

Personality Predictors of Academic Outcomes: Big Five Correlates of GPA and SAT Scores

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The authors examined relations between the Big Five personality traits and academic outcomes, specifically SAT scores and grade-point average (GPA). Openness was the strongest predictor of SAT verbal scores, and Conscientiousness was the strongest predictor of both high school and college GPA. These relations replicated across 4 independent samples and across 4 different personality inventories. Further analyses showed that Conscientiousness predicted college GPA, even after controlling for high school GPA and SAT scores, and that the relation between Conscientiousness and college GPA was mediated, both concurrently and longitudinally, by increased academic effort and higher levels of perceived academic ability. The relation between Openness and SAT verbal scores was independent of academic achievement and was mediated, both concurrently and longitudinally, by perceived verbal intelligence. Together, these findings show that personality traits have independent and incremental effects on academic outcomes, even after controlling for traditional predictors of those outcomes.

Keywords: Conscientiousness, Openness to Experience, achievement, SAT scores, GPA

Personality has important influences on success in school (De Raad & Schouwenburg, 1996; Digman & Takemoto-Chock, 1981) and work (Barrick & Mount, 1991; Ozer & Benet-Martínez, 2006; Roberts & Hogan, 2001). It is important to note that the predictive power of personality has little to do with intelligence or other aspects of cognitive ability. Early trait researchers made a clear distinction between intelligence and personality traits (Allport & Odbert, 1936). This distinction persists to this day and is reflected in the exclusion of explicit intelligence content from most contemporary personality inventories (McCrae & Costa, 1985, 1997). Recent studies have shown that personality predicts academic performance (e.g., Duckworth & Seligman, 2005; Wagerman & Funder, 2007) and occupational success (Hogan, 2005), even when intelligence and cognitive ability are controlled. The current research ex-

amines the ability of the Big Five personality traits to predict academic outcomes, specifically SAT scores and grade-point average (GPA).

Previous Research on the Personality Correlates of SAT Scores

In contrast to the abundance of research on personality and grades, there has been virtually no research on the personality correlates of SAT scores and other standardized measures of academic aptitude and achievement. The SAT is by far the most widely used measure of academic potential, and it plays a central role in admissions decisions at most universities in the United States. SAT scores have been interpreted in a number of different ways, both by the test's designers themselves (Educational Testing Service) and by college administrators, high school counselors, the popular press, and researchers in fields such as education and psychology. Indeed, even the name of the test has been repeatedly changed and reinterpreted over the years. It was introduced in 1901 as the Scholastic Achievement Test, purporting to measure the level of achievement attained by prospective college students. After considerable development (and growing popularity), it was renamed the Scholastic Aptitude Test in 1941 to emphasize the fact that it measures the *ability* to succeed in college. After the rise of "coaching courses," which demonstrated that students could successfully increase their test scores, the test was renamed the Scholastic Assessment Test in 1991. Finally, in 1994, the test was reduced to its initials: "Please note that SAT is not an initialism. It does

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not stand for anything” (College Board, 1994, as cited in Harper, 2002). As of 2005, the current version of the SAT was labeled the SAT Reasoning Test, which, according to the Educational Testing Service, assesses “reasoning ability” and not intelligence.

Despite the test maker’s claim that the SAT is not an intelligence test, recent research suggests that the SAT measures something very close to general mental ability. For example, Frey and Detterman (2004) found that the SAT correlated .82 with a measure of “g” (or general intelligence) extracted from the Armed Services Vocational Aptitude Battery in a large sample from the National Longitudinal Survey of Youth (see also Brodnick & Ree, 1995).

Given the link between SAT scores and intelligence, research on the personality correlates of intelligence can provide one window into the possible relation between personality and SAT scores. The overlap between personality and intelligence is the subject of some controversy. Some researchers have argued that certain personality dimensions, particularly Openness to Experience, overlap substantially with intelligence (Ackerman & Heggestad, 1997; Eysenck, 1991; see also Collis & Messick, 2001). In contrast, other researchers have maintained that personality and intelligence are conceptually and empirically distinct (Demetriou, Kyriakides, & Avraamidou, 2003; McCrae & Costa, 1997). Taking somewhat of a middle ground in this debate are Goldberg and Saucier (Goldberg, 1990; Saucier, 1992, 1994; Saucier & Goldberg, 1996), who, drawing from their lexical research on the Big Five trait domains, conceptualized the Openness domain as “Intellect,” emphasizing its connection to creativity, abstract thinking, depth of thought, and other intellectual qualities. In general, the research literature suggests that measures of intelligence and other aspects of cognitive ability are modestly but consistently related to Openness but are not consistently related to the other four Big Five domains (Moutafi, Furnham, & Crump, 2003, 2006). A recent study by Bischel and Baker (2006) suggested that the relation between Openness and intelligence is strong in young adulthood but weak later in adulthood, which may explain some inconsistencies in previous findings.

It is surprising that we could identify only two published studies that correlated an established measure of the Big Five dimensions with SAT scores. Wolfe and Johnson (1995) found that low Agreeableness (assessed via the Big Five Inventory; John & Srivastava, 1999) was the only significant predictor of total SAT scores. Conard (2006) found that Openness (assessed via the NEO Five Factor Inventory; Costa & McCrae, 1992) was the only significant predictor of total SAT scores. However, past research with non-Big Five measures has suggested that SAT scores are related to Openness-related traits, such as need for cognition, but also Conscientiousness-related traits, such as achievement and (work-oriented) resiliency (Tross, Harper, Osher, & Kneidinger, 2000). Mischel, Shoda, and Peake (1988; Shoda, Mischel, and Peake, 1990) found a relation between delay of gratification at age 4 (which reflects the self-control aspect of Conscientiousness) and higher SAT scores in late adolescence. However, other studies have found only weak relations between aspects of Conscientiousness, such

as Block’s construct of ego undercontrol, and SAT scores (Letzring, Block, & Funder, 2005).

We believe that the inconsistent results may be due, at least in part, to previous researchers’ failure to separately examine the correlates of SAT verbal and SAT math scores. Previous research suggests that verbal and quantitative abilities have different personality correlates (Schuerger, Kepner, & Lawler, 1979). One possible reason for their divergent correlates is that the SAT verbal test may be more strongly related to crystallized intelligence because of its vocabulary-related content, whereas the SAT math test may be more strongly related to fluid intelligence because of its numerical and spatial reasoning-related content (e.g., Rohde & Thompson, 2007). In a meta-analysis of the overlap between intelligence and personality, Ackerman and Heggestad (1997) found that crystallized intelligence was related to three Openness-related personality constructs, whereas fluid intelligence was not consistently related to any personality constructs. Similarly, Ashton, Lee, Vernon, and Jang (2000) found moderate to strong relations between Openness and aspects of crystallized intelligence and only weak relations between Openness and aspects of fluid intelligence. Thus, in the present research, we examined SAT verbal and math scores separately and expected to find that Openness predicts SAT verbal scores, whereas we made no specific predictions about SAT math scores.

Previous Research on Personality Correlates of Academic Performance

In contrast to the paucity of personality research on standardized tests such as the SAT, research linking personality traits to academic achievement has a long history in psychology. Early studies by Harrison Gough and his collaborators showed that California Psychological Inventory scales related to Conscientiousness predicted higher levels of achievement in both high school and college (Gough, 1964; Gough & Hall, 1964; Gough & Lanning, 1986). Similarly, Hogan and Weiss (1974) found that college students elected to Phi Beta Kappa (an academic honor for high achievers) tended to score higher on the California Psychological Inventory scales of responsibility, self-control, and socialization than did students who were not elected to Phi Beta Kappa. The link between personality and achievement has also been demonstrated with non-self-report measures of personality. For example, John, Caspi, Robins, Moffitt, and Stouthamer-Loeber (1994) found that mother reports of Conscientiousness and Openness in an ethnically diverse sample of middle school boys predicted teacher ratings of school performance in reading, writing, spelling, and math. These cross-method correlations replicate and extend other studies showing a link between teacher ratings of Conscientiousness and teacher ratings of school performance (Digman, 1989; Graziano & Ward, 1992), as well as between self-reported Openness and school grades (Lounsbury, Sundstrom, Loveland, & Gibson, 2003). Finally, a few studies have found small to medium associations between grades and other personality traits, including Agreeableness (E. C. Hair & Graziano, 2003) and Emotional Stability (Ridgell & Lounsbury, 2004).

