Conscientiousness and Eysenckian psychoticism as predictors of school grades: A one-year longitudinal study

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Abstract

Using data from the Wollongong Youth Study, we assessed the extent to which psychoticism (P) and conscientiousness (C) (both Time 1) predict academic performance one year later. Participants were in their first year of high school at Time 1 ($N = 784$; 382 males and 394 females; 8 did not indicate their gender). The mean age was 12.30 yrs. (SD = 0.49). End of year grades were obtained for English, Science, Mathematics, Religious studies, Visual art, and Design. C, but not P, significantly predicted Total grade as well as outcomes in English, Religious studies, Visual art, and Design. The impact of P was more modest. Changes in P and C over time were also related to academic performance at Time 2. Results are discussed with reference to previous work in this area and the nature of these major personality dimensions. Suggestions for future research are also made.
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1. Introduction

Although the possibility that personality might be related to academic performance (AP) was raised almost 100 years ago (Webb, 1915), it is only more recently that this area of research has

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undergone a significant resurgence. From modest studies such as the importance of character (Webb, 1915), to the role of persistence and cleverness in AP (Garnett, 1919), the development and refinement of contemporary personality trait theory as espoused in the Big Five (e.g. Costa & McCrae, 1985; Goldberg, 1999; Norman, 1963) and the biologically based Gigantic Three (e.g. Eysenck & Eysenck, 1985) has provided a significant impetus for research into AP. The links between academic achievement and personality as assessed by these major personality frameworks have received widespread research attention, although the impact of some of these dimensions is still debatable (e.g. Ackerman & Heggestad, 1997; Chamorro-Premuzic & Furnham, 2005).

There now appears to be general consensus among researchers in psychology and education that, in addition to an individual's innate cognitive ability, other factors (such as personality) are able to explain significant additional variance in AP (e.g. Grigorenko & Sternberg, 1995). As Chamorro-Premuzic and Furnham (2003) have explained, intelligence refers to what a person can do or achieve, whereas personality research is more concerned with *how* the individual will achieve certain outcomes. This would suggest that personality researchers have an important role to play in the area of AP.

Research into personality and AP to date has yielded at least two trends which have implications for the present study. First, the two most consistent personality domains associated with AP are psychoticism (P; Gigantic Three) and conscientiousness (C; Big Five). These dimensions are located in different (but related) conceptions of personality and, to the best of our knowledge, are not normally included in the same data set. The extent to which these dimensions are overlapping remains unresolved (see Costa & McCrae, 1995; Eysenck & Eysenck, 1985), nor is it clear how P and C differ in their respective influence on AP.

Secondly, a significant proportion of research produced thus far has been conducted among convenience samples of university psychology students (see, for example, the many studies cited in Chamorro-Premuzic & Furnham, 2005). By their very nature, such samples are highly biased. Because adolescence is a time of transition and developmental change (Smetana, Campione-Barr, & Metzger, 2006) and because it is not clear whether results obtained from university students can be generalized to school students, the present research sought to assess the long-term impact of P and C on AP across a number of different subjects among high school students.

1.1. Psychoticism

Eysenck hypothesized that the "uncaring and hostile nature" of the high P individual will invariably result in poor academic outcomes (Eysenck & Eysenck, 1985, p. 322), a prediction borne out by many subsequent studies across a wide array of academic outcomes. For example, high P scoring students were found to have poor oral expression and work habits (Furnham & Medhurst, 1995) as well as poor self-rated academic skills (Heaven, Mak, Barry, & Ciarrochi, 2002). School students judged by teachers to be interested in their studies were found to have low P scores (Aluja-Fabregat, Balleste-Almacellas, & Torrubia-Beltri, 1999).

Furnham and Medhurst (1995) reported strong links between P and tutors' reports of students' seminar behaviour. High P individuals were rated as having a low grasp of subject matter, work habits, motivation, written expression, oral expression, and participation in seminars. Petrides and colleagues found support for the important role of psychoticism in predicting school grades among senior school students (Petrides, Chamorro-Premuzic, Frederickson, & Furnham, 2005).

