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# **Personality, academic majors and performance: Revealing complex patterns**

Vedel, A., Thomsen, D.K., Larsen, L.

Center on Autobiographical Memory Research, Department of Psychology and Behavioral Sciences, Aarhus University.

## Abstract

Personality-performance research typically uses samples of psychology students without questioning their representativeness. The present article reports two studies challenging this practice. Study 1: Group differences in the Big Five personality traits were explored between students ( $N = 1,067$ ) in different academic majors (medicine, psychology, law, economics, political science, science, and arts/humanities) who were tested immediately after university enrolment. Study 2: Six and a half years later the students' academic records were obtained, and predictive validity of the Big Five personality traits and their subordinate facets was examined in the various academic majors in relation to Grade Point Average (GPA). Significant group differences in all Big Five personality traits were found between students in different academic majors. Also, variability in predictive validity of the Big Five personality traits and facets was found between different academic majors;  $R^2$  varied from .05 to .15 for the Big Five personality traits and from .16 to .57 for the Big Five facets. Complex patterns emerged; several Conscientiousness and Openness facets were good predictors of GPA in some majors, but not in others. The findings call for new directions in personality-performance research with broader sampling strategies and exploration of predictive validity of the Big Five facets.

## 1. Introduction

Researchers are notoriously attracted to the study of performance, be that in sports, music, or other fields. In psychological research, *academic* performance is a recurrent focus of interest. Both individuals and society benefit from higher education and high retention rates (e.g. Bloom, Hartley, & Rosovsky, 2007), and psychological researchers have explored multiple cognitive and personality predictors of academic performance throughout history (see Ackerman & Heggestad, 1997, for an overview). Thanks to this research we have gained insight into relationships between personality variables and academic performance. However, the personality-performance research has its weaknesses. Most often psychology students occupy the samples studied, but this fact is rarely given much attention in interpretation of the findings. The problems associated with this practice and the rationale for the present studies are specified below.

### 1.1. *The Big Five personality traits and academic majors*

Psychology students are the typical convenience sample in most psychological research, not just in personality-performance research. If psychology students are representative of students as a whole, then findings from this research can be generalised to the total student population. However, if psychology students are not representative of students in general in terms of personality for example, then interpretation of findings obtained from psychology samples should be done with caution if there is reason to believe that personality could affect the results. It is possible that psychology students differ from other students due to self-selection; students may select academic environments that match their specific personality traits, thereby creating personality group differences between academic majors. This notion of a “fit” between student and academic major has been put forward in relation to various personality taxonomies historically (e.g. Goldschmid, 1967; Holland, 1997). If true, this would have implications for practice. For educational practitioners personality group differences between academic majors could inform guidance and counselling, and teachers could modify their teaching practices accordingly to match their student population optimally.

With the growing consensus on the Big Five personality traits: *Agreeableness*, *Conscientiousness*, *Extraversion*, *Neuroticism*, and *Openness* (McCrae & Costa, 2008), several studies have explored possible group differences in the Big Five personality traits between students in different academic majors (De Fruyt & Mervielde, 1996; Kaufman, Pumacahua, & Holt, 2013; Lievens, Coetsier, De Fruyt, & De Maeseneer, 2002; Pozzebon, Ashton, & Visser, 2014; Rubinstein, 2005). As a whole, these studies found significant personality group differences with some general trends: economics students scored low on Agreeableness and Neuroticism, while psychology and arts/humanities students scored high; arts/humanities students scored low on Conscientiousness; science students scored low on Extraversion, while economics students scored high; and psychology and arts/humanities students scored high on Openness.

Cross-cultural findings have established that women generally report higher levels of Neuroticism, Extraversion, Agreeableness, and Conscientiousness than men (Costa, Terracciano, & McCrae, 2001; Schmitt, Realo, Voracek, & Allik, 2008). Consequently, one might suspect that the personality group differences between majors found in the studies reviewed above were artefacts of uneven gender distributions across majors. Still, even in studies where gender was treated as a covariate, and variation due to gender was removed from the dependent variables (the Big Five personality traits), the effect of academic major remained (e.g. Lievens et al., 2002).

Thus, personality group differences between academic majors are not mere gender effects, and the results could support the notion of a “fit” between student and major. However, only in one study was the personality questionnaire administered to students in the very beginning of their first academic year (Lievens et al., 2002). It is therefore yet to be determined whether the personality group differences between majors are pre-existing or derived from socialisation.

### *1.2. The Big Five personality traits and academic performance*

In continuation of the reasoning above, a sampling of psychology students only in personality-performance research could affect the generalisability of results obtained. A large body of research has examined the predictive validity of the Big

Five personality traits and established Conscientiousness as a robust predictor of Grade Point Average (GPA) at university, while the remaining four traits have shown limited predictive validity (Poropat, 2009). However, the majority of studies have employed samples of psychology students only, and the question is whether the findings from these studies hold for university students in other academic majors. Different academic majors reflect professions with different emphasis on various aspects such as interpersonal contact, creativity, etc. (Barrick & Mount, 1991). Consequently, it may be that different personality traits are advantageous in different majors. If this is the case, it implies that results from personality-performance research using psychology students cannot be generalised to the student population as a whole. Studies on personality-performance associations targeting broad student populations could then reveal results that would differ from those found in psychology student samples. Such knowledge would be relevant for practitioners involved in educational guidance and counselling; some students may have a greater chance of success in some majors than in others due to their personality.

A recent meta-analysis (Vedel, 2014) explored the moderating effect of academic major of study participants in personality-performance research and found that Conscientiousness-GPA correlations were significantly higher in studies using psychology students than in studies using non-psychology students. This suggests that the Big Five personality traits are not equally good at predicting academic performance across different academic disciplines. However, no studies have yet specifically explored variation in predictive validity of the Big Five personality traits in different academic majors.

