Personality Traits and Academic Examination Performance

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Abstract

British university students (N = 247) completed the NEO-PI-R (Costa & McCrae, 1992) personality inventory at the beginning of their course and took several written examinations throughout their three-year degree. Personality super-traits (especially Conscientiousness positively, and Extraversion and Neuroticism negatively) were significantly correlated with examination grades and were found to account for around 15% of the variance. Primary traits were also examined and results showed significant correlations between a small number of these traits (notably dutifulness and achievement striving positively, and anxiety and activity negatively) and academic achievement. Furthermore, selected primary personality traits (i.e. achievement striving, self-discipline, and activity) were found to explain almost 30% of the variance in academic examination performance. It is argued that personality inventory results may represent an important contribution to the prediction of academic success and failure in university (particularly in highly selective and competitive settings). Copyright © 2002 John Wiley & Sons, Ltd.

INTRODUCTION

For nearly a century differential psychologists have consistently attempted to understand the major predictors of individual academic performance (Binet & Simon, 1905; Busato, Prins, Elshout, & Hamaker, 2000; Elshout & Veehman, 1992; Harris, 1940; Thorndike, 1920). Recent research by Ackerman and Heggestad (1997) has suggested that individual difference variables such as personality, intelligence, and vocational interests can be used to explain not only variance in academic performance, but also the processes by which traits influence examination outcomes. Accordingly, Ackerman's (1996) PPKI theory (intelligence as processes, personality, knowledge, and interests) represents an attempt to develop an integrative conceptual framework for understanding the relation between

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non-cognitive and cognitive individual differences underlying the acquisition of knowledge and adult intellect. This theory posits that personality traits play an important role in the development of knowledge, in that they direct an individual's choice and level of persistence to engage in intellectually stimulating activities and settings. The theory of PPKI thus implies that individual differences in personality may influence academic performance (which is essentially a measure of field-specific knowledge) and, indeed, studies have shown that 'non-intellectual' factors such as personality traits and learning styles are significantly involved in academic performance (Busato et al., 2000; Chamorro-Premuzic & Furnham, submitted; De Fruyt & Mervielde, 1996).

There are several personality traits that have been shown to relate to academic performance. Openness to Experience (also known as Intellect) has been associated with academic success in school (Shuerger & Kuma, 1987) and university, both at an undergraduate (De Fruyt & Mervielde, 1996) and postgraduate (Hirschberg & Itkin, 1978) level. Some have argued that this association can be explained in terms of the correlation between crystallized intelligence and the Openness to Experience trait (Brand, 1994). Others (perhaps more appropriately) have explained this association in terms of *typical* rather than *maximal* performance (Goff & Ackerman, 1992; Hofstee, 2001), since Openness has also been shown to be highly correlated with Typical Intellectual Engagement (Goff & Ackerman, 1992), a trait that refers to one's typical efforts to invest in intellectual activities. However both Openness to Experience and Typical Intellectual Engagement have not always demonstrated predictive validity with regard to academic achievement (Goff & Ackerman, 1992; Busato et al., 2000; Chamorro-Premuzic & Furnham, submitted; Wolfe & Johnson, 1995).

The more traditional orthogonal trait variables of Extraversion and Neuroticism have also been associated with academic performance after nearly 40 years of investigation (Child, 1964). Early studies have attributed the relationship between Extraversion and academic performance to introverts' greater ability to consolidate learning, lower distractibility, and better study habits (Entwistle & Entwistle, 1970). Recent studies (notably Sanchez-Marin, Rejano-Infante, & Rodriguez-Troyano, 2001) have also suggested that extraverts under-perform in academic settings because of their distractibility, sociability, and impulsiveness. The negative relation between academic achievement and Neuroticism (Chamorro-Premuzic & Furnham, submitted; Furnham & Medhurst, 1995) has usually been explained in terms of stress and anxiety under test (i.e. examination) conditions (Zeidner & Matthews, 2000), although such traits may affect academic performance in a more general way, i.e. not just through exam performance (Chamorro-Premuzic & Furnham, submitted; Halamandaris & Power, 1999). Furthermore, earlier research suggested a possible ambiguity in the relation between Neuroticism (particularly anxiety) and academic achievement. Specifically, Eysenck and Eysenck (1985) have suggested that the motivational effects of anxiety may be greater in highly intelligent students because they encounter little difficulty in their studying. In this sense Neuroticism is a positive predictor in bright participants but a negative predictor in less talented participants.

Perhaps the personality factor more consistently associated with academic performance is Conscientiousness (Blickle, 1996; Busato et al., 2000; Costa & McCrae, 1992; De Raad & Schouwenburg, 1996). Studies have replicated this association in school (Wolfe & Johnson, 1995) as well as undergraduate (Chamorro-Premuzic & Furnham, submitted; Goff & Ackerman, 1992) and postgraduate (Hirschberg & Itkin, 1978) education. Some authors have argued that Conscientiousness may affect academic

performance beyond (and even compensate for poor) intellectual ability (see e.g. Furnham, Chamorro-Premuzic, & Moutafi, submitted). This would explain why females usually obtain higher grades albeit scoring lower on IQ tests than males (see Kling, 2001).