Table 1
Previous Findings on Personality and Academic Outcomes in College

	Criterion	N	Measure	E	A	C	N	O
Barchard (2003)	GPA	150	IPIP NEO-PI	0	0	+++	0	+
Busato et al. (2000) ^a	GPA	409	5PFT	0	0	+	0	0
Conard (2006)	GPA	289	NEO-FFI	0	0	+++	0	0
de Fruyt & Mervielde (1996)	GPA	714	NEO-PI-R	0	0	++	0	0
Duff et al. (2004)	GPA	146	16PFi	0	0	0	0	0
Farsides & Woodfield (2003) ^a	GPA	432	NEO-FFI	0	0	0	0	++
Furnham et al. (2003) ^a	GPA	93	NEO-PI-R	--	0	+++	0	0
Gray & Watson (2002)	GPA	300	NEO-FFI ^b	0	+	+++	0	+
Langford (2003)	GPA	203	BFM	0	0	+++	0	0
Oswald et al. (2004)	GPA	636	IPIP BFM	0	0	0	0	0
Ridgell & Lounsbury (2004)	GPA	140	PSI	0	0	0	0	0
Wolfe & Johnson (1995)	GPA	201	BFI	0	0	+++	0	0
Conard (2006)	Course grade	186	NEO-FFI	0	+	+++	0	0
Chamorro-Premuzic & Furnham (2003a) ^a	Course grade	70	NEO-FFI	0	0	+++	---	0
Chamorro-Premuzic & Furnham (2003b)	Course grade	247	NEO-PI-R	0	0	+++	-	0
Furnham & Chamorro-Premuzic (2004)	Course grade	91	NEO-FFI	--	0	++	0	0
P. Hair & Hampson (2006)	Course grade	236	BFI	-	0	+	0	0
Lounsbury et al. (2003)	Course grade	175	PSI	0	0	+	0	+
Lounsbury et al. (2005) ^a	Course grade	434	APSI	+	+	+	--	+
Ridgell & Lounsbury (2004)	Course grade	140	PSI	0	0	0	-	0
Mean effect size		5,292		-.04	.09	.26	-.07	.05

Note. E = Extraversion; A = Agreeableness; C = Conscientiousness; N = Neuroticism; O = Openness; IPIP NEO-PI = abbreviated version of the IPIP version of the Revised NEO Personality Inventory (NEO-PI-R; Costa & McCrae, 1992; Goldberg, 1999; see also Goldberg, et al., 2006); 5PFT = Vijf Persoonlijkheids-Factoren Test (Elshout and Akkerman, 1975); NEO-FFI = NEO Five Factor Inventory (Costa & McCrae, 1992); 16PFi = 16PFi Form A with second order factors for the Big Five (Cattell, 2000); BFM = Shafer's (1999) Bipolar Big Five Markers; IPIP BFM = IPIP version of the 50-item Big Five Marker measure; PSI = Personal Style Inventory (Lounsbury & Gibson, 2004); BFI = Big Five Inventory (John & Srivastava, 1999); APSI = Adolescent Personal Style Inventory (Lounsbury & Gibson, 2004). 0 refers to a nonsignificant correlation; - refers to a correlation between -.10 and -.19; -- refers to a correlation between -.20 and -.29; --- refers to a correlation between -.30 and -1.00; similarly, the + signs refer to the parallel ranges of positive correlation coefficients; for all correlations marked with - or + signs, $p < .05$.

^a A longitudinal study.

^b NEO-FFI for all domains except Conscientiousness, which is measured with the full NEO-PI-R.

To help readers better understand the overall pattern of relations between the Big Five dimensions and academic achievement, we present in Table 1 a summary of previous studies on the Big Five correlates of academic performance in college.¹ Conscientiousness emerges as the most robust predictor of college grades (mean $r = .26$). The other four Big Five factors were not consistently related to academic performance (mean r s = $-.04$, $.09$, $-.07$, and $.05$ for Extraversion, Agreeableness, Neuroticism, and Openness, respectively), although Openness had significant positive effects in one fourth of the studies.

Although Conscientiousness was the best predictor of academic success in college, the magnitude of the effect varied substantially across studies. This pattern may reflect, at least in part, the differential predictive validity of different facets of Conscientiousness (Ashton, 1998; Mershon & Gorsuch, 1988; Paunonen, 1998). For example, Paunonen and Ashton (2001) found that some Conscientiousness-related facets are more closely linked to grades than others (see also Wolfe & Johnson, 1995); specifically, the Personality Research Form (Jackson, 1984) Achievement and Endurance scales were moderate predictors of grades, whereas the Personality Research Form Order scale was almost completely unrelated to grades. In addition, researchers who have assessed self-control, an aspect of Conscientiousness (Roberts, Chernyshenko, Stark, & Goldberg, 2005), have found sizeable relations with grades (e.g., Tangney, Baumeister, & Boone,

¹ We used three methods to locate relevant studies. First, we reviewed reference lists from previously published articles and chapters on the relation between personality and academic achievement. Second, we searched the PsycINFO database (<http://www.apa.org/psycinfo/>) for articles published between 1887 (the earliest entry in the PsycINFO database) and June 2006, using the keywords "Big Five" and "Five Factor Model" paired with each of the following keywords: GPA, grade*, academic performance, and academic success. Third, we searched for relevant articles by reviewing the reference lists of the articles identified in the PsychINFO searches that met the inclusion criteria described in the next sentences. We included studies if they fulfilled five criteria. First, the study had to be published in a peer-reviewed journal. Second, the study had to include a self-report measure of the Big Five or the five-factor model; measures that assessed related traits (but not the actual domains) or single Big Five/five-factor-model traits were not included. Third, the study had to report correlations or regression (beta) coefficients for all five factors and the criterion variable. Fourth, the study had to include either overall GPA or some aggregated measure of academic performance (a grade for a single course, summed exam scores in a course). Fifth, the sample had to be drawn from a college population. Twenty studies satisfied these criteria, resulting in a total of 100 correlations on the basis of 5,292 participants.

2004). Using Costa and McCrae's (1992) NEO PI-R, Gray and Watson (2002) found that GPA was most closely related to the Conscientiousness facets of achievement striving ($r = .39$) and self-discipline ($r = .36$) but only weakly related to the Conscientiousness facet of order ($r = .15$).²

Gray and Watson (2002) found a divergent pattern of correlates for high school GPA and college GPA. When they simultaneously entered all of the Conscientious facets into multiple regression analyses, dutifulness emerged as the best predictor of high school grades, whereas the achievement-striving facet emerged as the only significant predictor of college grades. These findings seem to fit with Gough's (1957) distinction between achievement via conformance and achievement via independence, which have been linked, respectively, to high school and college achievement (see Gough & Lanning, 1986). Achievement via conformance reflects the capacity to work effectively in highly structured educational contexts, whereas achievement via independence reflects the ability to be successful in relatively open and unstructured settings (Gough & Lanning, 1986). On the basis of Gough's conceptualization of these two variables, we would expect Openness—in addition to Conscientiousness—to be linked to achievement via independence, and thus higher college GPA, because those who are high in Openness tend to have an intellectual style that is well-suited to contexts in which intellectual autonomy and creativity are rewarded. This prediction is consistent with Gray and Watson's finding that Openness was a significant positive predictor of college GPA but not high school GPA.

The weak and inconsistent relation between Openness and GPA might also reflect the differential predictive validity of the facets of Openness. For example, although Gray and Watson (2002) did not assess Openness facets, one might expect aspects of Openness that have to do with creativity, imagination, and engagement in and appreciation of abstract ideas to be positive predictors of college GPA, whereas aspects that have to do with the unconventional nature of the dimension may be negative predictors. In the present research, we used multiple measures of the Big Five personality domains, including two that have facet-level scales, to gain a more nuanced understanding of connections between personality and academic achievement in college.