### *1.3. The Big Five facets and academic performance*

In addition to the use of psychology student samples, a characteristic of the personality-performance research is a focus on broad personality dimensions, such as the Big Five personality traits. The Big Five personality traits are superordinate factors comprising six facets each. These facets are correlated with their respective factor, but they are largely independent of each other (McCrae, Zonderman, Costa, Bond, & Paunonen, 1996). Theoretically, this implies that the facets may vary in

their association with variables such as academic performance. As a general rule, correspondence in breadth of predictors and criteria maximises prediction (Wittmann & Süß, 1999). The Big Five personality traits may be too broad to predict GPA effectively, and their facets could have unique predictive validity.

While many studies have examined predictive validity of the Big Five personality traits, only a few studies have explored the predictive validity of the Big Five facets (see O'Connor & Paunonen, 2007, for a review). Furthermore, as with the Big Five personality traits themselves, no studies have examined variation in predictive validity of the Big Five facets in different academic majors.

#### *1.4. Aims and hypotheses*

The aim of Study 1 was to explore pre-existence of group differences on the Big Five personality traits of students entering different academic majors. The aim of Study 2 was to explore variation in predictive validity of the Big Five personality traits and facets in relation to GPA in different academic majors. The following hypotheses were proposed:

##### **H1.**

- a) Female students will score higher than male students on Neuroticism, Extraversion, Agreeableness, and Conscientiousness.
- b) Arts/Humanities students will score high on Agreeableness, Neuroticism, and Openness and score low on Conscientiousness compared to most other groups.
- c) Economics students will score high on Extraversion and low on Agreeableness and Neuroticism compared to most other groups.
- d) Psychology students will score high on Agreeableness, Neuroticism, and Openness compared to most other groups.
- e) Science students will score low on Extraversion compared to most other groups.

##### **H2.**

- a) The Big Five personality traits will show variability in correlations and predictive validity in relation to GPA in different majors.

- b) Conscientiousness will be more strongly associated with GPA for psychology students than for other students.
- c) The Big Five facets will show correlations and predictive validity in relation to GPA of at least the same magnitude as the Big Five personality traits. Predictive validity may vary between different majors, but no specific predictions are made.

## 2. Study 1

Study 1 examined personality group differences between students in different academic majors in relation to hypothesis H1.

### 2.1. Materials and methods

#### 2.1.1. Participants

Participants were 1,067 students enrolled at a Danish university in August 2007. This sample was representative in terms of age for the total of 3,243 students enrolled that semester at the university for whom records were available ( $M = 22.24$ ,  $SD = 4.47$  for responders, and  $M = 22.19$ ,  $SD = 3.91$  overall,  $t(1,066) = 0.35$ ,  $p > .05$ ). However, women were overrepresented in the sample (63.5% women and 36.5% men among responders compared to 56.8% women and 43.2% men overall,  $\chi^2(1) = 19.77$ ,  $p < .001$ ). Participants fell into one of seven academic fields: medicine ( $N = 131$ ; 67 % female), psychology ( $N = 97$ ; 86 % female), law ( $N = 96$ ; 66 % female), economics ( $N = 84$ ; 54 % female), political science ( $N = 70$ ; 56 % female), science (e.g. chemistry, mathematics, and physics;  $N = 217$ ; 43 % female), or arts/humanities (e.g. literature, history, and philosophy;  $N = 372$ ; 71 % female).

#### 2.1.2. Procedure

The study was approved by the Danish Data Protection Agency before the recruitment stage. Participants were recruited in cooperation with the University Registrar's Office. The Registrar's Office sent out a welcome email to all newly admitted students inviting them to participate in the research project through a link to an electronic personality questionnaire (see also Olesen, Thomsen, Schnieber, & Tønnesvang, 2010)<sup>1</sup>. Participants who consented to the study and completed all

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<sup>1</sup> This study used personality data from some of the students to explore conceptual overlaps between the Big Five and general causality orientations.

questionnaires were rewarded with a standard personality trait profile on request. Six and a half years after university enrolment, data on the students' age, gender, and academic major were obtained from the Registrar's Office (March 2014). Some students changed their major, and the major obtained for each student was the final one.

### 2.1.3. Measures

Personality traits were measured with the authorized Danish adaptation of the NEO Five-Factor Inventory (NEO-FFI; Costa & McCrae, 1992; Danish version: Hansen, Mortensen, & Schiøtz, 2004). The Danish 60-item questionnaire measures the Big Five personality traits and their respective six facets each with 12 items per factor and two items per facet. General personality-relevant statements are self-rated on a 5-point Likert scale from 0 (*strongly disagree*) to 4 (*strongly agree*). The Danish adaptation of the NEO-FFI is a validated instrument with high internal consistency corresponding to the American NEO-FFI (Hansen, Mortensen, & Schiøtz, 2004). In the current study, Cronbach's  $\alpha$  for the NEO-FFI scales ranged from .74 for Openness to .83 for Conscientiousness (see Table 1).

### 2.2. Results

Means and standard deviations for the Big Five personality traits are presented by gender in Table 1. Two (gender) by seven (academic major) analyses of variance with the Big Five personality traits as dependent variables were performed, and the results are presented in Table 2. Significant gender effects were found: female students scored significantly higher on Neuroticism, Agreeableness, and Conscientiousness than male students, supporting H1a. They also scored significantly higher on Openness. They did not score significantly higher on Extraversion, though, contrary to H1a. For all five traits there was a significant effect of academic major. No significant interactions between gender and academic major were present.