Although research seems to be approaching a consensus on the identification of the personality factors that may account for a significant proportion of variance in academic performance, such identification has focused on super-traits (e.g. Neuroticism and Extraversion) rather than primary traits[1] (e.g. anxiety, activity, and dutifulness). However, an examination of the primary traits would provide important information about the specific non-cognitive variables that may affect an individual's academic performance, as people with identical superfactor scores may have very different primary trait factor scores. Identification of the specific personality traits associated with academic performance would therefore reduce speculative interpretations about the predictive nature of super-traits, that is, which *aspects* of Neuroticism, Extraversion, Openness, and Conscientiousness are actually related to academic performance.

Further, it is important to examine whether the use of primary traits may improve the prediction of academic performance by super-traits. As Hough (1992) noted, it is still necessary to clarify whether broad personality dimensions (such as Conscientiousness) are to be preferred to more specific and narrow dimensions (such as achievement striving). This question brings up the well known debate on bandwith–fidelity, i.e. whether specific or general personality characteristics have more predictive validity with regard to human performance (see Barrick & Mount, 1994; Ones & Viswesvaran, 1996). Although recent reviews on this subject seem to suggest that broad traits are better predictors of performance than primary traits, it has also been argued that examining specific personality traits has important exploratory advantages for the understanding of the processes underlying the relation between personality and performance (Ones & Viswesvaran, 1996). Furthermore, since most of the bandwidth–fidelity debate has focused on job performance (with very few published papers, notably De Fruyt & Mervielde, 1996, reporting correlations between academic performance and personality at the primary trait level), it would be interesting to compare general and specific personality traits in relation to academic performance.

So far, only a few studies have examined the relationship between academic performance and personality at the primary trait level. Most of these studies have focused on the anxiety trait (Darke, 1988; Eysenck, 1997; Matthews, Davies, Westerman, & Stammers, 2000). Among the first ones to examine performance difference at the trait level were Morris and Liebert (1970). The authors suggested that only the worry (as opposed to the emotionality) components of anxiety are related to performance impairment. According to Spielberger (1972), trait anxious individuals would be more likely to suffer from information-processing disruption and performance impairment (state anxiety). Eysenck (1997) has argued that anxiety may specially affect performance on difficult, short-term or working memory, and secondary (i.e. dual) tasks. Likewise Matthews et al. (2000) suggested that, due to interference with attention, working memory, and retrieval, anxiety is likely to impair learning and academic achievement. Further, Wells and Matthews (1994) concluded that anxious individuals tend irrationally to lack confidence in their abilities, and would therefore adopt coping strategies, such as worry (emotion-focused coping), that are likely to impair performance.

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[1]From now on we shall reserve the use of 'primary traits' for the sub-components (sub-facets) of the Big Five 'super-traits' (i.e. Neuroticism, Extraversion, Openness to Experience, Agreeableness, and Conscientiousness).

With regard to the primary facets of the other four super-traits (i.e. Extraversion, Openness, Agreeableness, and Conscientiousness), research has yet to provide psychometric evidence for their relation to academic performance.

Hence the importance of this study, which will examine (i) whether and to what extent the Big Five can predict academic performance in university, (ii) which, among the super and primary traits, are the most significant correlates and predictors of academic performance, and (iii) whether the prediction of academic performance by personality can be more accurate at the super- or primary trait level. This study will therefore attempt to replicate previous findings on the relation between academic performance and personality at the super-trait level, as well as exploring the relation between academic performance and personality at the primary trait level. Several hypotheses will be tested.

H1. *Neuroticism will be negatively and significantly related to academic performance*. This would confirm previous findings (Chamorro-Premuzic & Furnham, submitted; Furnham & Medhurst, 1995) as well as reflecting the modest but consistent positive association between Neuroticism and test anxiety (see Zeidner & Matthews, 2000).

H2. *Extraversion will be negatively and significantly related to academic performance as measured by written examinations*. Although the negative relation between Extraversion and academic performance has not been as consistently supported as that of Neuroticism and academic performance, one may expect that the more active social life of extraverts is counter-productive with regard to their study habits (Entwistle & Entwistle, 1970; Sanchez-Marin et al., 2001).

H3. *Openness will be positively and significantly related to academic performance*. This is predicted on the basis of the significant correlation between Openness and intelligence (up to $r = 0.4$ with crystallized intelligence) (see Zeidner & Matthews, 2000). However some studies have failed to support this hypothesis, suggesting that the creative and imaginative nature of open individuals may be a disadvantage in academic settings, particularly when individuals are required to reproduce curricular content rather than produce novel responses or creative problem-solving (see Blickle, 1996; De Fruyt & Mervielde, 1996).

H4. *Agreeableness will not be significantly related to academic performance*. This prediction is based on the lack of existing evidence for the significant relation between Agreeableness and academic performance on one hand, and Agreeableness and intelligence on the other (Zeidner & Matthews, 2000).

H5. *Conscientiousness will be positively and significantly related to academic performance*. This would confirm the results of several recent studies that reported significant associations between these variables (Blickle, 1996; Busato et al., 2000; De Raad & Schouwenburg, 1996).