The Present Research

Our primary goal was to examine the Big Five correlates of college GPA and SAT scores. Our research builds on previous research in several ways. First, we replicated our findings across four independent samples, including one sample of over 10,000 college students. Second, we replicated our findings across multiple personality inventories, including the Big Five Inventory (BFI; John & Srivastava, 1999), the NEO Five-Factor Inventory (NEO-FFI), the Revised NEO Personality Inventory (NEO-PI-R; Costa & McCrae, 1992), and the HEXACO Personality Inventory (HEXACO-PI; Lee & Ashton, 2004). Third, we used the Big Five facet scales of the HEXACO-PI, as well as the Conscientiousness and Openness facet scales of the NEO-PI-R, to examine how specific facets of the five broad personality dimensions relate to indicators of academic aptitude and achievement. Fourth, we examined both GPA and SAT scores in the same samples of participants, allowing us to test whether the effects of personality on GPA are independent of SAT, and vice versa. Fifth, we examined both high school and college GPA in the same samples of

participants, allowing us to examine their differential personality correlates and whether the effects of personality on college GPA are independent of high school GPA. Sixth, one of our studies included GPA and SAT scores obtained from university records as well as self-reported scores, allowing us to determine the degree to which college students accurately report their GPA and SAT scores. Seventh, we report findings from a 4-year longitudinal study, which allowed us to test the long-term effects of personality, and changes in personality, on academic outcomes. Eighth, we assessed several achievement-related variables, including perceived verbal intelligence, perceived academic ability, and academic effort, to better understand the processes that mediate any observed relations between personality and academic outcomes.

On the basis of previous research, we expected that Conscientiousness would be the best predictor of academic performance (both high school and college GPA)—especially Conscientiousness facets that have to do with achievement motivation and self-control. In addition, we expected Openness to also be a predictor of academic performance in college, in line with its conceptual link to achievement via independence. We expected that Openness would be related to SAT verbal scores, but we made no predictions about personality correlates of SAT math scores, given the inconsistencies in the literature. Moreover, we expected that these effects would be independent; that is, Conscientiousness and Openness would have independent effects on GPA and SAT scores. We also expected that the effects of personality on GPA would be independent of SAT and vice versa. Finally, we expected that all of these effects would replicate across the three personality inventories used in the present research.

Method

To test our basic research questions, we conducted four studies with data collected on four independent samples, all of which included measures of the Big Five dimensions, GPA, and SAT scores (as well as other variables). However, to simplify presentation of the findings, and to facilitate comparison of findings across studies, we report the results from all four samples together.

Samples

Sample 1. Participants were drawn from the psychology department subject pool at the University of California, Davis from 2003–2005. The sample included 10,497 undergraduate students (63% female, 37% male) from a diverse range of ethnic backgrounds (2% African American, 42% Asian, 34% Caucasian, 8% Hispanic/Latino, 2% Middle Eastern, 11% “Other/Multicultural,” and less than 1% Native American). Participants ranged in age from 18 years to 30 years ($Mdn = 19$ years; $SD = 1.51$).

Sample 2. Sample participants were drawn from the Berkeley Longitudinal Study, an ongoing study designed to examine personality, achievement motivation, and self-concept development during college and early adulthood (for further details about the study, see

² de Fruyt and Mervielde (1996) previously reported relations between NEO-PI-R facets and comprehensive exams in a Belgian sample. Their findings for Conscientiousness facets were remarkably similar to Gray and Watson's (2002) findings—strongest relations for self-discipline and achievement striving and weakest for order.

Robins, Fraley, Roberts, & Trzesniewski, 2001; Robins, Nofle, Trzesniewski, & Roberts, 2005). The initial sample included 508 undergraduate students who entered the University of California at Berkeley in 1992. Participants were recruited during the 1st week of their 1st year of college and then assessed annually throughout college. The original sample was diverse in terms of ethnicity (7% African American, 43% Asian, 36% Caucasian, 13% Hispanic/Latino, 1% Native American), sex (56% female, 44% male), and socioeconomic status (20% came from families with 1992 household incomes below \$25,000 and 20% from families with household incomes above \$100,000). Participants ranged in age from 17 years to 30 years ($Mdn = 18$ years; $SD = 1.10$). The present study focused on a subsample of 475 participants who completed the NEO-FFI at the beginning of the 1st year of college and at the end of the 4th year of college.

Sample 3. Participants were University of California, Davis students taking introductory psychology classes who were part of the subject pool in spring 2006. The sample included 470 undergraduate students (78% female, 22% male) from a diverse range of ethnic backgrounds (2% African American, 43% Asian, 35% Caucasian, 7% Hispanic/Latino, 4% Pacific Islander, 9% "Other/Multicultural," and less than 1% Native American). Participants ranged in age from 17 years to 29 years ($Mdn = 19$ years; $SD = 1.51$).

Sample 4. Participants were University of California, Davis students taking introductory psychology classes who were part of the subject pool in fall 2006. The sample included 425 undergraduate students (61% female, 39% male) from a diverse range of ethnic backgrounds (1% African American, 41% Asian, 32% Caucasian, 11% Hispanic/Latino, 3% Pacific Islander, 12% "Other/Multicultural," and less than 1% Native American). Participants ranged in age from 17 years to 31 years ($Mdn = 19$ years; $SD = 1.70$).

Measures

Personality. In Sample 1, the 44-item BFI (John & Srivastava, 1999) was administered to participants in the quarterly prescreening questionnaire; alpha reliabilities were .87 for Extraversion, .79 for Agreeableness, .81 for Conscientiousness, .82 for Neuroticism, and .79 for Openness to Experience. Items were rated on a 5-point scale ranging from 1 (*strongly disagree*) to 5 (*strongly agree*).

In Sample 2, The 60-item NEO-FFI (Costa & McCrae, 1992) was administered during the 1st week of college (Week 1) and at the end of the 4th year (Year 4); alpha reliabilities were .83 and .82 for Extraversion, .76 and .77 for Agreeableness, .81 and .83 for Conscientiousness, .84 and .85 for Neuroticism, and .77 and .75 for Openness to Experience, respectively, for the two assessments. Items were rated on a 5-point scale ranging from 1 (*not very true of me*) to 5 (*very true of me*).

In Sample 3, the 208-item HEXACO-PI (Lee & Ashton, 2004, 2006) was administered to participants. Alpha reliabilities were .93 for Extraversion, .91 for Agreeableness, .89 for Conscientiousness, .87 for Emotionality (hereafter referred to as "Neuroticism" for ease of comparison across the three samples),³ and .87 for Openness to Experience.⁴ Each of the HEXACO-PI domain scales includes four facet scales; alpha reliabilities for these facet scales ranged from .67 (Openness:Unconventionality) to .88 (Conscientiousness:Organization). All items were rated on a 5-point scale ranging from 1 (*strongly disagree*) to 5 (*strongly agree*).

In Sample 4, the Conscientiousness and Openness to Experience facet scales of the NEO-PI-R (96 items; Costa & McCrae, 1992) were administered to participants. Alpha reliabilities for the 12 facet scales ranged from .53 (Openness to Actions)⁵ to .80 (Openness to Aesthetics) and were .90 and .89 for the full-scale Conscientiousness and Openness dimensions, respectively. We did not administer facet scales related to Extraversion, Agreeableness, and Neuroticism because of time constraints and because these three domains are less conceptually and empirically linked to academic outcomes than are Conscientiousness and Openness.

SAT scores. In all four samples, participants self-reported their verbal and math SAT scores. In Sample 2, SAT scores were also obtained from university records. Students' self-reported total SAT scores correlated very highly with scores obtained from university records ($r = .92$), which is consistent with previous research (e.g., Cassady, 2001).