**Table 1**

Means and standard deviations by gender and Cronbach's  $\alpha$  for the Big Five personality traits.

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Mean	SD	$\alpha$
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	Males	Females	Total	Males	Females	Total	
Agreeableness	27.86	31.08	29.90	6.54	5.85	6.30	.75
Conscientiousness	30.29	32.63	31.78	7.14	6.21	6.66	.83
Extraversion	30.75	31.62	31.30	7.14	6.74	6.90	.82
Neuroticism	20.70	24.93	23.39	7.27	7.22	7.52	.82
Openness	29.61	32.33	31.34	6.57	6.22	6.48	.74

**Table 2**

Two (gender) by seven (academic major) analyses of variance with the Big Five personality traits as the dependent variables.

	Gender		Major		Gender x Major	
	<i>F</i> (df)	$\eta^2$	<i>F</i> (df)	$\eta^2$	<i>F</i> (df)	$\eta^2$
Agreeableness	61.33 (1, 1,053)**	.06	7.99 (6, 1,053)**	.04	1.29 (6, 1,053)	.01
Conscientiousness	18.60 (1, 1,053)**	.02	6.73 (6, 1,053)**	.04	.60 (6, 1,053)	.00
Extraversion	0.16 (1, 1,053)	.00	11.44 (6, 1,053)**	.06	.46 (6, 1,053)	.00
Neuroticism	58.84 (1, 1,053)**	.05	2.97 (6, 1,053)*	.02	.42 (6, 1,053)	.00
Openness	11.16 (1, 1,053)**	.01	23.15 (6, 1,053)**	.12	1.51 (6, 1,053)	.01

\*  $p < .01$ .

\*\*  $p < .001$ .

Table 3 presents the post-hoc comparisons of means by academic major for the Big Five personality traits using the Bonferroni correction. Since Levene's test of homogeneity of variance was statistically significant ( $p < .05$ ) for Agreeableness, Extraversion, and Openness, bootstrapped confidence intervals for the post-hoc tests were selected in these instances. Arts/humanities students scored significantly higher on Agreeableness (than law and economics students), Neuroticism (than medicine and economics students), and Openness (than medicine, law, economics, and science students) and lower on Conscientiousness (than medicine and psychology students), supporting H1b. Economics students scored significantly lower on Agreeableness (than medicine, psychology, science, and arts/humanities students) and Neuroticism (than psychology and arts/humanities students), supporting H1c. Psychology students scored significantly higher on Agreeableness (than law and economics students), Neuroticism (than medicine and economics

students), and Openness (than law, economics, and science students), supporting H1d. Science students scored significantly lower on Extraversion than all others, supporting H1e. A finding not hypothesised was that medicine and psychology students scored the highest on Conscientiousness, significantly higher than science and arts/humanities students.

**Table 3**

Means and standard deviations for the Big Five personality traits by academic major.

	Agreeableness*		Conscientious.		Extraversion*		Neuroticism		Openness*	
	<i>M</i>	<i>SD</i>	<i>M</i>	<i>SD</i>	<i>M</i>	<i>SD</i>	<i>M</i>	<i>SD</i>	<i>M</i>	<i>SD</i>
Medicine	30,84 <sup>c,d</sup>	5.15	34,17 <sup>g</sup>	6.02	33,30 <sup>h,g</sup>	5.83	21,91	7.25	31,09 <sup>e,d,f</sup>	6.16
Psychology	30,49 <sup>c,d</sup>	6.28	33,84 <sup>h,g</sup>	5.45	32,87 <sup>f</sup>	5.75	24,97 <sup>a,d</sup>	7.21	33,08 <sup>e,d,f</sup>	5.04
Law	27,39	7.39	32,48	6.82	33,05 <sup>f</sup>	6.21	23,05	7.31	28,54	6.52
Economics	26,93	6.18	32,36	5.75	31,77 <sup>f</sup>	6.76	21,10	6.93	27,11	6.41
Political Sc.	28,64	6.60	32,37	7.46	33,64 <sup>h,g</sup>	6.57	22,36	7.06	32,19 <sup>c,d,f</sup>	6.75
Science	30,06 <sup>c,d</sup>	6.04	31,22	6.87	28,53	7.34	23,22	7.75	28,71	6.48
Arts/Hum.	30,88 <sup>c,d</sup>	6.10	30,30	6.64	30,81 <sup>f</sup>	6.93	24,39 <sup>a,d</sup>	7.62	34,02 <sup>a,c,d,f</sup>	5.43

<sup>a</sup> The mean is higher than the mean for medicine at  $p < .05$ .

<sup>b</sup> The mean is higher than the mean for psychology at  $p < .05$ .

<sup>c</sup> The mean is higher than the mean for law at  $p < .05$ .

<sup>d</sup> The mean is higher than the mean for economics at  $p < .05$ .

<sup>e</sup> The mean is higher than the mean for political sc. at  $p < .05$ .

<sup>f</sup> The mean is higher than the mean for science at  $p < .05$ .

<sup>g</sup> The mean is higher than the mean for arts/humanities at  $p < .05$ .

\* Bootstrapping was performed.

### 3. Study 2

Study 2 examined predictive validity of the Big Five personality traits and the Big Five facets in relation to hypothesis H2.

#### 3.1. Materials and methods

##### 3.1.1. Participants

Participants were the same as in Study 1 (see section 2.1.1.). GPA was higher for responders ( $M = 7.87$ ,  $SD = 2.07$ ) compared to the student population as a

whole ( $M = 7.63$ ,  $SD = 2.19$ ),  $t(1,066) = 3.69$ ,  $p < .001$ ,  $d = 0.12$ )<sup>2</sup>, however, this mean difference represented no effect following the guidelines of Cohen (1988).