H6. *The Big Five super-traits will significantly predict academic performance*. This hypothesis is stated in terms of the previous predictions that refer to the significant associations between academic performance and four of the five main personality traits (see H1, H2, H3, and H5), as well as the results of the regressional analyses of a recent study by Chamorro-Premuzic and Furnham (submitted).

H7. *Primary traits will be more significant predictors than super-traits*. Given that the five super-traits represent equally weighted (added) components of their underlying primary factors, one can expect that the sub-facets of the NEO-PI-R will encapsulate more ('purer') personality variance. Hence if one assumes individual

differences in personality to be relevant (i.e. account for a significant amount of the variance) with regard to academic performance, one may expect primary traits to comprise the 'full' variance of personality and thus increase the amount of explained variance in academic performance (in comparison to super-traits).

Given the exploratory nature of the psychometric examination of the relationship between academic performance and personality at the primary-trait level, no specific hypotheses are stated with regard to the significant primary-trait correlates of academic performance. One may however expect that all the Conscientiousness sub-facets will be positively and significantly related to academic performance, whereas most of the Neuroticism sub-facets will be negatively and significantly related to academic performance. On the other hand, one may also expect that the sub-facets of Extraversion and Openness will be differentially correlated with academic performance (some may be positively, some negatively, some significantly, and some not significantly related to academic performance). With regard to Agreeableness, we do not expect any of the sub-facets to be significantly correlated with academic performance.

METHOD

Participants

Participants were 247 (179 females and 68 males) undergraduate students from University College London. Most students were native English speakers, but those who were not were fully bi- or tri-lingual. Initial age ranged from 17 to 23, with an arithmetic mean of 20.1 ($SD = 2.04$) years. Data for each participant were collected throughout three academic years. Students are highly selected with an application: acceptance ratio of 12:1. School grades played a major role as well as an interview. Selection decision was not based on any psychological test data. The department has been rated one of the best in the country and students' school grades are among the highest.

Measures

Academic performance and personality data were collected from the University College London archive by the first author.

Academic performance

Academic performance was measured by overall exam marks based on five three-hour written examination sessions (on a 1–100% scale, where 32% is a pass and 70% is a first or distinction). There are two examinations in the first two years (one at the end of the first and one at the end of the second year) and three more examinations at the end of the third year. Examination questions are chosen by course convenors, i.e. senior lecturers or professors of the department. Each of the final examination sessions corresponds to one of the three academic years. During each of these years, students undertake a number of courses, such as 'Introduction to the science of psychology', 'Memory and decision making' (first year course units), 'Design and analysis of psychological experiments', 'Cognition and language' (second year course units), 'Psychology and education' and 'Social psychology' (third year course units). In total, each student completes 20 units (including forced and open choices). Although the choice of the course units may vary, the number of course units is the same for all students. Furthermore, academic performance in

all course units is assessed via written (essay-based type) examinations. Examinations are double marked blindly and re-examined by an external examiner. Examination marks ranged from 39.0 to 74.2, with an arithmetic mean of 62.2 ($SD = 6.29$). Typically a three-hour examination requires written answers to three questions selected by the candidate out of nine on three examination papers.

Personality

The *NEO Personality Inventory—Revised* (NEO-PI-R; Costa & McCrae, 1992) is a well established 240-item questionnaire and measures the 'Big Five' personality factors, i.e. Neuroticism, Extraversion, Openness to Experience, Agreeableness, and Conscientiousness, as well as 30 sub-facets (six for each super-factor). Items involve questions about typical behaviours or reactions that are answered on a five-point Likert scale, ranging from 'strongly disagree' to 'strongly agree'. There is a great deal of empirical literature over the past decade providing evidence of its concurrent, construct, convergent, divergent, incremental, and predictive validity.

Procedure

As described above, this is an archival study. Data from student files were matched to personality data collected in their first month.

RESULTS

Table 1 presents the correlations between the Big Five super-traits (i.e. Neuroticism, Extraversion, Openness to Experience, Agreeableness, and Conscientiousness) and yearly as well as totalled overall examination marks. Due to the large number of statistical tests performed, Alpha levels were adjusted from $p < 0.05$ to $p < 0.01$. This would reduce the probability of obtaining significant results by chance (i.e. type I error rate). As expected (H1), Neuroticism was significantly correlated with academic performance (although the correlation between Neuroticism and totalled exam marks was only significant at $p < 0.05$). Extraversion only correlated significantly (and negatively) with first year exam marks (H2 was only partly confirmed). Openness was not significantly correlated with academic performance (H3 was not confirmed). As predicted (H4), Agreeableness was not significantly correlated with exam grades, and (H5) Conscientiousness was moderately, positively, and significantly related to academic performance (in the three years and overall).

In order to test the contribution of each of the personality super-traits in the prediction of academic performance, examination marks were then regressed onto the Big Five. It should be noted that due to the low variation between yearly examination marks, only the totalled (average) grade was discussed as the outcome variable and indicator of academic performance in the regressions. It was believed that this would both further reduce type I error rate as well as representing the most reliable measure of academic performance. Table 2 presents the standardized β coefficients and *t* values for the multiple regression. As expected (H5), Conscientiousness was the most significant predictors of exam marks. However Neuroticism and Openness were not significant predictors of totalled exams (H1 and H3 not confirmed), whereas Extraversion was significant only at $p < 0.05$. Personality accounted for 13% of the variance in overall totalled examination results, which confirmed H6.