In fact, the effects of psychoticism were stronger for female than male students leading the researchers to conclude that, because the non-conformist and toughminded behaviours of the high P individual are usually associated with males, females with such characteristics are at a distinct disadvantage with respect to AP. Likewise, in a longitudinal study of a small sample of British university students enrolled in psychology courses ($N = 75$), P significantly predicted course-work outcomes, although it did not significantly predict tutor's overall predictions of students' performance or actual exam marks achieved (Chamorro-Premuzic & Furnham, 2003). In opposition to these findings, Furnham and Mitchell (1991) found no significant longitudinal effects of P on the AP of occupational therapy students over a 4-year period. Notwithstanding this result, the bulk of the evidence indicates that P is a strong predictor of poor academic outcomes.

1.2. Conscientiousness

Numerous studies attest to the important role that C plays in AP. Thus, De Raad and Schouwenburg (1996, p. 325), commented that this factor is the "... main psychological resource in learning and education". De Fruyt and Mervielde (1996, p. 420), suggested that "Conscientiousness can perhaps be conceived of as the non-cognitive counterpart of the cognitive *g* factor, explaining part of the variance in different educational outcome measures across academic curricula". Such sentiment is hardly surprising given the fact that conscientious individuals have been described as having higher intrinsic motivation (Furnham, 1995), as being persistent and reliable, and as showing dutifulness, self-discipline, and competence (Costa & McCrae, 1985). This has been disputed by Farsides and Woodfield (2003) who found C to significantly predict tutor's reports of their student's progress, but not student's final grades. On the other hand, some researchers have gone so far as to suggest that C is a better predictor of AP than psychometric intelligence (Furnham, Chamorro-Premuzic, & McDougall, 2003). Conscientiousness predicts academic outcomes among school students (e.g. Bratko, Chamorro-Premuzic, & Saks, 2006; Heaven et al., 2002; Wolfe & Johnson, 1995), undergraduates (Busato, Prins, Elshout, & Hamaker, 2000; Diseth, 2003; Furnham et al., 2003; Lounsbury, Sundstrom, Loveland, & Gibson, 2003), and postgraduates (Rothstein, Paunonen, Rush, & King, 1994). The C dimension has been linked to low absenteeism and positive behaviour in class (Furnham et al., 2003), and Blickle (1996) found strong links between C and a factor he labeled "learning discipline". This comprises traits such as the learning environment, attention, organization, rehearsal, and effort. Such results accord with other findings in which C has been found to be related to a "strategic learning" approach. That is, high C individuals attempt to achieve the best results they can through good time management and good organization of the learning environment (Diseth, 2003).

1.3. Aims and rationale of present study

In view of the widespread agreement as to the importance of P and C in predicting AP, the main aim of the present study was to simultaneously assess the distinct longitudinal effects of these personality factors on the academic grades of high school students. More specifically, we assessed the impact of personality at Time 1 on grades one year later (Time 2) after controlling for academic ability or aptitude. Put another way, we were interested in the extent to which P and C predict over- or under-achievement once aptitude had been controlled for.

Access to a large sample of school students also provided an opportunity to determine the unique effects of P and C on several different subjects. As far as we have been able to establish, no study to date has provided such a comprehensive coverage of academic outcomes. Following previous work in this area, we expected psychoticism to be significantly negatively associated with lower school grades across all subjects (Petrides et al., 2005), and conscientiousness to be significantly positively associated with higher school grades across all subjects (e.g. Diseth, 2003).