### 3.1.2. Procedure

This study was also approved by the Danish Data Protection Agency beforehand. As with the data on age, gender, and academic major, the students' GPA was obtained from the Registrar's Office six and a half years after university enrolment (see section 2.1.2.). The GPA was based on exam grades for all exams taken since admission into the final major.

### 3.2. Results

Correlations between the Big Five personality traits and GPA overall and split by academic major are presented in Table 4. There was substantial variation in correlations for the academic majors, supporting H2a. This was especially the case with Extraversion, which correlated negatively with GPA for psychology students ( $r = -.28$ ) but positively for economics students ( $r = .11$ ), and Openness, which correlated positively with GPA for political science students ( $r = .23$ ) but negatively for law students ( $r = -.13$ ). Correlations between Conscientiousness and GPA varied somewhat, but Conscientiousness was not more strongly associated with GPA for

**Table 4**

Correlations between the Big Five personality traits and GPA overall and split by academic major.

	GPA							
	Total	Med.	Psych.	Law	Econ.	Pol. Sc.	Science	Arts
Agreeableness	.06*	.04	.07	.03	.04	.12	-.02	.03
Conscientiousness	.15**	.18*	.20*	.21*	.09	.15	.20**	.19**
Extraversion	.01	.03	-.28**	.07	.11	.05	.03	.08
Neuroticism	.03	.11	.11	-.12	-.13	-.01	-.04	.08
Openness	.08*	-.03	-.08	-.13	.12	.23	.08	.07

\*  $p < .05$ .

\*\*  $p < .01$ .

psychology students ( $r = .20$ ) than for other students, contrary to H2b. Multiple regressions were performed overall and separately for each major with the Big Five personality traits as predictors and GPA as outcome variable. Results are presented

<sup>2</sup> The Danish 7-point grading scale: -3, 00, 02, 4, 7, 10, and 12.

in Table 5. The Big Five personality traits showed very limited predictive validity as predictors of GPA when analysing all data simultaneously ( $R^2 = .03$ ), yielding a small effect size by the standards of Cohen (1988). When analysing the data separately for each major, the predictive validity was higher, yielding small-medium effect sizes. Variability in predictive validity between majors was present, supporting H2a.

Correlations between the Big Five personality traits' subordinate facets and GPA overall and split by major are presented in Table 6. Overall, the facet-GPA correlations exceeded the trait-GPA correlations, supporting H2c. There was much variation in correlations in different majors. To explore the predictive potential of the Big Five facets, multiple regressions were performed overall and split by academic major with the Big Five facets as predictors and GPA as outcome variable. Results are presented in Table 7. Compared to the results for the Big Five personality traits, predictive validity of the facets was higher and represented medium-large effect sizes by Cohen's guidelines (Cohen, 1988), supporting H2c. As for the Big Five personality traits, variability in predictive validity in different majors was present.

**Table 5**

The Big Five personality traits as predictors of GPA overall and split by academic major.

	Total				Medicine				Psychology				Law			
	<i>b</i>	SE	$\beta$	<i>t</i>	<i>b</i>	SE	$\beta$	<i>t</i>	<i>b</i>	SE	$\beta$	<i>t</i>	<i>b</i>	SE	$\beta$	<i>t</i>
Agreeableness	0.01	0.01	.03	1.12	0.01	0.03	.02	0.24	0.03	0.03	.09	0.95	0.01	0.03	.04	0.42
Conscientiousness	0.05	0.01	.16	5.20***	0.06	0.03	.20	2.33*	0.08	0.03	.26	2.57*	0.07	0.04	.19	1.74
Extraversion	-0.01	0.01	-.02	-0.59	0.03	0.03	.10	1.07	-0.08	0.03	-.28	-2.62*	0.04	0.05	.09	0.73
Neuroticism	0.01	0.01	.05	1.58	0.04	0.02	.17	1.86	0.03	0.03	.11	1.07	0.01	0.04	.01	0.11
Openness	0.03	0.01	.08	2.43*	-0.02	0.03	-.05	-0.56	-0.01	0.03	-.01	-0.14	-0.06	0.04	-.16	-1.35
	$F(5, 1,061) = 7.44^{***}$				$F(5, 125) = 1.67$				$F(5, 91) = 3.25^{**}$				$F(5, 90) = 1.27$			
	$R^2 = .03$				$R^2 = .06$				$R^2 = .15$				$R^2 = .07$			
	Economics				Political Sc.				Science				Arts/Humanities			
	<i>b</i>	SE	$\beta$	<i>t</i>	<i>b</i>	SE	$\beta$	<i>t</i>	<i>b</i>	SE	$\beta$	<i>t</i>	<i>b</i>	SE	$\beta$	<i>t</i>
Agreeableness	0.03	0.05	.06	0.50	0.01	0.03	.07	0.56	-0.02	0.02	-.06	-0.89	0.00	0.02	.01	0.10
Conscientiousness	0.04	0.06	.07	0.62	0.02	0.02	.11	0.87	0.07	0.02	.21	3.03**	0.06	0.02	.22	4.02***
Extraversion	0.01	0.05	.03	0.20	-0.01	0.03	-.03	-0.20	-0.01	0.02	-.04	-0.53	0.02	0.02	.08	1.48
Neuroticism	-0.06	0.05	-.15	-1.16	-0.01	0.02	-.03	-0.25	-0.00	0.02	-.01	-0.16	0.04	0.01	.17	3.06**
Openness	0.07	0.05	.15	1.26	0.04	0.03	.20	1.58	0.03	0.02	.10	1.42	0.01	0.02	.04	0.67
	$F(5, 78) = 0.81$				$F(5, 64) = 0.97$				$F(5, 211) = 2.24$				$F(5, 366) = 4.96^{***}$			
	$R^2 = .05$				$R^2 = .07$				$R^2 = .05$				$R^2 = .06$			

\*  $p < .05$ .