Table 1. Correlations between Big Five super- and primary traits and examination marks (first, second, and third years and total)

	Exams 1	Exams 2	Exams 3	Exams t
Neuroticism	−0.01	**−0.22****	**−0.21****	−0.16*
Anxiety	**−0.20****	**−0.28****	**−0.32****	**−0.29****
Angry hostility	−0.05	−0.19**	**−0.18****	−0.15*
Depression	0.06	−0.11	−0.06	−0.04
Self-consciousness	**0.20****	0.09	0.08	0.13*
Impulsiveness	**−0.17****	**−0.28****	**−0.28****	**−0.26****
Vulnerability	0.09	−0.13*	−0.08	−0.04
Extraversion	**−0.17****	−0.02	−0.13*	−0.11
Warmth	−0.02	0.08	0.01	0.03
Gregariousness	**−0.21****	−0.14*	**−0.22****	**−0.20****
Assertiveness	−0.15*	0.09	0.00	−0.01
Activity	**−0.27****	−0.16*	**−0.23****	**−0.24****
Excitement	−0.06	−0.04	−0.09	−0.07
Positive emotions	−0.02	0.08	0.01	0.03
Openness to experience	−0.03	0.06	0.02	0.02
Fantasy	−0.07	−0.02	−0.05	−0.05
Aesthetics	0.02	0.09	0.06	0.06
Feelings	0.01	0.01	−0.01	0.01
Actions	−0.03	0.06	0.02	0.02
Ideas	−0.00	0.04	0.03	0.02
Values	−0.06	0.04	0.01	−0.01
Agreeableness	0.07	0.04	0.08	0.07
Trust	0.02	0.03	0.02	0.03
Straightforwardness	0.05	0.03	0.09	0.06
Altruism	−0.09	−0.03	−0.05	−0.06
Compliance	0.11	0.06	0.11	0.10
Modesty	0.14*	0.06	0.09	0.10
Tender-mindedness	−0.01	−0.02	0.01	0.01
Conscientiousness	**0.25****	**0.36****	**0.39****	**0.36****
Competence	−0.05	0.04	0.01	0.00
Order	0.05	0.12	0.15*	0.11
Dutifulness	**0.34****	**0.37****	**0.37****	**0.38****
Achievement striving	**0.25****	**0.36****	**0.37****	**0.35****
Self-discipline	0.13*	**0.22****	**0.27****	**0.22****
Deliberation	0.12	0.14*	0.19*	0.16*

*p < 0.05; **p < 0.01. $N = 247$

Correlations between academic performance and primary (as opposed to super-) personality traits were also performed on the data (see Table 1). The most significant trait correlates of academic performance at the primary level were two Conscientiousness sub-facets, namely dutifulness and achievement striving, which correlated moderately with overall examination marks. Anxiety and impulsiveness from Neuroticism, and gregariousness and activity from Extraversion, were negatively and significantly correlated with overall examination marks. Finally, another Conscientiousness trait, i.e. self-discipline, was modestly but significantly correlated with overall examination results.

Finally, another multiple regression was carried out to test the predictability of examination grades by personality traits at the primary level. It was found that NEO-PI-R sub-facets were significant predictors of academic performance, accounting for 28% of the variance in overall examination grades. Thus the prediction that primary traits would

Table 2. Standardized β and t values for the Big Five super-traits as predictors of first, second, and third year and totalled examination marks after multiple regression analysis

Intercept	Exams 1 56.34			Exams 2 56.63			Exams 3 61.03			Exams T 58.00		
	St. β	β	t	St. β	β	t	St. β	β	t	St. β	β	t
N	−0.01	−0.00	−0.15	−0.16	−0.05	−2.26*	−0.20	−0.06	−2.85**	−0.13	−0.04	−1.83
E	−0.17	−0.06	−2.29*	−0.09	−0.03	−1.23	−0.21	−0.07	−3.01**	−0.17	−0.05	−2.32*
O	0.01	0.04	0.15	0.03	0.	0.51	0.03	0.01	0.49	0.03	0.00	0.41
A	0.06	0.02	0.93	0.00	−0.00	0.07	0.04	0.01	0.64	0.03	0.01	0.55
C	0.23	0.09	3.48**	0.31	0.12	4.84**	0.32	0.12	5.15**	0.31	0.11	4.80**
$F_{(5, 241)}$		4.79**			8.57**			11.89**			8.64**	
R^2		0.09			0.15			0.20			0.15	
Adj. R^2		0.07			0.13			0.18			0.13	

$*p < 0.05$; $**p < 0.01$.
N, Neuroticism; E, Extroversion; A, Agreeableness; O, Openness; C, Conscientiousness. $N = 247$.

account for more variance in academic performance than super-traits (H7) was also confirmed. The three significant predictors were dutifulness, achievement striving, and activity. Furthermore, these three variables alone were found to account for more than 28% of the variance in overall exam grades ($F(3, 243) = 33.45$, $p < 0.01$). Regression coefficients for the multiple regression including all 30 sub-facets are presented in Table 3.