College and high school GPA. In all four samples, participants reported their high school GPA and their current college GPA. In Sample 2, the participants' high school GPAs and current college GPAs were also obtained from university records. As with SAT scores, we found that GPA obtained from university records correlated very highly with self-reported GPA ($r = .89$). Similarly, past research has found close associations between self-reported GPA and GPA obtained from university records (e.g., Gray & Watson, 2002, p. 190).

Perceived verbal intelligence, perceived academic ability, and academic effort. In Samples 2 and 3, participants were asked to rate their verbal intelligence relative to the general population (*perceived verbal intelligence*) using the following scale: 1 (*bottom 5%*), 2 (*bottom 10%*), 3 (*bottom 20%*), 4 (*bottom 30%*), 5 (*bottom 50%*), 6 (*top 50%*), 7 (*top 30%*), 8 (*top 20%*), 9 (*top 10%*), 10 (*top 5%*). In Sample 2, perceived verbal intelligence was assessed at the end of the 2nd, 3rd, and 4th years of college, so a composite of all three assessments was used for the analyses (except where noted below). The correlation between perceived verbal intelligence and SAT verbal was .34 ($p < .05$) in Sample 2 and .42 ($p < .05$) in Sample 3; the correlation between perceived verbal intelligence and SAT math was .10 (*ns*) in Sample 2 and .11 ($p < .05$) in Sample 3. These correlations between self-reported intelligence and SAT scores are similar to those

³ Lee and Ashton (2004) refer to the Neuroticism dimension as "Emotionality" in their HEXACO model. Although we refer to this domain as "Neuroticism" for ease of presentation of data across the three samples, some conceptual differences between Lee and Ashton's model and Big Five Neuroticism should be noted. First, HEXACO Emotionality does not include the irritability or angry hostility content usually associated with Neuroticism (this content is instead relegated to the low pole of Agreeableness). Second, HEXACO Emotionality includes content related to sentimentality and dependence (vs. toughness and bravery), which is usually not associated with Neuroticism.

⁴ We do not report findings for the Honesty-Humility (H-H) domain, which is the sixth dimension of personality in Lee and Ashton's (2004) model.

⁵ Although the Openness to Actions facet had by far the lowest alpha reliability (the next lowest reliability was .63 for Competence), its reliability was comparable to that found for this scale in previous research (e.g., $\alpha = .58$; Costa & McCrae, 1992, p. 44).

Table 2
Means (and Standard Deviations) for Personality and Academic Variables

Variable	Sample 1 (BFI)		Sample 2 (NEO-FFI)		Sample 3 (HEXACO)		Sample 4 (NEO-PI-R)	
	<i>M</i>	<i>SD</i>	<i>M</i>	<i>SD</i>	<i>M</i>	<i>SD</i>	<i>M</i>	<i>SD</i>
Extraversion	3.26	0.75	3.47	0.57	3.21	0.56	—	—
Agreeableness	3.71	0.60	3.62	0.51	3.05	0.49	—	—
Conscientiousness	3.49	0.62	3.48	0.56	3.39	0.47	3.28	0.38
Neuroticism	2.95	0.72	2.87	0.64	3.45	0.44	—	—
Openness	3.55	0.59	3.66	0.54	3.23	0.46	3.41	0.37
SAT verbal	567	94	546	100	567	99	567	99
SAT math	598	91	638	98	601	99	593	98
College GPA	2.92	0.55	3.14	0.54	3.00	0.56	2.89	0.51
High school GPA	3.73	0.35	3.91	0.48	3.76	0.33	3.70	0.36

Note. BFI = Big Five Inventory; NEO-FFI = NEO Five Factor Inventory; NEO-PI-R = Revised NEO Personality Inventory. *N*s = 10,497 (BFI), 475 (NEO-FFI), 470 (HEXACO), and 425 (NEO-PI-R). Sample sizes for high school GPA are generally lower. *N*s = 7,218 (BFI), 465 (NEO-FFI), 464 (HEXACO), and 414 (NEO-PI-R). The sample size for college GPA in Sample 4 is significantly lower (*N* = 256), because the study was conducted in the fall quarter when the 1st-year students in the sample did not yet have college GPAs. — indicates that the data were not collected.

found in previous research between self-reported intelligence and IQ tests (e.g., Paulhus, Lysy, & Yik, 1998).

In Samples 2 and 3, *perceived academic ability* was measured with a standardized composite of six items (α s = .91 and .84 for the two samples, respectively), tapping two facets of perceived ability: (a) direct self-reports of ability (“I am confident of my ability to do well in school,” “Compared to the average UC Berkeley [UC Davis] student, how would you rate your academic ability?” “Do you think you have the ability to compete in college?”) and (b) expected performance in college (“What overall GPA do you think you are capable of attaining?” “Realistically, what overall GPA do you think you will attain?” “What is the lowest overall GPA you would be satisfied attaining?”). In Sample 2, perceived academic ability was assessed at the end of the 1st, 2nd, 3rd, and 4th years of college, so a composite of all assessments was used for the analyses (except where noted below). The correlation between perceived academic ability and college GPA was .60 ($p < .05$) in Sample 2 and .61 ($p < .05$) in Sample 3.

In Samples 2 and 3, *academic effort* was measured with a standardized composite of two items, tapping into behaviors and self-perceptions related to the effort participants put into school work: “On average, how many hours a week (outside of class time) have you spent on school work the current semester [quarter]?” and “How much effort have you been devoting to your school work this current semester [quarter] in order to achieve the grades you hope for?” In Sample 2, academic effort was assessed at the end of the 1st, 2nd, 3rd, and 4th years of college, so a composite of all assessments was used for the analyses (except where noted). The correlation between academic effort and college GPA was .25 ($p < .05$) in Sample 2 and .17 ($p < .05$) in Sample 3.

Results

Descriptive Statistics

Table 2 shows means and standard deviations for the SAT, GPA, and the Big Five separately in each of the four samples. In all four samples, the range and variance in SAT scores and GPA

is quite substantial, despite the fact that the participants came from highly selective universities. The small mean differences between the UC Berkeley and UC Davis samples in GPA and SAT scores are probably due to cohort differences in SAT norming and the higher threshold of academic performance needed to gain admission to UC Berkeley.

Across samples, women tended to score higher on Neuroticism (r s = .23, .25, .20, and .23 for Samples 1, 2, 3, and 4, respectively; p s < .01), which is consistent with past research (Costa, Terracciano, & McCrae, 2001). The only other consistent gender difference was a tendency for women to score lower on the SAT math test (r s = .23, .25, and .20 for Samples 1, 2, and 3, respectively; p s < .01), which also replicates past research (Stricker, Rock, & Burton, 1991). Given that gender is correlated with two of our key variables, in subsequent analyses we tested whether gender accounts for any of the observed personality effects.

Big Five Correlates of SAT Scores

Table 3 shows correlations between the Big Five dimensions and SAT verbal and math scores. As predicted, Openness was consistently related to higher SAT verbal scores (r s ranged from .20 to .26 across the samples);⁶ the Openness effect held when all five personality dimensions were entered simultaneously in a multiple regression analysis predicting SAT scores. The other four Big Five dimensions were not consistently related to SAT verbal scores, although we found a weak and inconsistent tendency for individuals who were low in Extraversion and Agreeableness to have higher SAT verbal scores. None of the Big Five dimensions was consistently related to SAT math scores across samples, although significant but weak (r s ranging from .05 to .07) corre-

⁶ We examined differences between native English speakers and non-native English speakers for our main findings and found little difference in the magnitude of correlations between the two groups (for example, the correlations between Openness and SAT verbal scores were .17 and .16 for native English and nonnative English speakers, respectively).