\*\*  $p < .01$ .

\*\*\*  $p < .001$ .

**Table 6**

Correlations between the Big Five facets and GPA overall and split by academic major.

		Total	Med.	Psyc.	Law	Econ.	Pol.	Sci.	Arts
Agreeableness	A1 <sup>a</sup>	.09**	.08	-.04	.01	.15	.17	.07	.08
	A2 <sup>a</sup>	.08**	.10	.10	.00	.03	.03	.04	.08
	A3 <sup>a</sup>	.05	.04	.17	.07	.12	.00	-.08	-.01
	A4 <sup>a</sup>	-.05	-.04	-.08	-.02	.04	.00	-.13	-.11*
	A5 <sup>a</sup>	-.01	.06	-.02	-.02	-.12	.05	-.07	.01
	A6 <sup>a</sup>	.06*	-.15	.17	.08	-.04	.24*	.08	.06
Conscientiousness	C1 <sup>a</sup>	.18**	.17	.02	.30**	.26*	.03	.20**	.24***
	C2 <sup>a</sup>	.11**	.17	-.01	.09	.15	.15	.18**	.12*
	C3 <sup>a</sup>	.06	.05	.24*	.01	-.06	.15	.13	.08
	C4 <sup>a</sup>	.04	.15	.06	.17	-.08	.10	.02	.08
	C5 <sup>a</sup>	.13**	.25**	.04	.24*	.10	.22	.18**	.13*
	C6 <sup>a</sup>	.11**	-.03	.37***	.11	.03	.03	.13	.13*
Extraversion	E1 <sup>a</sup>	-.02	-.08	-.24*	.00	-.14	.03	.02	.06
	E2 <sup>a</sup>	-.03	.04	-.22*	.01	.11	-.10	-.09	.04
	E3 <sup>a</sup>	.05	.12	-.15	.03	.31**	.09	.02	.10
	E4 <sup>a</sup>	.06	.08	-.07	.09	.11	.11	.10	.08
	E5 <sup>a</sup>	.02	.06	-.14	.14	-.01	.06	.06	.08
	E6 <sup>a</sup>	-.04	-.11	-.30**	-.03	.06	.00	.04	-.01
Neuroticism	N1 <sup>a</sup>	.04	.15	.22*	-.17	-.10	-.02	.00	.07
	N2 <sup>a</sup>	.00	.01	-.08	.04	-.14	-.07	-.05	.07
	N3 <sup>a</sup>	.01	.17	.10	-.10	-.27*	-.02	-.09	.06
	N4 <sup>a</sup>	.04	.15	-.04	-.10	-.01	.07	.00	.08
	N5 <sup>a</sup>	-.02	-.03	-.15	-.07	.05	.07	-.06	.00
	N6 <sup>a</sup>	.04	-.02	.35***	-.12	-.05	-.07	.02	.08
Openness	O1 <sup>a</sup>	-.00	-.03	.00	-.18	-.11	.16	.03	-.04
	O2 <sup>a</sup>	.06	-.10	.06	-.07	-.10	.19	.08	.09
	O3 <sup>a</sup>	-.00	-.15	.11	-.08	-.06	.10	-.07	.03
	O4 <sup>a</sup>	.00	-.01	-.08	-.14	.20	.11	-.08	.03
	O5 <sup>a</sup>	.13**	.10	-.21*	.02	.24*	.18	.17*	.06
	O6 <sup>a</sup>	.12**	.13	-.19	-.01	.32**	.20	.17*	.07

<sup>a</sup> A1 = Trust; A2 = Straightforwardness; A3 = Altruism; A4 = Compliance; A5 = Modesty; A6 = Tender-mindedness; C1 = Competence; C2 = Order; C3 = Dutifulness; C4 = Achievement Striving; C5 = Self-discipline; C6 = Deliberation; E1 = Warmth; E2 = Gregariousness; E3 = Assertiveness; E4 = Activity; E5 = Excitement Seeking; E6 = Positive Emotions; N1 = Anxiety; N2 = Angry, Hostility; N3 = Depression; N4 = Self-consciousness; N5 = Impulsiveness; N6 = Vulnerability; O1 = Fantasy; O2 = Aesthetics; O3 = Feelings; O4 = Actions; O5 = Ideas; O6 = Values.

\*  $p < .05$ .

\*\*  $p < .01$ .

\*\*\*  $p < .001$ .

**Table 7**

The Big Five facets as predictors of GPA overall and split by academic major.