DISCUSSION

The present study has examined which and to what extent personality (super- and primary) traits as measured by the NEO-PI-R (Costa & McCrae, 1992) predict university examination marks. Consistently with recent studies (Blickle, 1996; Busato et al., 2000; Chamorro-Premuzic & Furnham, submitted), there were modest but significant correlations between Conscientiousness and academic performance. Also in accordance with previous investigations (Chamorro-Premuzic & Furnham, submitted; Furnham & Medhurst, 1995) were the significant negative correlations between academic performance and Neuroticism. Furthermore, the present results also replicated earlier findings on the negative correlation between academic achievement and Extraversion (see Child, 1964; Entwistle & Entwistle, 1970). Our results therefore indicate that conscientious, stable, and introverted individuals would be more likely to succeed in university-based academic settings, and that these variables may account for around 15% of the variance in academic examination performance.

In order to identify the more specific personality characteristics associated with academic achievement, the correlational analysis was also carried out at the primary level. Results showed that the Conscientiousness primary traits dutifulness and achievement-striving were the highest academic performance correlates of exam scores. Self-discipline (also a Conscientiousness trait) was also significantly correlated with academic performance, albeit more modestly. On the other hand, primary scales from the Neuroticism factor were differentially correlated with academic performance. Only anxiety and impulsiveness were negatively and significantly ($p < 0.01$) correlated with academic performance. This would indicate that the negative association between academic success and Neuroticism is mainly a consequence of the anxiety and impulsiveness traits. Whereas the negative relation between academic achievement and anxiety is supported by previous literature (both correlational and experimental, see Zeidner, 1998; see also Matthews et al., 2000, for a review), academic performance has not yet been explicitly related to impulsiveness. Looking at the checklist items of the impulsiveness scale from the NEO (see Costa & McCrae, 1992), it may be suggested that the moody, irritable, and excitable nature of impulsive individuals may be counter-productive for a student's study habits. Thus neurotic students may be less able to control certain impulses (i.e. resist desires) that may be detrimentally associated with learning discipline. It is however noticeable that these characteristics are better encompassed by the Conscientiousness sub-facets (e.g. dutifulness, deliberation). This may explain why the predictive effect of academic performance by impulsiveness disappears in the multiple regression (when Conscientiousness facets are also included as predictors).

In the case of Extraversion primary traits, correlations are even more heterogeneous. Two facets, namely activity and gregariousness, were both significantly and negatively related to examination grades. Further, these two sub-facets were the only significant Extraversion correlates of academic performance, suggesting that introverts would benefit

Table 3. Standardized β and t values for the Big Five super-traits as predictors of first, second, and third year and totalled examination marks after multiple regression analysis