Table 3
Big Five Correlates of SAT Verbal and Math Scores

Variable	SAT verbal				SAT math			
	Sample 1 (BFI)	Sample 2 (NEO-FFI)	Sample 3 (HEXACO)	Sample 4 (NEO-PI-R)	Sample 1 (BFI)	Sample 2 (NEO-FFI)	Sample 3 (HEXACO)	Sample 4 (NEO-PI-R)
Extraversion	.02 (-.04 [*])	-.15 [*] (-.17 [*])	.07 (-.02)	—	-.06 [*] (-.09 [*])	-.08 (-.08)	-.04 (-.05)	—
Agreeableness	-.03 [*] (-.08 [*])	-.05 (-.03)	-.10 (-.16 [*])	—	-.06 [*] (-.08 [*])	-.06 (-.05)	-.03 (-.04)	—
Conscientiousness	-.01 [*] (-.02)	-.09 (-.05)	.05 (.05)	.00 (-.02)	-.07 [*] (-.06 [*])	-.03 (.00)	-.03 (-.00)	-.06 (-.06)
Neuroticism	-.05 [*] (-.07 [*])	.03 (-.03)	-.02 (-.01)	—	-.07 [*] (-.12 [*])	.03 (-.01)	-.08 (-.08)	—
Openness	.20 [*] (.21 [*])	.20 [*] (.22 [*])	.26 [*] (.28 [*])	.26 [*] (.27 [*])	.05 [*] (.08 [*])	.02 (.03)	.04 (.06)	.05 (.06)
Multiple R	.22 [*]	.27 [*]	.30 [*]	.26 [*]	.17 [*]	.10	.11	.08

Note. BFI = Big Five Inventory; NEO-FFI = NEO Five Factor Inventory; NEO-PI-R = Revised NEO Personality Inventory. *N*s = 10,497 (BFI), 475 (NEO-FFI), 448 (HEXACO), and 407 (NEO-PI-R). Values in the table are correlations (with standardized beta weights in parentheses). — indicates that the data were not collected.

* $p < .01$.

lations were found in the BFI sample (Sample 1), because even very small correlations will be significant in such a very large sample.

Facet-Level Correlates of SAT Scores

To gain a more detailed understanding of the personality effects, we examined relations between the facets of Conscientiousness and Openness, as measured by the HEXACO-PI and NEO-PI-R, and SAT scores (see Table 4). Consistent with the domain-level

Table 4
Facet-Level Correlates of SAT Verbal and Math Scores in Samples 3 and 4

Personality facet scale (α reliability)	SAT verbal	SAT math
HEXACO Conscientiousness (.89)	.05	-.03
Organization (.88)	-.09	-.14 [*]
Diligence (.80)	.08	.02
Perfectionism (.77)	.12 [*]	.04
Prudence (.77)	.05	.03
NEO-PI-R Conscientiousness (.90)	.00	-.06
Competence (.63)	.12	-.02
Order (.66)	-.04	-.03
Dutifulness (.67)	.00	.02
Achievement-Striving (.70)	.00	-.09
Self-Discipline (.77)	-.05	-.04
Deliberation (.69)	-.04	-.11
HEXACO Openness (.87)	.26 [*]	.04
Aesthetic Appreciation (.81)	.23 [*]	.00
Inquisitiveness (.72)	.20 [*]	.03
Creativity (.78)	.20 [*]	.07
Unconventionality (.67)	.15 [*]	.04
NEO-PI-R Openness (.89)	.26 [*]	.05
Fantasy (.76)	.24 [*]	.02
Aesthetics (.80)	.12 [*]	-.05
Feelings (.76)	.18 [*]	.00
Actions (.53)	.01	.03
Ideas (.75)	.23 [*]	.12
Values (.68)	.26 [*]	.10

Note. NEO-PI-R = Revised NEO Personality Inventory. *N*s = 444 (HEXACO) and 407 (NEO-PI-R).

* $p < .01$.

correlations, all four HEXACO Openness facets were related to SAT verbal scores, with correlations ranging from .15 for Unconventionality to .23 for Aesthetic Appreciation. In addition, five of the six NEO-PI-R facets were related to SAT verbal scores, with correlations ranging from .12 for Openness to Aesthetics to .26 for Openness to Values. Of all the Openness facets, only Openness to Values was unrelated to SAT verbal scores ($r = .01$; *ns*).

In general, the Conscientiousness facets were not related to SAT scores. There were two exceptions: HEXACO Perfectionism, which reflects a tendency toward thoroughness and attention to detail, was positively related to SAT verbal scores ($r = .12$), whereas HEXACO Organization, which reflects orderliness and neatness, was negatively related to SAT math scores ($r = -.14$).

An examination of the Extraversion, Agreeableness, and Neuroticism facets of the HEXACO revealed few significant effects, consistent with the findings at the level of the broad domains. There was one exception: the Flexibility facet of Agreeableness had a negative relation with SAT verbal scores ($r = -.14$).

Big Five Correlates of GPA

Table 5 shows correlations between the Big Five dimensions and college and high school GPA. The strongest and most consistent finding is that Conscientiousness was positively related to both college and high school GPA (seven of the eight zero-order correlations were significant and ranged from .18 to .26). These relations held when all five personality dimensions were entered simultaneously in a multiple regression analysis predicting GPA.

We found some support for our prediction that Openness and college GPA (but not high school GPA) would be correlated. Openness was weakly, but significantly, related to college GPA in three of four samples but was never significantly correlated with high school GPA. Finally, we found a weak negative relation between Extraversion and college GPA and a weak positive relation between Agreeableness and high school GPA, but neither of these relations replicated across all four samples.

Facet-Level Correlates of GPA

To better understand the effects of the broad personality domains, we examined relations between the facets of Conscientious-

Table 5
Big Five Correlates of GPA

Variable	College GPA				High school GPA			
	Sample 1 (BFI)	Sample 2 (NEO-FFI)	Sample 3 (HEXACO)	Sample 4 (NEO-PI-R)	Sample 1 (BFI)	Sample 2 (NEO-FFI)	Sample 3 (HEXACO)	Sample 4 (NEO-PI-R)
Extraversion	-.02 (-.06*)	.02 (-.05)	-.11 (-.17*)	—	.03 (.01)	-.09 (-.11)	.03 (-.01)	—
Agreeableness	.03* (-.03*)	.10 (.05)	-.03 (-.07)	—	.10* (.05*)	.06 (.06)	.11* (.07)	—
Conscientiousness	.22* (.25*)	.19* (.19*)	.20* (.22*)	.18* (.17*)	.22* (.23*)	.10 (.12)	.26* (.24*)	.25* (.25*)
Neuroticism	.04* (.07*)	-.08 (-.02)	.10 (.06)	—	.03 (.09*)	.04 (.05)	.05 (.01)	—
Openness	.06* (.06*)	.13* (.14*)	.05 (.10)	.13* (.11)	.01 (-.02)	.03 (.05)	.02 (-.01)	.04 (.03)
Multiple R	.25*	.25*	.28*	.21*	.24*	.17	.26*	.25*

Note. BFI = Big Five Inventory; NEO-FFI = NEO Five Factor Inventory; NEO-PI-R = Revised NEO Personality Inventory. *N*s (college GPA) = 10,497 (BFI), 475 (NEO-FFI), 470 (HEXACO), and 256 (NEO-PI-R); *N*s (high school GPA) = 7,218 (BFI), 465 (NEO-FFI), 464 (HEXACO), and 414 (NEO-PI-R). Values in the table are correlations (with standardized beta weights in parentheses). — indicates that the data were not collected.
* $p < .01$.

ness and Openness, assessed by the HEXACO-PI and NEO-PI-R scales, and GPA (see Table 6). Three HEXACO Conscientiousness facets were significantly associated with college GPA: Diligence ($r = .24$), Prudence ($r = .21$), and Perfectionism ($r = .19$). Three NEO-PI-R facets were significantly associated with college GPA: Achievement-Striving ($r = .21$), Competence ($r = .19$), and Self-Discipline ($r = .15$), which replicates Gray and Watson’s (2000) results, although they also found significant correlations with some of the other facets.