	Total				Medicine				Psychology				Law			
	<i>b</i>	SE	$\beta$	<i>t</i>	<i>b</i>	SE	$\beta$	<i>t</i>	<i>b</i>	SE	$\beta$	<i>t</i>	<i>b</i>	SE	$\beta$	<i>t</i>
A1 Trust	0.12	0.05	.09	2.51*	0.07	0.13	.05	0.50	-0.20	0.14	-.18	-1.52	0.03	0.22	.02	0.15
A2 Straightforw.	0.10	0.04	.10	2.78**	0.09	0.10	.09	0.09	-0.04	0.10	-.05	-0.37	0.11	0.20	.09	0.53
A3 Altruism	0.01	0.04	.01	0.27	0.04	0.12	.04	0.33	0.01	0.11	.01	0.05	-0.03	0.22	-.02	-0.13
A4 Compliance	-0.09	0.05	-.07	-1.92	-0.08	0.12	-.06	-0.68	-0.11	0.12	-.11	-0.89	0.14	0.26	.09	0.55
A5 Modesty	-0.06	0.04	-.05	-1.34	-0.06	0.11	-.05	-0.52	-0.05	0.10	-.05	-0.48	0.08	0.23	.05	0.33
A6 Tender-mind.	-0.01	0.05	-.01	-0.18	-0.28	0.15	-.21	-1.92	0.33	0.13	.28	2.59*	0.18	0.26	.12	0.70
C1 Competence	0.22	0.06	.15	3.87***	0.04	0.17	.03	0.24	0.18	0.17	.13	1.08	0.83	0.34	.46	2.44*
C2 Order	0.02	0.05	.02	0.46	0.05	0.12	.05	0.40	-0.13	0.13	-.11	-0.99	-0.31	0.22	-.22	-1.41
C3 Dutifulness	-0.04	0.05	-.03	-0.76	0.06	0.14	.05	0.45	0.29	0.16	.21	1.82	-0.33	0.26	-.18	-1.26
C4 Ach. striving	-0.11	0.05	-.09	-2.37*	0.10	0.13	.09	0.80	0.21	0.13	.19	1.70	-0.02	0.28	-.02	-0.09
C5 Self-discipline	0.14	0.05	.12	2.76**	0.28	0.15	.24	1.90	-0.10	0.14	-.10	-0.76	0.20	0.28	.14	0.74
C6 Deliberation	0.08	0.05	.06	1.65	-0.14	0.14	-.11	-0.98	0.17	0.11	.17	1.52	0.09	0.24	.06	0.36
E1 Warmth	-0.06	0.05	-.05	-1.15	0.00	0.13	.00	0.02	0.17	0.17	.14	0.98	-0.21	0.31	-.14	-0.69
E2 Gregariousness	-0.00	0.05	-.00	-0.09	0.17	0.15	.15	1.16	-0.20	0.13	-.20	-1.51	0.08	0.24	.05	0.32
E3 Assertiveness	0.09	0.04	.08	2.04*	0.10	0.13	.08	0.78	-0.06	0.12	-.05	-0.46	0.16	0.22	.12	0.73
E4 Activity	0.05	0.05	.04	0.93	0.10	0.15	.08	0.65	0.14	0.14	.13	1.04	0.10	0.28	.06	0.37
E5 Excite. seeking	0.06	0.05	.05	1.31	0.10	0.14	.08	0.71	0.07	0.12	.07	0.62	0.24	0.21	.17	1.12
E6 Pos. emotion	-0.10	0.06	-.06	-1.63	-0.18	0.17	-.11	-1.02	-0.60	0.19	-.43	-3.22**	-0.17	0.30	-.09	-0.59
N1 Anxiety	0.06	0.05	.05	1.28	0.12	0.14	.11	0.81	-0.02	0.13	-.02	-0.13	-0.18	0.22	-.13	-0.82
N2 Angry hostility	0.03	0.05	.02	0.57	-0.17	0.13	-.15	-1.29	-0.48	0.13	-.45	-3.65***	0.35	0.27	.21	1.31

N3 Depression	-0.04	0.05	-.04	-0.93	0.12	0.15	.13	0.82	0.06	0.12	.06	0.47	-0.16	0.25	-.12	-0.63
N4 Self-consc.	0.08	0.04	.08	1.96*	0.25	0.11	.26	2.24*	-0.05	0.11	-.05	-0.42	0.16	0.25	.12	0.63
N5 Impulsivity	0.02	0.05	.02	0.40	-0.02	0.15	-.01	-0.11	0.11	0.13	.11	0.88	0.03	0.22	.02	0.12
N6 Vulnerability	0.07	0.04	.07	1.75	0.05	0.10	.06	0.49	0.51	0.12	.56	4.22***	-0.11	0.23	-.08	-0.49
O1 Fantasy	0.01	0.04	.01	0.14	0.01	0.10	.01	0.06	0.05	0.10	.05	0.49	-0.12	0.18	-.10	-0.67
O2 Aesthetics	-0.01	0.03	-.01	-0.26	-0.08	0.10	-.09	-0.77	0.00	0.09	.00	0.02	-0.22	0.22	-.19	-1.00
O3 Feelings	-0.07	0.04	-.06	-1.68	-0.34	0.12	-.30	-2.94**	-0.02	0.14	-.02	-0.15	-0.10	0.21	-.07	-0.48
O4 Actions	0.00	0.04	.00	0.09	-0.03	0.12	-.03	-0.24	0.08	0.11	.08	0.78	-0.15	0.19	-.11	-0.79
O5 Ideas	0.13	0.04	.11	2.99**	0.19	0.12	.18	1.60	-0.19	0.14	-.16	-1.37	0.15	0.21	.11	0.71
O6 Values	0.12	0.05	.07	2.31*	0.27	0.14	.18	1.90	-0.05	0.14	-.04	-0.34	-0.19	0.26	-.10	-0.73
	$F(30, 1,036) = 4.04^{***}$				$F(30, 100) = 1.73^*$				$F(30, 66) = 2.90^{***}$				$F(30, 65) = 0.87$			
	$R^2 = .11$				$R^2 = .34$				$R^2 = .57$				$R^2 = .29$			