	Exams 1 61.25			Exams 2 62.71			Exams 3 65.97			Exams totalled 63.31		
Intercept	St. β	β	t	St. β	β	t	St. β	β	t	St. β	β	t
Anxiety	-0.11	-0.12	-1.45	-0.04	-0.04	-56	-0.13	-0.13	-1.82	-0.10	-0.10	-1.38
Angry hostility	-0.02	-0.03	-0.24	-0.16	-0.21	-1.69	-0.15	-0.20	-1.68	-0.12	-0.15	-1.29
Depression	-0.05	-0.06	-0.49	-0.02	-0.02	0.20	-0.06	-0.06	-0.58	-0.04	-0.05	-0.46
Self-consciousness	-0.02	-0.02	-0.21	0.02	0.02	-0.29	-0.09	-0.11	-1.23	-0.03	-0.06	-0.39
Impulsiveness	-0.01	-0.01	-0.09	-0.08	-0.11	1.08	-0.04	-0.06	-0.65	-0.05	-0.06	-0.66
Vulnerability	0.22	0.32	2.27*	0.07	0.10	0.73	0.15	0.21	1.63	0.16	0.21	1.69
Warmth	0.13	0.22	1.12	0.09	0.15	-0.78	0.07	0.12	0.69	0.10	0.16	0.95
Gregariousness	-0.05	-0.06	-0.56	-0.01	-0.20	0.18	-0.08	-0.09	-0.98	-0.05	-0.06	-0.61
Assertiveness	-0.10	-0.13	-1.19	0.05	0.06	-0.64	0.01	0.01	0.13	-0.01	-0.02	-0.17
Activity	-0.22	-0.32	-3.05**	-0.16	-0.23	-2.25*	-0.19	-0.26	-2.78**	-0.21	-0.27	-2.94**
Excitement	0.04	-0.05	0.47	-0.08	-0.11	1.01	-0.05	-0.07	-0.70	-0.03	-0.04	-0.43
Positive emotions	0.08	0.10	0.77	0.09	0.12	-0.92	0.05	-0.06	0.51	0.08	0.09	0.81
Fantasy	-0.10	-0.15	-1.46	-0.03	-0.05	0.51	-0.02	-0.02	-0.26	-0.06	-0.07	-0.83
Aesthetics	-0.00	-0.00	-0.06	0.05	0.07	0.65	-0.01	-0.00	-0.09	0.01	0.02	0.18
Feelings	0.08	0.15	1.12	0.01	0.02	0.19	0.05	0.08	0.69	0.05	0.08	0.73
Actions	-0.03	-0.04	-0.40	0.01	0.01	-0.11	-0.03	-0.04	-0.42	-0.02	-0.03	-0.24
Ideas	0.01	0.01	0.10	-0.06	-0.07	0.69	-0.04	-0.04	-0.47	-0.03	-0.04	-0.38
Values	0.04	0.00	0.52	0.09	0.17	-1.21	0.10	0.16	1.26	0.08	0.13	1.08
Trust	-0.09	-0.10	-1.06	-0.14	-0.18	-1.78	-0.16	-0.19	-2.07*	-0.14	-0.16	-1.77
Straightforwardness	-0.00	-0.00	-0.02	-0.04	-0.05	-0.50	0.02	0.00	0.32	-0.01	-0.07	-0.08
Altruism	-0.14	-0.28	-1.69	-0.10	-0.20	-1.28	-0.12	-0.23	-1.55	-0.13	-0.24	-1.65
Compliance	0.01	0.02	0.15	-0.03	-0.05	0.33	0.01	0.02	0.18	0.00	-0.04	-0.00
Modesty	0.05	0.06	0.65	0.02	0.03	-0.34	0.03	0.03	0.40	0.04	0.04	0.51
Tender-mindedness	-0.10	-0.15	-1.35	-0.07	-0.10	-0.90	-0.00	-0.00	-0.07	-0.06	-0.09	-0.87
Competence	-0.09	-0.14	-1.24	-0.10	-0.16	-1.42	-0.13	-0.19	-1.85	-0.11	-0.16	-1.61
Order	-0.15	-0.20	-2.12*	-0.07	-09	-1.05	-0.08	-0.10	-1.20	-0.11	-0.14	-1.61
Dutifulness	0.40	0.49	4.98**	0.36	0.43	4.51**	0.34	0.39	4.47**	0.39	0.43	5.09**
Achievement striving	0.20	0.27	2.54*]	0.28	0.37	3.54**	0.25	0.31	3.22***	0.26	0.32	3.38**
Self-discipline	0.07	0.10	0.96	0.05	0.07	0.68	0.12	0.16	1.65	0.09	0.11	1.18
Deliberation	-0.03	-0.03	-0.38	-0.03	-0.04	-0.43	0.01	0.01	0.17	-0.02	-0.02	-0.25
$F(30, 216)$		3.52**			3.75**			4.42**			4.26**	
R^2		0.33			0.34			0.38			0.37	
Adj. R^2		0.23			0.25			0.29			0.28	

$*p < 0.05$; $**p < 0.01$.

from being less active (perhaps socially) and gregarious than extraverts. However, warmth and excitement (two primary traits which may also be associated with poorer study habits) were not significantly correlated with examination grades. It is therefore necessary that research further explore the relationship between academic performance and Extraversion at the primary level.

Openness to Experience and Agreeableness were not significantly related to examination grades, either at the super, or at the primary, level. In the case of Agreeableness, results support our initial hypothesis, since none of the primary traits of this personality factor seem to be relevant in learning processes or examination performance. Furthermore, Agreeableness has been shown to be unrelated to intellectual ability (Ackerman & Heggestad, 1997; Zeidner & Matthews, 2000). In the case of Openness to Experience however, results run counter to our predictions. It is perhaps the most surprising result in the present study that none of the Openness primary traits were (even modestly) related to academic performance. Nevertheless, recent studies (e.g. Busato et al., 2000; Chamorro-Premuzic & Furnham, 2002; Wolfe & Johnson, 1995) have equally failed to replicate significant relations between Openness to Experience and academic achievement. It may be possible that the rather simple and practical personality characteristics of low Openness to Experience individuals (Matthews et al., 2000) may be also beneficial for academic performance. Thus Openness may be associated with higher intelligence, but not with academic attainment. Further, it is possible that Openness may have a positive effect in academic performance when artistic, imaginative, and creative intervention of students is highly regarded, but not in other degrees in which systematic, organized, and dutiful performance is required.

Finally, the regressions carried out in the present study indicate that personality traits as measured by a reliable and well established inventory such as the NEO-PI-R (Costa & McCrae, 1992) can be very useful in the prediction of academic success and failure. Specifically, the present findings replicate the results of previous studies (e.g. Chamorro-Premuzic & Furnham, submitted; Child, 1964; Entwistle & Entwistle, 1970; Furnham & Medhurst, 1995; Kling, 2001; Sanchez-Marin et al., 2001) and confirm that Conscientiousness (positively) and Extraversion and Neuroticism (both negatively) can be modest but significant predictors of academic achievement. Furthermore, the present results suggest that the accuracy in the prediction of academic performance by personality could be increased significantly by employing primary rather than super-traits. In particular dutifulness, achievement striving, and activity seem to be moderately and consistently related to academic performance, accounting for most of the variance in examination grades. However it is worth noticing that the increase in the amount of explained variance by primary traits may not be proportionally significant to the number of predictors employed. That is, relative to the number of predictor variables, primary traits are less powerful than the super-factors: five factors account for approximately 15%, while 30 factors account for less than 30% of the variance. This leaves us with an average of 3% of the variance accounted for by each super-trait, and an average of less than 1% accounted for by each primary trait. These results may therefore re-open the debate on the bandwidth–fidelity dilemma (i.e. whether specific or more general traits are to be preferred to maximize the prediction of human performance (particularly in academic settings) (see Barrick & Mount, 1994; Ones & Viswesvaran, 1996). Whereas from the results of the present study we may support the theoretical argument that favours the use of super-traits, at the same time, we believe that for exploratory purposes research at the primary level should be encouraged.