2. Method

2.1. Participants

Students, all participants in the Wollongong Youth Study, were surveyed during their first year of high school and again one year later. At Time 1, 784 students (mean age = 12.30 yrs, SD = 0.49) completed the questionnaire (382 males and 394 females; 8 did not indicate their gender). The students were located in five different Catholic high schools located in Wollongong and Sydney. In Australia 33% of all students now attend non-government (including Catholic) schools (Australian Bureau of Statistics, 2004). Our sample is representative of key demographic indicators, closely resembling national distributions with respect to number of intact families and language other than English in the home (e.g. Australian Bureau of Statistics, 2006).

Final end-of-year grades were obtained for all of the students once they completed their second year of high school (Time 2). Data were collected from 942 participants at Time 2. This increase in sample size was due to an administrative error at Time 1 in one school where some classes of the year grade were not available for testing on that day. Using coded questionnaires, we were able to directly match the Time 1 data to the Time 2 grades of students in a number of subjects, but we selected the following because of their large sample size: English (N = 666; 333 males, 333 females), Mathematics (N = 666; 333 m, 333 f), Science (N = 666; 333 m, 333 f), Religious studies (N = 666; 333 m, 333 f), Visual art (N = 595; 291 m, 304 f), Design (N = 666; 333 m, 333 f). Thus our follow-up rate for compulsory subjects such as English, Math, Science, and Religious studies was 84.9%.

2.2. Materials

2.2.1. Time 1
Students were provided with a questionnaire booklet comprising the following personality measures:

1. *Eysenckian psychoticism* (Eysenck & Eysenck, 1975). We used Corulla's (1990) revision of the junior psychoticism scale. This measure has been shown in previous studies to predict poor AP as well as general maladjustment in Australian youth (e.g. Claridge, 1997; Heaven et al., 2002). The scale comprises 12 items and yielded an alpha coefficient of 0.68.
2. *Conscientiousness* (Mak, Heaven, & Rummery, 2003). This measure was specifically designed for use with Australian high school students. It comprises 16 items derived from self-descriptors of this personality dimension provided by John (1990) and Norman (1963) and has good

Table 1
Children's conscientiousness scale

Scale item	Equivalent self-descriptor as found in John (1990) and Norman (1963)	Item-total correlation ($N = 874$)
1. I like to keep my things in order	Fussy	0.53
2. I am a responsible person	Responsible	0.63
3. I am slack	Slipshod	0.43
4. I am careless	Careless	0.43
5. I like to succeed	Persevering, quitting	0.34
6. I give up quickly	Quitting	0.23
7. I like to do things perfectly	Precise, fussy	0.44
8. I cooperate with others	Cooperative	0.44
9. I try to be careful when I do things	Cautious	0.53
10. I am efficient	Efficient	0.53
11. Others can depend on me	Dependable	0.51
12. I am not very responsible	Irresponsible	0.57
13. I am undependable	Undependable	0.51
14. I am a well organised person	Organised	0.57

internal consistency and validity. For instance, high C scorers on this instrument were found to have positive attitudes to school and self-rated academic performance (Heaven et al., 2002). High C students were also more likely (mean $r = 0.22$, $p < 0.01$) to identify with a so-called "studious" crowd at school than with so-called "rebels", mean $r = -0.20$, $p < 0.01$ (Mak et al., 2003).[1] Sample items include "I am a well organised person"; "I pay attention at school" (Table 1). Responses were indicated on a 5-point Likert scale from "not at all like me" (1) to "a lot like me" (5), while negative items were reverse-scored. Alpha coefficient was 0.83.

3. *Verbal and numerical ability scores.* A few weeks prior to the completion of the Time 1 measures all students completed standardized numerical and verbal assessments. These are not intelligence tests, but are classified as aptitude or ability tests, even though they assess the learning that has occurred up to the time of administration. They are therefore curriculum-based, criterion-referenced tests and are administered by the New South Wales Department of Education and Training. There are six numerical (numeracy, number, measurement, space, data, numeracy problem solving) and three verbal (writing achievement, reading achievement, and language achievement) subtests. Scores on the subtests were summated to provide a total verbal and total numeracy score.