	Economics				Political Sc.				Sciences				Arts/Humanities			
	<i>b</i>	SE	$\beta$	<i>t</i>	<i>b</i>	SE	$\beta$	<i>t</i>	<i>b</i>	SE	$\beta$	<i>t</i>	<i>b</i>	SE	$\beta$	<i>t</i>
A1 Trust	0.31	0.26	.17	1.20	0.07	0.12	.10	0.61	0.12	0.11	.09	1.07	0.16	0.07	.14	2.15*
A2 Straightforw.	0.32	0.21	.21	1.50	-0.01	0.12	-.02	-0.09	0.09	0.09	.08	0.98	0.11	0.06	.10	1.76
A3 Altruism	-0.05	0.24	-.03	-0.21	-0.35	0.14	-.56	-2.54*	-0.13	0.10	-.10	-1.30	-0.08	0.07	-.07	-1.20
A4 Compliance	0.24	0.27	.11	0.88	-0.07	0.13	-.08	-0.49	-0.27	0.12	-.19	-2.31*	-0.15	0.08	-.12	-2.00*
A5 Modesty	-0.23	0.20	-.15	-1.12	0.23	0.13	.33	1.82	-0.06	0.11	-.04	-0.54	0.02	0.08	.02	0.26
A6 Tender-mind.	-0.25	0.22	-.14	-1.15	0.40	0.17	.44	2.35*	0.02	0.11	.01	0.15	-0.07	0.08	-.06	-0.91
C1 Competence	0.66	0.36	.26	1.85	-0.16	0.20	-.17	-0.78	0.17	0.14	.11	1.23	0.32	0.09	.24	3.61***
C2 Order	-0.10	0.26	-.06	-0.41	0.10	0.18	.14	0.56	0.09	0.12	.07	0.76	0.01	0.07	.01	0.15
C3 Dutifulness	-0.22	0.31	-.10	-0.70	0.07	0.18	.07	0.39	0.06	0.13	.04	0.44	0.01	0.08	.01	0.10
C4 Ach. striving	-0.20	0.25	-.11	-0.78	-0.48	0.21	-.64	-2.28*	-0.26	0.12	-.20	-2.27*	-0.09	0.08	-.08	-1.16
C5 Self-discipline	0.34	0.27	.18	1.25	0.53	0.20	.69	2.63*	0.20	0.12	.17	1.73	0.06	0.08	.06	0.82

C6 Deliberation	0.15	0.28	.08	0.55	-0.01	0.18	-.01	-0.03	0.03	0.12	.02	0.24	0.10	0.07	.09	1.42
E1 Warmth	-0.44	0.27	-.25	-1.64	-0.34	0.21	-.42	-1.67	0.07	0.12	.06	0.54	0.05	0.08	.04	0.56
E2 Gregariousness	0.22	0.29	.13	0.75	0.15	0.17	.21	0.90	-0.15	0.11	-.14	-1.39	0.08	0.07	.08	1.19
E3 Assertiveness	0.56	0.24	.35	2.31*	0.12	0.14	.17	0.88	0.00	0.09	.00	0.04	0.11	0.07	.11	1.66
E4 Activity	0.06	0.23	.03	0.27	0.17	0.15	.21	1.13	0.02	0.14	.01	0.12	0.01	0.09	.01	0.08
E5 Excite. seeking	-0.05	0.26	-.03	-0.18	-0.06	0.14	-.08	-0.44	0.14	0.11	.10	1.24	0.10	0.07	.09	1.38
E6 Pos. emotion	-0.01	0.29	-.00	-0.03	0.01	0.19	.01	0.05	0.11	0.15	.07	0.77	-0.10	0.09	-.07	-1.11
N1 Anxiety	0.22	0.24	.13	0.94	0.17	0.16	.19	1.06	0.05	0.12	.04	0.44	0.04	0.07	.04	0.59
N2 Angry hostility	0.10	0.27	.05	0.36	0.09	0.17	.11	0.54	-0.14	0.12	-.10	-1.16	0.12	0.08	.11	1.54
N3 Depression	-0.43	0.23	-.30	-1.86	-0.14	0.15	-.20	-0.90	-0.11	0.11	-.11	-1.06	0.04	0.08	.04	0.48
N4 Self-consc.	0.38	0.23	.24	1.64	-0.10	0.16	-.13	-0.61	0.08	0.11	.07	0.73	0.08	0.07	.08	1.16
N5 Impulsivity	0.26	0.25	.14	1.04	0.52	0.19	.68	2.70**	0.10	0.13	.07	0.77	-0.03	0.07	-.02	-0.38
N6 Vulnerability	-0.06	0.23	-.04	-0.27	-0.13	0.11	-.19	-1.10	0.16	0.12	.12	1.35	0.11	0.07	-.11	1.67
O1 Fantasy	-0.06	0.20	-.04	-0.29	0.16	0.14	.21	1.16	-0.02	0.09	-.02	-0.23	-0.00	0.07	-.00	-0.05
O2 Aesthetics	-0.35	0.17	-.27	-2.07*	0.01	0.12	.02	0.09	0.03	0.08	.04	0.44	0.04	0.06	.04	0.65
O3 Feelings	-0.11	0.22	-.07	-0.48	-0.33	0.18	-.44	-1.85	-0.13	0.09	-.11	-1.36	-0.08	0.08	-.07	-1.07
O4 Actions	0.27	0.25	.15	1.05	-0.00	0.17	-.00	-0.01	-0.10	0.10	-.08	-0.99	0.02	0.06	.02	0.25
O5 Ideas	0.18	0.20	.12	0.90	0.40	0.21	.45	1.87	0.20	0.10	.16	2.01*	0.03	0.07	.02	0.35
O6 Values	0.45	0.24	.25	1.90	0.24	0.20	.23	1.22	0.16	0.12	.10	1.31	0.09	0.08	.06	1.04
	$F(30, 53) = 2.14^{**}$				$F(30, 39) = 0.96$				$F(30, 186) = 1.65^*$				$F(30, 341) = 2.10$			
	$R^2 = .55$				$R^2 = .42$				$R^2 = .21$				$R^2 = .16$			

\*  $p < .05$ .

\*\*  $p < .01$ .

\*\*\*  $p < .001$ .