There are of course some limitations to the present study, which we want to address. These limitations are mainly referred to our data set, which only included personality and academic performance information. Furthermore, only *specific* data on personality and academic performance were available to this study: personality was assessed via the NEO-PI-R, which may undoubtedly be considered one of the most widely used and validated personality scales, but certainly *not* the only one (as there are a number of leading researchers in the field of personality who prefer to employ other scales, such as the 16PF and the Gigantic Three) (see Matthews & Deary, 1998). On the other hand, the only measure of academic performance was provided by examination grades. Hence one may only speculate about the extent to which other assessment methods (participation in class, absenteeism, course work) may be differentially related to the examined personality traits. At the same time however, examination marks are (at least in Great Britain) the ultimate indicator of academic performance, and measuring academic performance through examination marks becomes thus a rather pragmatic approach (this is certainly justifiable from an applied perspective).

Another limitation refers to the fact that the present study did not employ any measure of intelligence (note that this was entirely due to the archival nature of the data). Thus there remains the question of whether the NEO-PI-R would have shown some incremental validity with regard to ability measures (e.g. IQ test). In that sense, one could argue that the sample was highly selected with regard to their educational background and intellectual ability (although no standardized psychometric tests were employed), which allows us to assume that participants' IQ scores would have been rather high and the total sample fairly homogeneous. However this has implications for the generalizability of the findings and, moreover, to a conceptual reconsideration of what sort-of academic performance this study has examined: is personality important only when intelligence is levelled (or placed as covariate)? Having said this, one should also recall that, after a decade of intense research on the personality–intelligence interface, researchers seemed to have agreed that personality and intelligence are essentially unrelated constructs (Hofstee, 2001; Zeidner & Matthews, 2000). Thus there would be little reason to expect an overlap between personality inventories and IQ tests in the prediction of academic achievement.

On the other hand, this study would have certainly benefited from the inclusion of other scales, such as questionnaires on interest, study habits, or learning styles, and, furthermore, the Typical Intellectual Engagement scale of Goff and Ackerman (1992). It is argued (especially when taking into account Ackerman's (1996) PPKI theory), that the relation between personality (and intelligence) and academic performance may be mediated by other variables, such as motivation and interests, which would also play an important role in determining students' knowledge acquisition—a key feature in examination performance. However researchers within this framework (notably Wittman & Suess, 1999) have also found a direct effect of personality traits on performance (even when it is controlled for knowledge and intellectual ability). Furthermore, considering all the variables that could not be examined and contributed to the limitations of the present study, it is rather impressive that a 40-minute personality inventory such as the NEO-PI-R can predict up to almost 30% of the variance in academic performance three years later. Non-intellectual variables such as personality traits seem to play an important role in the processes underlying academic success and failure, particularly in highly selected and competitive settings.

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REFERENCES

Ackerman, P. (1996). Intelligence as process and knowledge: an integration for adult development and application. In W. Rogers, & A. Fisk, et al. (Eds.), *Aging and skilled performance: Advances in theory and application* (pp. 139–156). Hillsdale, NJ: Erlbaum.

Ackerman, P., & Heggestad, E. (1997). Intelligence, personality, and interests: evidence for overlapping traits. *Psychological Bulletin, 12*, 219–245.

Barrick, M. R., & Mount, M. K. (1994, April). Do specific components of conscientiousness predict better than the overall construct? In *Personality and job performance: Big Five versus specific traits*. Symposium conducted at the meeting of the Society for Industrial and Organizational Psychology, Nashville, TN.

Barrick, M. R., Mount, M. K., & Strauss, J. P. (1993). Conscientiousness and performance of sales representatives: test of the mediating effects of goal setting. *Journal of Applied Psychology, 78*, 715–722.

Binet, A., & Simon, T. (1905). Methodes nouvelles pour le diagnostique du niveau intellectuel des anormaux [New methods for the diagnosis of the intellectual levels of subnormals] (E. S. Kite, Trans). In J. J. Jenkins, & D. G. Paterson (Reprint Eds.), *Studies in individual differences, the search for intelligence* (pp. 90–96). New York: Appleton–Century–Croft (reprinted in 1961).

Blickle, G. (1996). Personality traits, learning strategies, and performance. *European Journal of Personality, 10*, 337–352.

Brand, C. (1994). Open to experience–closed to intelligence: why the 'Big Five' are really the 'Comprehensive Six.' *European Journal of Personality, 8*, 299–310.

