**)	.129(**)

(n) = 131 (*) p<.05 (**) p<.01

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