2.2.2. Time 2

1. *Psychoticism and conscientiousness.* We used the same measures as used previously. Alpha coefficients were 0.73 and 0.87, respectively.

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[1] In data collected subsequently with our participants, cross-sectional analyses revealed that our C scale correlated 0.62 ($p < 0.001$) with a shortened version (five items) of Goldberg's (1999) measure of conscientiousness supporting the validity of our measure.

2. *School grades*. Final end-of-year school grades were obtained for all students at the end of their second year of high school. Grades were obtained for the subjects listed above and were calculated as follows: each subject had four to five outcomes (identical outcomes applied across the schools) which were graded on a 5-point scale where 5 represented the highest achievement and 1 the lowest achievement. An average score for each subject was calculated for each student. In addition, outcomes in each subject were summed to calculate a Total grade for each student.

2.3. Procedure

After obtaining consent from Diocesan authorities, schools and parents, students were invited to participate in a study on "Youth Issues". Administration of the questionnaire took place during regular classes under the supervision of one of the authors. Students completed the questionnaires anonymously and without any discussion. At the conclusion of the session students were thanked for their participation and debriefed. School grades were linked to Time 1 data with the consent of Diocesan authorities, parents, and students.

3. Results

3.1. Preliminary analyses

Psychoticism correlated significantly negatively with conscientiousness, $r(664) = -0.53$, $p < 0.001$ in accord with previous studies (e.g. Eysenck, 1992, p. 668). Verbal and numerical ability were highly correlated, $r(622) = 0.75$, $p < 0.001$. The personality measures were quite stable: psychoticism at Time 1 correlated 0.62 (df = 662; $p < 0.001$) with the Time 2 measure; for conscientiousness the correlation was 0.59 (df = 664; $p < 0.001$).

3.2. Correlations

Table 2 shows the Pearson correlations between school grades and the two personality dimensions at Time 1. As predicted, P was significantly negatively related to AP in all subjects, whereas

Table 2
Correlations and effect sizes between personality (Time 1) and school grades (Time 2)

Subject Time 2	Psychoticism Time 1	Cohen's *d*	Conscientiousness Time 1	Cohen's *d*
English	−0.18**	0.3	0.21**	0.4
Religious studies	−0.22**	0.4	0.23**	0.4
Mathematics	−0.14**	0.2	0.16**	0.3
Science	−0.22**	0.4	0.22**	0.4
Visual art	−0.24**	0.4	0.26**	0.5
Design	−0.36**	0.7	0.34**	0.7

** $p < 0.001$.

C was positively associated with achievement in every subject. Effect sizes tended to be larger for Design (P and C) and Visual art (C) than for Math.

3.3. Predicting school grades

We conducted a MANOVA (general linear model; GLM) to assess multivariate effects on school grades. Gender was entered as a fixed factor, whereas verbal and numerical ability, P, and C were entered as covariates. Significant multivariate effects were found for each factor: gender, Wilks' Lambda = 0.80, $F(6, 546) = 22.53$, $p < 0.001$, $\eta^2 = 0.198$; verbal ability, Wilks' Lambda = 0.85, $F(6, 546) = 16.54$, $p < 0.001$, $\eta^2 = 0.154$; numerical ability, Wilks' Lambda = 0.78, $F(6, 546) = 25.89$, $p < 0.001$, $\eta^2 = 0.221$; psychoticism, Wilks' Lambda = 0.96, $F(6, 546) = 3.61$, $p < 0.01$, $\eta^2 = 0.038$; conscientiousness, Wilks' Lamda = 0.96, $F(6, 546) = 3.49$, $p < 0.01$, $\eta^2 = 0.037$.