Table 6
Facet-Level Personality Correlates of GPA in Samples 3 and 4

Personality facet scale (α reliability)	College GPA	High school GPA
HEXACO Conscientiousness (.89)	.20*	.26*
Organization (.88)	.00	.11*
Diligence (.80)	.24*	.24*
Perfectionism (.77)	.19*	.20*
Prudence (.77)	.21*	.21*
NEO-PI-R Conscientiousness (.90)	.18*	.25*
Competence (.63)	.19*	.22*
Order (.66)	.08	.13*
Dutifulness (.67)	.13	.17*
Achievement-Striving (.70)	.21*	.22*
Self-Discipline (.77)	.15*	.18*
Deliberation (.69)	.07	.17*
HEXACO Openness (.87)	.05	.03
Aesthetic Appreciation (.81)	.08	.07
Inquisitiveness (.72)	.07	.04
Creativity (.78)	.00	.01
Unconventionality (.67)	-.02	-.06
NEO-PI-R Openness (.89)	.13	.04
Fantasy (.76)	.05	-.04
Aesthetics (.80)	.10	.08
Feelings (.76)	.12	.10
Actions (.53)	-.04	-.10
Ideas (.75)	.09	.07
Values (.68)	.17*	.02

Note. NEO-PI-R = Revised NEO Personality Inventory. *N*s = 464–470 (HEXACO), 256 (college GPA and NEO-PI-R), and 414 (high school GPA and NEO-PI-R).
* $p < .01$.

High school GPA was predicted by the same three HEXACO Conscientiousness facets (r s ranged from .20 to .24) as college GPA; in addition, HEXACO Organization also predicted high school GPA ($r = .11$), albeit modestly. High school GPA had a somewhat different pattern of correlations with the NEO-PI-R facets. We found that all six facets of the NEO-PI-R were associated with high school GPA, ranging from .13 for Order to .22 for Competence and Achievement-Striving. These relations demonstrate that it is the goal-driven (HEXACO Diligence and NEO-PI-R Achievement-Striving) and self-controlled (HEXACO Prudence and NEO-PI-R Self-Discipline) aspects of Conscientiousness that are most important for academic achievement, whether at the high school or the college level. The weak or nonsignificant associations between NEO-PI-R Order and HEXACO Organization and college and high school GPA is a point to which we return in the Discussion section.

In general, the Openness facets were not related to either high school or college GPA, which is consistent with the weak domain-level effects. The one exception is that NEO-PI-R Openness to Values was positively related to college GPA ($r = .18$).

As with the SAT, an examination of the Extraversion, Agreeableness, and Neuroticism facets of the HEXACO revealed few significant effects. College GPA was associated with (low) Sociability ($r = -.15$). High school GPA was associated with the Agreeableness facet of Patience and the Neuroticism/Emotionality facet of Sentimentality (both r s = .14).

Are the Personality Correlates of GPA Independent of SAT Scores and Vice Versa?

Table 7 shows the results of multiple regression analyses predicting GPA, in which gender and SAT scores were entered at Step 1 and the Big Five dimensions were entered at Step 2. Adding the Big Five dimensions at Step 2 produced a significant increase in R^2 in all three samples for college and high school GPA. Consistent with the zero-order correlations, Conscientiousness was a significant positive predictor of GPA, even controlling for gender and SAT scores, and this finding replicated across all three samples. Thus, personality, in particular the Conscientiousness dimension, and SAT scores have inde-

Table 7
Independent Effects of Big Five and SAT Scores on GPA

Variable	College GPA			High school GPA		
	Sample 1 (BFI)	Sample 2 (NEO-FFI)	Sample 3 (HEXACO)	Sample 1 (BFI)	Sample 2 (NEO-FFI)	Sample 3 (HEXACO)
	Step 1					
Gender	.17*	.16*	.10	.18*	.09	.12
SAT verbal	.20*	.27*	.19*	.09*	.15*	.11
SAT math	.15*	.28*	.24*	.12*	.54*	.07
Multiple <i>R</i>	.31*	.49*	.38*	.22*	.63*	.19*
	Step 2					
Gender	.13*	.13*	.06	.13*	.05	.11
SAT verbal	.19*	.28*	.18*	.10*	.16*	.12
SAT math	.16*	.28*	.25*	.13*	.53*	.07
Extraversion	-.05*	.01	-.14*	.00	-.05	.00
Agreeableness	-.02	.04	-.04	.05*	.08	.07
Conscientiousness	.24*	.18*	.22*	.21*	.12*	.24*
Neuroticism	.06*	-.07	.07	.07*	.04	-.03
Openness	.01	.06	.03	-.05*	-.01	-.06
Multiple <i>R</i>	.39*	.54*	.45*	.31*	.64*	.32*

Note. BFI = Big Five Inventory; NEO-FFI = NEO Five Factor Inventory. *Ns* (college GPA) = 10,472 (BFI), 465 (NEO-FFI), and 444 (HEXACO); *Ns* (high school GPA) = 7,214 (BFI), 465 (NEO-FFI), and 446 (HEXACO). Values in table are standardized beta weights. All R^2 changes from Step 1 to Step 2 were significant. Gender is keyed toward female, so positive beta weights indicate that women have higher levels of the criterion variable.
* $p < .01$.

pendent effects on both high school and college grades. Indeed, in several cases, Conscientiousness was a slightly stronger predictor of GPA than were SAT scores. The overall multiple correlations, with all variables entered in the equation, were moderate to large, ranging from .31 to .64.

Table 8 shows the results of multiple regression analyses predicting SAT scores, in which gender and high school GPA scores were entered at Step 1 and the Big Five dimensions were entered at Step 2. Adding the Big Five dimensions at Step 2 produced a significant increase in R^2 for both SAT verbal and

Table 8
Independent Effects of Big Five and High School GPA on SAT Scores

Variable	SAT verbal			SAT math		
	Sample 1 (BFI)	Sample 2 (NEO-FFI)	Sample 3 (HEXACO)	Sample 1 (BFI)	Sample 2 (NEO-FFI)	Sample 3 (HEXACO)
	Step 1					
Gender	-.12*	-.10	-.04	-.24*	-.21*	-.21*
High school GPA	.14*	.45*	.16*	.15*	.60*	.13*
Multiple <i>R</i>	.17*	.47*	.16*	.26*	.64*	.24*
	Step 2					
Gender	-.08*	-.10	-.03	-.20*	-.21*	-.20*
High School GPA	.15*	.45*	.16*	.17*	.60*	.14*
Extraversion	-.03	-.12*	.00	-.06*	.00	-.04
Agreeableness	-.07*	-.03	-.16*	-.05*	-.03	-.03
Conscientiousness	-.03	-.09	.00	-.06*	-.04	-.04
Neuroticism	-.05*	-.02	.00	-.08*	.04	.00
Openness	.22*	.21*	.28*	.07*	.02	.07
Multiple <i>R</i>	.27*	.54*	.34*	.29*	.65*	.25*

Note. BFI = Big Five Inventory; NEO-FFI = NEO Five Factor Inventory. *Ns* = 7,214 (BFI), 475 (NEO-FFI), and 442 (HEXACO). Values in table are standardized beta weights. All R^2 changes from Step 1 to Step 2 were significant except for SAT math analyses for the NEO-FFI and HEXACO samples. Gender is keyed toward female, so positive beta weights indicate that women have higher levels of the criterion variable.
* $p < .01$.

SAT math in all three samples. Consistent with the zero-order correlations, Openness was a significant predictor of SAT verbal scores across all samples, even after controlling for the (in one case substantial) relation between high school GPA and SAT verbal. Thus, Openness and high school GPA were independently associated with SAT verbal scores. There were no consistent personality predictors of SAT math scores. The overall multiple correlations, with all variables entered in the equation, were moderate to large, ranging from .25 to .65.

Table 9 shows the results of multiple regression analyses predicting college GPA, in which gender, high school GPA, and SAT scores were entered at Step 1 and the Big Five dimensions were entered at Step 2. Adding the Big Five dimensions at Step 2 produced a significant increase in R^2 in all three samples. Consistent with the zero-order correlations, Conscientiousness was the strongest and most consistent predictor of college GPA, even after controlling for both high school GPA and SAT scores. Thus, Conscientiousness, prior academic performance, and standardized test scores independently predicted college performance. The overall multiple correlations, with all variables entered in the equation, were moderate to large, ranging from .40 to .60.

Together, these analyses show that personality traits have independent and incremental effects on academic outcomes, even after controlling for traditional predictors of those outcomes.