## 4. Discussion

### 4.1. Personality group differences between academic majors

The significant group differences in the Big Five personality traits between students in different academic majors found in Study 1 largely followed the results from previous research and supported H1. Since students completed the personality questionnaire used in this study just after enrolment at the university, this renders it most probable that the various group differences found were pre-existing and not a result of socialisation into certain academic milieus as could otherwise be suspected (Kaufman, Pumacahua, & Holt, 2013). Whether consciously or not, assessing academic environments and professions associated with these on personality-relevant parameters in order to match an education to one's self-image may be an essential part of students' education choice process along with other factors such as family traditions, peers, and economic concerns. This would be a prime example of our more general tendency to select environments based on similarities in order to feel comfortable, a *proactive transaction* with the environment (e.g. Caspi, 1998).

Gender distributions varied between academic majors, and this should be taken into consideration when interpreting the findings, as explained above (see section 1.1.). However, academic majors with the same gender distributions had very different mean scores. Medicine and law, for example, had roughly the same percentage of female students (67 % and 66 %, respectively), yet scored very differently on both Agreeableness and Openness. Also, no interaction between gender and academic major was present in the analyses of variance. Taken together, the group differences on the Big Five personality traits between students from different majors are not mere gender effects.

A finding not hypothesised was that medicine and psychology students scored higher than other students on Conscientiousness. A possible explanation could be the combination of admission criteria at the university, where the present study was conducted, and the high popularity of the two academic fields. The large majority of students at this university are granted admission solely based on GPA from secondary education. The more applicants for a specific academic degree, the higher the GPA required for admission. Medicine and psychology are the most popular studies at this university with many applicants and sky-high GPA required for admission. Keeping

in mind that Conscientiousness predicts GPA well in secondary school settings (Poropat, 2009), it is not surprising that exactly medicine and psychology students at this university scored higher on average than other students on this personality trait.

#### *4.2. Variability in predictive validity of the Big Five personality traits*

The results from Study 2 both converged with results from previous research and revealed new findings on predictive validity of the Big Five personality traits. Conscientiousness had the highest correlation with GPA overall ( $r = .15$ ) and had general predictive validity in line with previous research (e.g. Poropat, 2009). A possible explanation for this general predictive validity is that Conscientiousness seems to be associated with behaviours that are beneficial in educational settings in general, such as effortful strategies (e.g. Corker, Oswald, & Donnellan, 2012).

The new, and therefore perhaps more interesting, finding is that Extraversion and Openness emerged as superior predictors of GPA in specific majors and correlated even more strongly with GPA than Conscientiousness; Extraversion negatively for psychology students ( $r = -.28$ ) and Openness positively for political science students ( $r = .23$ ). Different traits seem to be advantageous in different academic environments, which could reflect inter-faculty variations in teaching methods, examinations, learning goals, etc. If the findings from the present study are replicated, it means that generalising results from personality-performance research conducted on psychology students to all university students is not valid. For practitioners it means that some students may have a greater chance of success in some academic majors than in others, and this could potentially inform educational counselling and guidance.

#### *4.3. Variability in predictive validity of the Big Five facets*

Overall, the Big Five facets showed higher predictive validity ( $R^2 = .11$ ) than the Big Five personality traits ( $R^2 = .03$ ), supporting H2c. However, the predictive validity varied across academic majors, and much higher predictive validity was found in specific majors ( $R^2 = .16 - .57$ ). The variation was so pervasive that the same facets that correlated positively with GPA in some academic majors correlated negatively with GPA in other academic majors. An extreme example was the

Openness facet measuring tolerance for diversity, O6, which correlated negatively with GPA for psychology students ( $r = -.19$ ) but positively with GPA for economics students ( $r = .32$ ). Also, several facets subordinate to the same Big Five personality traits pulled in opposite directions, both overall and in specific academic majors.

These new findings demonstrate predictive potential of the Big Five facets worth further examination. The Big Five personality traits are truly “Big” and cover a wide range of personality variation, but their facets may be more closely associated with behaviours relevant for educational settings. Recalling the personality group differences found between students from different academic majors in Study 1, one could wonder whether students conforming to the personality profile of their respective major fare better than other students. This, however, does not seem to be the case when comparing the personality group differences to the personality-GPA correlations. The trait, Openness, illustrates this point. Psychology students scored high on Openness compared to most other students, and economics students scored low. Nevertheless, for psychology students a high score on Openness was actually negatively correlated with GPA, and the reverse was true for economics students.

#### *4.4. Limitations and future directions*

The present studies used a broad sample of university students in different academic majors. Still, these students only represent seven academic fields. Engineering and business studies are not represented in the seven academic fields, for example. Future studies might benefit from an even broader sampling of students.

Some students decide to change their academic major at some point. The present studies did not examine whether such choices are related to personality traits or affect academic performance. This could be a relevant focus for future studies.

The present studies are inherently explorative. Only one previous study has examined pre-existence of personality group differences between academic majors, and no previous studies have examined variation in predictive validity of the Big Five personality traits and facets across academic majors. Accordingly, interpretation of the results from the present studies should be done with caution, and detailed attempts to explain individual correlations, regressions, etc. would be inappropriate. It is too soon to draw final conclusions, and replication of the present findings is necessary.

However, the results of the studies should encourage such research, especially in the predictive potential of the Big Five facets and in variations across academic majors.

## 5. Conclusion

The present studies revealed significant group differences between students in different academic majors. These differences were pre-existing and not a result of socialisation processes. Variability was found in both personality-GPA correlations and in predictive validity of the Big Five personality traits and their underlying facets in relation to GPA across academic majors. This calls for a new approach in personality-performance research and for a more nuanced conception of the successful university student.

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