Because of the effects of listwise deletion of missing cases on statistical power, we used multiple regression analyses to examine the best predictors of performance in each subject. Subject scores were regressed on gender (block 1), verbal and numerical ability (block 2), followed by C and P in the third block (see Table 3). Neither C nor P significantly predicted AP in Math. C was a significant predictor of performance in English, Religious studies, Visual art, and Design such that C was related to improved performance. On the other hand, P significantly predicted poor outcomes in Science. Both C and P were significant predictors of Total grade as well as outcomes in Design. Across the individual subjects, C explained 10.2% additional variance, whereas P explained 2.3% additional variance. With respect to Total grade, C explained a greater proportion of the variance than did P.

3.4. Personality change and school performance

In order to determine whether changes in personality from Time 1 to Time 2 affected Time 2 grades, we calculated the residual scores for P and C. We then regressed individual subject and total grade scores on gender, verbal and numerical ability, C_{change}, and P_{change} (see Table 4). These results show that the effect of personality change on grades was strongest for C. Increases in C over time were significantly associated with improved AP in English, Math, Science, Design, and Total grade. Increases in P over time were significantly related to poorer outcomes in English, Religious studies, and Design. Changes in P were not significantly associated with Total grade.

4. Discussion

Several studies to date have shown that psychoticism (from the Gigantic Three) and conscientiousness (from the Big Five) are consistent personality predictors of AP. As P and C are not usually included in the same set of predictor variables, and as the extent to which they might overlap in their prediction of AP remains unresolved, we assessed their longitudinal impact on the AP of young teenagers in a number of different school subjects.

It was found that P was negatively and C positively related to school performance. This supports many previous studies into the correlates of these personality dimensions (e.g. Diseth,

Table 3
Significant predictors of school performance

Subject (Time 2)	Predictors (Time 1)	β	t	R^2
English	Gender	0.19	5.39***	0.102
	Verbal ability	0.45	8.87***	0.394
	Numerical ability	0.13	2.67**	0.401
	C	0.08	2.25*	0.406
	P	0.02	0.53	0.407
Religious studies	Gender	0.23	6.32***	0.107
	Verbal ability	0.23	4.53***	0.337
	Numerical ability	0.32	6.41***	0.377
	C	0.08	2.21*	0.386
	P	−0.03	−0.85	0.387
Mathematics	Gender	0.13	3.90***	0.04
	Verbal ability	0.15	3.08***	0.352
	Numerical ability	0.54	11.73***	0.470
	C	0.05	1.36	0.473
	P	−0.01	−0.38	0.473
Science	Gender	0.04	1.20	0.03
	Verbal ability	0.30	6.19***	0.383
	Numerical ability	0.38	8.12***	0.439
	C	0.06	1.75	0.451
	P	−0.11	−2.96**	0.459
Visual art	Gender	0.34	8.22***	0.174
	Verbal ability	0.17	2.90**	0.248
	Numerical ability	0.11		0.253
	C	0.15	3.45**	0.275
	P	−0.01	−0.30	0.276
Design	Gender	0.30	7.84***	0.181
	Verbal ability	0.15	2.64**	0.233
	Numerical ability	0.07	1.36	0.235
	C	0.17	4.09***	0.286
	P	−0.14	−3.31***	0.298
Total grade	Gender	0.25	8.32***	0.158
	Verbal ability	0.33	7.28***	0.523
	Numerical ability	0.35	7.96***	0.570
	C	0.12	3.84***	0.593
	P	−0.07	−2.02*	0.596

*$p < 0.05$; **$p < 0.01$; ***$p < 0.001$.