Table 9
Independent Effects of Big Five, SAT Scores, and High School GPA on College GPA

Variable	College GPA		
	Sample 1 (BFI)	Sample 2 (NEO-FFI)	Sample 3 (HEXACO)
	Step 1		
Gender	.12*	.13*	.08
High school GPA	.19*	.36*	.13*
SAT verbal	.18*	.21*	.18*
SAT math	.13*	.09	.23*
Multiple R	.36*	.56*	.40*
	Step 2		
Gender	.10*	.12*	.06
High school GPA	.15*	.33*	.09
SAT verbal	.18*	.22*	.17*
SAT math	.14*	.11	.24*
Extraversion	-.04*	.03	-.15*
Agreeableness	-.04*	.01	-.05
Conscientiousness	.21*	.14*	.19*
Neuroticism	.05*	-.08	.06
Openness	.02	.06	.04
Multiple R	.40*	.60*	.46*

Note. BFI = Big Five Inventory; NEO-FFI = NEO Five Factor Inventory. $N_s = 7,214$ (BFI), 465 (NEO-FFI), and 442 (HEXACO). Values in table are standardized beta weights. All R^2 changes from Step 1 to Step 2 were significant. Gender is keyed toward female, so positive beta weights indicate that women have higher levels of the criterion variable.

* $p < .01$.

Longitudinal Relations Between the Big Five and GPA

We followed the participants in Sample 2 from the beginning to the end of college, which allowed us to examine the relation between change in personality and academic performance. To assess change in the Big Five dimensions, we regressed each of the Year-4 NEO scores on the corresponding Week-1 NEO scores and saved the standardized residuals. These residual-change scores provide an individual-level measure of how much a person changed and in which direction; they adjust for differences in initial status and thus estimate how much individuals would have changed had they all started out at the same level. Positive scores indicate relative increases over time, and negative scores indicate relative decreases.

We found that individuals who increased in Conscientiousness over the course of college tended to have higher GPAs ($r = .22$, $p < .01$). This relation held even after controlling for mean levels of Conscientiousness (partial $r = .16$, $p < .01$). Changes in Extraversion, Agreeableness, Neuroticism, and Openness were not significantly related to GPA (r_s ranged from $-.06$ to $.07$, n_s).

Testing Mediators of the Effects of Personality on Academic Outcomes

We found two basic effects in our analyses in which we used personality to predict academic outcomes: Conscientiousness was related to higher grades, and Openness was related to higher SAT verbal scores. In this section, we explore potential mediators of these two effects. First, we tested the hypothesis that Conscientiousness is associated with higher grades because it is associated with increased effort and higher levels of perceived academic ability. Consistent with social-cognitive views of personality and achievement, we assumed that the personality trait of Conscientiousness would be expressed and exert its effects on real-world outcomes by shaping a person's thoughts and feelings (e.g., their self-perceptions) and by influencing their actual behavior (e.g., their level of effort). Second, we tested the hypothesis that Openness is associated with higher SAT verbal scores because it is associated with higher levels of perceived verbal intelligence. In this case, we are assuming that openness might influence a person's identity as a verbally intelligent person (e.g., as an "intellectual") and that this self-perception might translate into the pursuit of activities (e.g., reading, attending the theater, engaging in philosophical discussions, interest in the arts) that ultimately impact actual verbal intelligence, as assessed by the SAT.

Academic effort. Academic effort was significantly associated with both Conscientiousness ($r = .37$ and $.35$ for Samples 2 and 3, respectively), and college GPA ($r = .22$ and $.17$ for Samples 2 and 3, respectively). We conducted multiple regression analyses to test whether effort mediates the relation between Conscientiousness and college GPA. We found evidence of significant mediation in both Samples 2 ($t = 3.02$; $p < .05$) and 3 ($t = 2.23$; $p < .05$), on the basis of a Sobel test. The relation between Conscientiousness and college GPA was reduced from $.19$ to $.10$ (Sample 2) and from $.20$ to $.16$ (Sample 3) when effort was entered in the regression equation.

As a more stringent test of mediation, we examined these relations longitudinally, using the data from Sample 2. Specific-

cally, we conducted a multiple regression analysis to test whether effort assessed in the middle of college (i.e., in Years 1, 2, and 3), mediated the effect of Conscientiousness, assessed at the beginning of college (Week 1), on cumulative college GPA, assessed at the end of college (Year 4). Again, effort emerged as a significant mediator ($t = 3.67$; $p < .05$); the effect of Conscientiousness was reduced from .13 to $-.01$ when effort was entered in the regression equation.

Perceived academic ability. Perceived academic ability was significantly associated with both Conscientiousness ($r = .19$ and $.25$ for Samples 2 and 3, respectively) and college GPA ($r = .62$ and $.61$ for Samples 2 and 3, respectively). Consistent with the findings for effort, perceived ability was a significant mediator of the relation between Conscientiousness and college GPA in both Sample 2 ($t = 3.66$; $p < .05$) and Sample 3 ($t = 5.17$; $p < .05$). The relation between Conscientiousness and college GPA was reduced from .19 to .05 (Sample 2) and from .20 to .06 (Sample 3) when perceived ability was entered in the regression equation. Moreover, this mediator effect replicated when we examined longitudinal relations in Sample 2 ($t = 2.08$; $p < .05$); the effect of Conscientiousness on GPA was reduced from .13 to .00 when perceived ability was entered in the regression equation.

Perceived verbal intelligence. Perceived verbal intelligence was significantly associated with both Openness ($r = .27$ and $.28$ for Samples 2 and 3, respectively; $ps < .01$) and SAT verbal scores ($r = .42$ for both samples, $ps < .01$). As expected, perceived verbal intelligence was a significant mediator of the relation between Openness and SAT verbal scores in both Sample 2 ($t = 4.26$; $p < .05$) and Sample 3 ($t = 5.01$; $p < .05$). The effect of Openness on SAT verbal scores was reduced from .20 to .12 (Sample 2) and from .26 to .19 (Sample 3) when perceived verbal intelligence was entered in the regression equation.

In sum, we found that all three variables—perceived verbal intelligence, perceived academic ability, and academic effort—were significant mediators. It is important to note that the mediator effects held up when we analyzed the relations longitudinally from the beginning to the end of college. Together, these results help to explain our two basic findings and provide a preliminary glimpse into the processes underlying the personality–academic–outcome relations.

Discussion

The present findings shed new light on the relation between personality and academic aptitude and achievement. Data from four samples and four different personality inventories demonstrate a positive relation between Conscientiousness and college GPA and a positive relation between Openness to Experience and SAT verbal scores. These relations were similar regardless of whether we analyzed GPA and SAT scores from self-reports or university records. We discuss each of these findings in turn below.

Conscientiousness and GPA

Conscientiousness, whether assessed by the NEO-FFI, the BFI, the HEXACO, or the NEO-PI-R, was associated with higher college grades, a robust association that persisted even when

controlling for gender, SAT scores, and high school GPA. Moreover, individuals who increased in Conscientiousness over the course of college tended to attain higher GPAs, even after controlling for their average level of Conscientiousness during college. Further analyses showed that the effects of Conscientiousness on college achievement were mediated by increased effort and more positive perceptions of one's academic ability.

The link between Conscientiousness and GPA is consistent with the extant literature. However, there have been few studies that have demonstrated the somewhat surprising robust predictive power of the trait—that it remains a significant predictor even when controlling for traditional indicators of academic achievement, such as SAT scores and high school GPA. A recent exception is Wagerman and Funder (2007), who showed that this predictive power of Conscientiousness even extends to informant reports of the trait. In addition, analyses of the HEXACO and NEO-PI-R facets demonstrate that it is the achievement-striving, persevering, and self-controlled aspects of Conscientiousness, and not the orderly or organized aspects of Conscientiousness, that are most important to both high school and college achievement.