Busato, V. V., Prins, F. J., Elshout, J. J., & Hamaker, C. (2000). Intellectual ability, learning style, achievement motivation and academic success of psychology students in higher education. *Personality and Individual Differences, 29*, 1057–1068.

Child, D. (1964). The relationships between introversion–extraversion, neuroticism and performance in school examinations. *British Journal of Educational Psychology, 34*, 187–196.

Costa, P., & McCrae, R. (1992). *Revised NEO Personality Inventory (NEO-PI-R) and NEO Five-Factor Inventory (NEO-FFI): Professional manual*. Odessa, FL: Psychological Assessment Resources.

Darke, S. (1988). Anxiety and working memory capacity. *Cognition and Emotion, 2*, 145–154.

De Fruyt, F., & Mervielde, I. (1996). Personality and interests as predictors of streaming and achievement. *European Journal of Personality, 10*, 405–425.

De Raad, B., & Schouwenburg, H. (1996). Personality in learning and education: a review. *European Journal of Personality, 10*, 303–336.

Elshout, J., & Veenman, M. (1992). Relation between intellectual ability and working method as predictors of learning. *Journal of Educational Research, 85*, 134–143.

Entwistle, N., & Entwistle, D. (1970). The relationships between personality, study methods and academic performance. *British Journal of Educational Psychology, 40*, 132–143.

Eysenck, H. J., & Eysenck, M. W. (1985). *Personality and individual differences: A natural science approach*. New York: Plenum.

Eysenck, M. W. (1997). *Anxiety and cognition: A unified theory*. Hove: Psychology.

Furnham, A., & Medhurst, S. (1995). Personality correlates of academic seminar behaviour: a study of four instruments. *Personality and Individual Differences, 19*, 197–208.

Goff, M., & Ackerman, P. (1992). Personality–intelligence relations: assessment of typical intellectual engagement. *Journal of Educational Psychology, 84*, 537–552.

Halamandaris, K. F., & Power, K. G. (1999). Individual differences, social support and coping with examination stress: a study of the psychosocial and academic adjustment of first year home students. *Personality and Individual Differences, 26*, 665–685.

Harris, D. (1940). Factors affecting college grades: a review of the literature, 1930–1937. *Psychological Bulletin, 37*, 125–166.

Hirschberg, N., & Itkin, S. (1978). Graduate student success in psychology. *American Psychologist, 33*, 1083–1093.

Hofstee, W. K. B. (2001). Personality and intelligence: do they mix? Invited paper presented at the second Spearman Seminar. *Intelligence and personality—bridging the gap in theory and measurement*, Plymouth.

Hough, L. M. (1992). The Big Five personality variables—construct confusion: description versus prediction. *Human Performance, 15*, 139–155.

Kling, K. C. (2001). The role of personality, academic ability, and gender in predicting academic achievement. Poster presented at the 2001 meeting of the International Society for the Study of Individual Differences.

Matthews, G., Davies, D. R., Westerman, S. J., & Stammers, R. B. (2000). *Human performance. Cognition, stress, and individual differences.* Hove: Psychology.

Matthews, G., & Deary, I. (1998). *Personality traits.* Cambridge: Cambridge University Press.

Morris, L. W., & Liebert, R. M. (1970). Relationship of cognitive and emotional components of test anxiety to physiological arousal and academic performance. *Journal of Consulting and Clinical Psychology, 35*, 332–337.

Ones, D. S., & Viswesvaran, C. (1996). Bandwidth–fidelity dilemma in personality measurement for personnel selection. *Journal of Organizational Behavior, 17*, 609–626.

Sanchez-Marin, M., Rejano-Infante, E., & Rodriguez-Troyano, Y. (2001). Personality and academic productivity in the university student. *Social Behavior and Personality, 29*, 299–305.

Shuerger, J. M., & Kuma, D. L. (1987). Adolescent personality and school performance: a follow up study. *Psychology in the Schools, 24*, 281–285.

Spielberger, C. D. (1972). Anxiety as an emotional state. In C. D. Spielberger (Ed.), *Anxiety: Current trends theory and research* (Vol. 1). London: Academic.

Thorndike, E. L. (1920). Intelligence examinations for college entrance. *Journal of Educational Research, 1*, 329–337.

Wells, A., & Matthews, G. (1994). *Attention and emotion: A clinical perspective.* Hove: Erlbaum.

Wittmann, W. W., & Suess, H. M. (1999). Investigating the paths between working memory, intelligence, knowledge, and complex problem-solving performances via Brunwik symmetry. In P. L. Ackerman, P. C. Kyllonen, et al. (Eds.), *Learning and individual differences: Process, trait, and content determinants* (pp. 77–108). Washington, DC: American Psychological Association.

Wolfe, R., & Johnson, S. (1995). Personality as a predictor of college performance. *Educational and Psychological Measurement, 55*, 77–185.

Zeidner, M. (1998). *Test anxiety: The state of the art.* New York: Plenum.

Zeidner, M., & Matthews, G. (2000). Intelligence and personality. In R. Sternberg (Ed.), *Handbook of intelligence* (pp. 581–610). New York: Cambridge University Press.