2003; Lounsbury et al., 2003; Petrides et al., 2005). However, once gender and ability were controlled for, the impact of these personality dimensions on grades was considerably reduced. P and C explained unique, albeit small, additional variance in AP (Table 3). The impact of the personality variables varied, C explaining significant additional variance across four of the six subjects including Total grade, whereas the effect of P was limited to two subjects only, namely, Science

Table 4
Significant predictors of school grades using residuals of P and C

Subject (Time 2)	Predictors (Time 1)	Residual scores	β	t	R^2
English	Gender		0.18	5.31***	0.101
	Verbal ability		0.44	8.84***	0.389
	Numerical ability		0.14	2.84**	0.396
		C change	0.09	2.76**	0.409
		P change	−0.07	−1.98*	0.413
Religious studies	Gender		0.23	6.73***	0.105
	Verbal ability		0.23	4.48***	0.330
	Numerical ability		0.33	6.57***	0.370
		C change	0.04	1.30	0.377
		P change	−0.10	−2.80**	0.384
Mathematics	Gender		0.13	4.10***	0.040
	Verbal ability		0.15	3.09***	0.348
	Numerical ability		0.54	11.76***	0.465
		C change	0.11	3.49**	0.479
		P change	−0.03	−0.90	0.480
Science	Gender		0.09	2.64**	0.033
	Verbal ability		0.31	6.44***	0.378
	Numerical ability		0.37	7.78***	0.435
		C change	0.07	2.18*	0.439
		P change	0.02	0.55	0.439
Visual art	Gender		0.36	9.10***	0.173
	Verbal ability		0.19	3.07**	0.244
	Numerical ability		0.11	1.78	0.249
		C change	0.06	1.54	0.251
		P change	0.03	0.65	0.252
Design	Gender		0.35	9.24***	0.179
	Verbal ability		0.17	2.96**	0.231
	Numerical ability		0.08	1.47	0.233
		C change	0.08	2.10*	0.246
		P change	−0.11	−2.74**	0.255
Total grade	Gender		0.28	9.28***	0.157
	Verbal ability		0.32	7.03***	0.517
	Numerical ability		0.36	8.15***	0.564
		C change	0.10	3.31***	0.578
		P change	−0.06	−1.85	0.581

* $p < 0.05$; ** $p < 0.01$; *** $p < 0.001$.

and Design. Likewise, our results suggest that changes in P and C over time are associated with school grades at Time 2, such that those students who experience the greatest increase in P at Time 2 are also likely to have the poorest grades, whereas those who experience the greatest increases in C are likely to have the best outcomes. Changes in C appeared to have a greater effect on grades than changes in P.

Conscientiousness was a relatively stronger predictor of outcomes in the non-traditional academic subjects (Visual art and Design). One possible explanation for this is that these subjects place more emphasis on creativity and attain this by tapping into students' feelings, experiences, and opinions, rather than emphasizing academic knowledge and rigorous content as in subjects such as Science or Math, where performance is more reliant on ability. Thus, performance in Visual art and Design is more likely to be determined by the sorts of personality dimensions assessed in the present study.

These data suggest that global personality dimensions such as P and C have a very modest longitudinal effect on the school performance of youth, once gender and ability have been controlled for. This is not to minimize the importance of personality. Indeed, it is highly likely that facet scales of P and C are likely to be influential, possibly including measures such as achievement striving, self-discipline, and order (conscientiousness), and risk-taking and impulsiveness (psychoticism). Aluja-Fabregat and Blanch (2004) found, among a sample of 13-year-olds, that self-discipline was a significant predictor of AP, suggesting that self-discipline is associated with good study habits. It was also found that controlling for measured study habits reduced the impact of personality. Likewise, Paunonen and Ashton (2001) found that some facet scales predict behaviour better than global personality dimensions. Such a view accords with that of Farsides and Woodfield (2003) who, employing all of the Big Five factors in their longitudinal study, concluded that the overall impact of these dimensions on AP, once intelligence had been accounted for, was relatively modest.

How does one reconcile our disappointing results regarding the P dimension with those of Petrides et al. (2005) among British school students? One explanation for these observed differences may be that, in the London study, students were between two and four years older than those of the present study. Our results are based on younger teenagers and a short time-span of only one year. As we plan to continue tracking our participants, we shall be in a good position to examine the impact of P and C over a longer period, assessing their influence on AP across all of the high school years.

Acknowledgements

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