The finding that Openness was generally weakly related to academic performance was somewhat surprising. Although we expected Conscientiousness to be the major predictor of both high school and college GPA, we also expected Openness to be a predictor, at least of college GPA. Gough's (1957) model of achievement distinguishes between achievement via conformance and achievement via independence, which correspond conceptually to Conscientiousness and Conscientiousness plus Openness, respectively. This distinction is also related to Hough's (1992) distinction between dependability and achievement, or conscientiousness in reference to others' aims versus conscientiousness in reference to one's own aims. Drawing from Gough and Lanning (1986), and from intuitive notions of college achievement as necessitating more independent approaches to schoolwork, we hypothesized that success in high school would entail achievement via conformance and thus be linked to Conscientiousness, whereas success in college would entail both achievement via conformance and via independence and thus be linked to both Conscientiousness and Openness. Although the findings are consistent with our expectations for Conscientiousness, the general lack of Openness effects on GPA was surprising. We did find a relation between Openness and college GPA in three of the four samples, but the relations were very small and disappeared when we controlled for gender and SAT scores. The facet analyses, instead of revealing associations between GPA and aspects of Openness that were obscured in the domain-level analyses, further confirmed the lack of a clear association between GPA and Openness. It is possible that if we had included scales that are combinations of high Openness and Conscientiousness, such as traits like industriousness and foresightedness represented in the ABC5 structure (Hofstee, De Raad & Goldberg, 1992), which fit more closely with Gough's conception of achievement via independence, we may have found that these "interstitial" traits were more strongly correlated with college GPA. However, if we had included more lexically based measures of the Big Five, which conceptualize Openness as Intellect (Goldberg, 1990), we may have found stronger relations with college GPA.

Unlike the other facets of Conscientious, the HEXACO organization and NEO-PI-R order facets were completely unrelated to college GPA and were the most weakly linked out of each group of facets to high school GPA. This replicates the findings of Paunonen and Ashton (2001) and also fits well with Roberts et al.'s (2005) study of facets of Conscientiousness in an adult sample. Roberts et al. found that different facets of Conscientiousness differentially predicted a set of behaviors comprising work dedication, which was predicted positively by industriousness and self-control, and negatively by order, when all Conscientiousness facets were entered simultaneously into a regression equation. Overall, these findings support the idea that organization, order, and generally keeping one's ducks all in a row, has little to do with achievement, and at high levels, such a rigidity (as in obsessive-compulsive disorder) may actually hinder one's steady progress towards valued goals. These findings might also help to explain past research that has found weaker relations between Conscientiousness and academic achievement. For example, using Goldberg's (1992) markers, E. C. Hair and Graziano (2003) found stronger longitudinal relations between high school GPA and middle school self-rated Openness and Agreeableness than they found for Conscientiousness. However, Goldberg's markers of Conscientiousness are most strongly related to the organization and orderliness aspects of Conscientiousness and less strongly related to being hard working and persistent, traits that we found to be most closely related to earning good grades.

Our results, together with those of Paunonen, Ashton, Goldberg, and others, indicate that it is important to measure traits both broadly and deeply and that studying only broad personality dimensions will not suffice in properly predicting these sorts of outcomes.

Openness and SAT Scores

We found a robust relation between Openness to Experience and SAT verbal scores. Individuals who are high in Openness, whether assessed by the NEO-FFI, the BFI, the HEXACO-PI, or the NEO-PI-R, tended to score higher on the SAT verbal test, even after we controlled for their gender and their prior and concurrent academic achievement. Facet-level analyses revealed that SAT verbal scores were related to virtually every Openness facet on the HEXACO and the NEO-PI-R; the only exception was the Openness to Actions facet of the NEO-PI-R, suggesting that verbal ability is unrelated to novelty seeking. In contrast, Conscientiousness (and its facets) were almost completely unrelated to SAT scores, at least in our four samples. Thus, being a verbally intelligent individual has more to do with being creative, imaginative, and inquisitive than it does with being hard working, organized, and industrious. In contrast, mathematical aptitude, as measured by the SAT math test, does not seem to be reliably associated with any of the Big Five personality traits.

One interpretation of these findings might have to do with the differential relation of the two sections of the SAT to intelligence, which would explain why Openness is related to verbal but not math scores. The SAT verbal section may be related more strongly to crystallized intelligence because of its vocabulary-related content, whereas the SAT math section may be related more strongly to fluid intelligence because of its reasoning-related content. This

fits with the findings of Ashton et al. (2000), who found moderate to strong relations between Openness and aspects of crystallized intelligence and only a weak (or no) relation with aspects of fluid intelligence. The differential personality facet correlates of SAT verbal and math scores demonstrate the problematic trend in past research to identify personality correlates of summed SAT scores and highlight the benefits of considering the two scores separately. These findings also support the claim that intelligence and personality are slightly overlapping but largely differentiable individual differences (McCrae & Costa, 1997).

Implications, Conclusions, and Future Directions

In a review of the literature on predicting academic success, Mouw and Khanna (1993) bemoaned the relatively weak predictive validity of ability tests and suggested that willingness to work hard is "quite probably, at least half the battle" (Mouw & Khanna, 1993, p. 334). Because the resurgence of interest in personality traits as predictors of important life outcomes (Hogan, 2005; Ozer & Benet-Martínez, 2006; Roberts et al., in press), studies such as this one have since attempted to address the role of personality in academic achievement. Although willingness to work hard, as captured by Conscientiousness, was not quite as strong of a predictor as Mouw and Khanna might have expected (i.e., not quite "half the battle"), we found it to be a robust predictor of academic success. Overall, the present findings reveal highly replicable relations between personality traits and the two most commonly used indicators of academic aptitude and achievement: the SAT and GPA.

It is important to neither overestimate nor underestimate the practical significance of these findings. Although replicable, the personality effects were generally small in magnitude. Several points are worth considering. First, although the effect sizes found in the present study suggest that personality explains only a small proportion of the variance in academic aptitude and achievement, the magnitude of these effects is nonetheless comparable to other widely used predictive tests in the biomedical sciences, such as the prediction of heart disease by electrocardiogram stress tests, pregnancy outcomes by ultrasound exams, and breast cancer by screening mammograms (Meyer et al., 2001). Moreover, they are similar to the effects of personality on other life domains, such as relationship, health, and work outcomes (Ozer & Benet-Martínez, 2006).

Second, small effects are to be expected when predicting a multiply determined outcome (Ahadi & Diener, 1989), and academic achievement is a quintessential example of such an outcome. In our own data, we saw that when personality and SAT test scores are combined to predict college GPA, the predictive validity can reach moderate to high levels. Similarly, our mediational analyses suggest that exerting effort toward schoolwork, as well as having perceptions of one's self as academically competent and verbally intelligent, play an important role in predicting academic outcomes. Other factors, such as values, motives, study and test-taking skills, attributional style, self-efficacy, and even pragmatic factors related to financial resources (e.g., not needing to work outside of school), are also important ingredients for academic success. Thus, a wide range of predictors are needed to fully

account for individual differences in academic aptitude and achievement.

Third, it is often overlooked that small effect sizes can have a major impact on outcomes over time (Abelson, 1985; Rosenthal & Rubin, 1982). Over the course of a lived life, even relatively small differences in achievement between individuals who are high and those who are low in Conscientiousness and Openness might produce large cumulative differences in lifetime achievements. This may take place through the mechanism of *cumulative continuity*, or Caspi and colleagues' idea that behaviors are reinforced and maintained through the snowballing accrual of their outcomes (Caspi, Bem, & Elder, 1989; Roberts & Caspi, 2003).

With personality traits established as important predictors of academic outcomes and some preliminary insights into the mediating processes, future researchers should be able examine the interplay between traits and other factors in academic achievement. To the extent that personality is more malleable in childhood and adolescence than in adulthood (e.g., Roberts & DelVecchio, 2000), our findings indicate that it may be useful for educators to foster and facilitate optimal personality development in their students, in addition to teaching the standard curriculum. However, before investing in interventions to modify personality in the hope of promoting academic achievement or using personality tests as predictors in a selection battery, we believe that further research is needed to establish the causal direction of the effects, to clarify the mediating processes, and to better specify the particular facets involved.

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