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## Personality and school performance: Incremental validity of self- and peer-ratings over intelligence

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### Abstract

This paper examines the relationship of self and other-assessed personality with school grades in 255 (88 male) Croatian pupils. Conscientiousness was the strongest personality correlate of school grades for both self and peer-ratings. Grades were also negatively correlated with self-assessed Extraversion and Emotional Stability, and positively correlated with peer-ratings of Autonomy. When cognitive ability was partialled out correlations between personality and school grades showed little change, indicating that the effects of personality on academic performance were independent of intelligence. Hierarchical regressions indicated that personality accounted for unique variance in school grades: 18% by self- and 25% by peer-ratings. Self-ratings had only marginal incremental validity over peer-ratings in predicting school grades (3%), while incremental validity of peer- over self-ratings was larger (9%).

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*Keywords:* Personality traits; Big five; School performance; Intelligence; Peer-ratings

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## 1. Introduction

Although academic performance (AP) has been the validity criterion for ability tests for over a century (Brody, 2000; Cronbach, 1949) an increasing number of studies have recently indicated that individual differences in AP can also be explained by personality traits (Busato, Prins, Elshout, & Hamaker, 2000; Chamorro-Premuzic & Furnham, 2003a, 2003b, 2004, 2005; Furnham, Chamorro-Premuzic, & McDougall, 2003; Petrides, Chamorro-Premuzic, Frederickson, & Furnham, 2005).

Research into the trait correlates of AP has no doubt been prompted by the growing consensus of the idea that personality can be best understood in terms of the Five Factor or “big five” model, which posits that individual differences are a function of Neuroticism/Emotional Stability, Extraversion, Agreeableness, Conscientiousness, and Openness to Experience. Whilst the first four dimensions are well established (e.g., Costa & McCrae, 1992; Goldberg, 1992; Matthews & Deary, 1998), the meaning of Openness or “factor V” is debated. The most widely-used measure of the big five, NEO-PI-R (Costa & McCrae, 1992) emphasizes the creative and artistic profile of high Openness scorers (McCrae, 1994; McCrae & Costa, 1997a, 1997b). However moderate correlations between Openness and intelligence measures have increased speculation of the possibility that factor V is an indicator of intellectual competence (Ashton, Lee, Vernon, & Jang, 2000; Austin, Deary, & Gibson, 1997; Bates & Shieles, 2003; Brand, 1994; Chamorro-Premuzic, Moutafi, & Furnham, 2005; Demetriou, Kyriakides, & Avraamidou, 2003; DeYoung, Peterson, & Higgins, 2005; Gignac, 2005; Harris, Vernon, Olson, & Jang, 1999). Accordingly, studies have shown that Openness is positively correlated with AP (see Chamorro-Premuzic & Furnham, 2005 for a recent review). Five Factor Personality Inventory (FFPI) (Hendriks, Hofstee, & De Raad, 1999) conceptualizes factor V as “Autonomy” and assesses it through items such as “wants to form his/her opinions”, “analyzes problems”, and “copies others” (inverted). The theoretical background of the FFPI is the Abridged Big Five Circumplex model (Hofstee, De Raad, & Goldberg, 1992; see also Johnson, 1994). Autonomy is neither conceptually, nor empirically identical to the Openness factor. De Fruyt, Mc Crae, and Szirmak (2004) correlated the FFPI with the NEO-PI-R facets (Costa & McCrae, 1992) in Belgian, American and Hungarian samples. Autonomy was not clearly related to Openness, and facet analysis suggested that it might be better interpreted as a dominance factor (see also Hendriks, Hofstee, & De Raad, 2002; Perugini & Ercolani, 1998; Rodriguez-Fornells, 2001). Whilst Hendriks et al. (1999) reported correlations in the region of  $r = .15$  to  $r = .20$  between Autonomy and educational background, the importance of Autonomy in educational settings is yet to be demonstrated.

The most consistent personality predictor of AP is Conscientiousness (Blickle, 1996; Busato et al., 2000; Chamorro-Premuzic & Furnham, 2003a, 2003b; De Raad, 1996; Furnham et al., 2003; Hirschberg & Itkin, 1978), a trait referring to individuals’ level of dutifulness, achievement striving and organization. Importance of Conscientiousness in educational settings is self-explanatory: Being organized, disciplined and motivated to succeed has no doubt beneficial effects on students’ study habits, affecting their level of effort and commitment with the course.

The educational implications of the other big five traits are less clear. For example, some have argued that high Neuroticism is detrimental for AP because it increases the chances of experiencing test anxiety, which is in turn likely to impair performance on school examinations (Busato et al., 2000; Cattell & Kline, 1977; Chamorro-Premuzic & Furnham, 2003a, 2003b; Hembree,

1988; Lathey, 1991). However, others suggested that the higher levels of worry and perfectionism that characterize neurotic individuals may lead to better preparation and higher performance, in particular under non-arousing conditions (Eysenck & Eysenck, 1985; Matthews, Davies, Westerman, & Stammers, 2000; Zeidner, 1998).

The personality trait of Extraversion has also been inconsistently associated with indicators of AP, with some studies showing a positive (Furnham & Medhurst, 1995; Chamorro-Premuzic & Furnham, 2003a), others a negative (Anthony, 1973; Chamorro-Premuzic & Furnham, 2003b; Child, 1964; Eysenck & Eysenck, 1985) correlation with academic achievement. From secondary school onwards most correlations between Extraversion and AP appear to be negative though (Petrides et al., 2005; Furnham et al., 2003). This pattern of results may reflect the passage from the more informal, interactive, class-oriented environment of primary school to the more academic, knowledge-based and study-oriented context of secondary school and higher education (Rolfhus & Ackerman, 1999). Alternative explanations point in the direction of developmental changes in the ability-Extraversion correlation, such that brighter individuals become more introverted over time and vice-versa (Anthony, 1973; Eysenck & Cookson, 1969; Wolf & Ackerman, 2005).

One frequent problem is that studies into personality and AP have typically failed to account for the effects of ability. Such failure has largely undermined the implications of significant personality correlates of AP, leading sceptics – in particular IQ researchers – to wonder how much of the variance in AP would have still been explained by personality had IQ scores been considered. Theoretically, failure to account for individual differences in ability may be justified by the fact that, Openness aside, there is only a modest overlap between personality and intelligence measures (Ackerman & Heggestad, 1997; Chamorro-Premuzic & Furnham, 2005; Eysenck, 1994; McCrae & Costa, 1997a). Empirically, evidence is mixed, with some studies indicating personality has incremental validity over ability in the prediction of AP (Furnham et al., 2003; Petrides et al., 2005), but others showing it does not (Gagne & St Pere, 2001).

A second problem is that studies of personality and AP typically use self-ratings of traits. Most researchers have used self-report inventories because they are convenient and because they believe that people have a unique perspective of their own private experiences and history of behaviors. However, self-ratings can be inaccurate because people may present themselves in an unrealistically positive light (Paulhus, 1991; Paulhus & John, 1998; Hendriks et al., 1999), or their position of an “actor” can bias their perception of their own consistent personality attributes (Kolar, Funder, & Colvin, 1996). Other-rating data, although influenced by many other factors than by the traits themselves (e.g. by the relationship between rater and ratee), can be less susceptible to distortions caused by defensiveness and self-presentational strategies (McCrae, 1994). Hofstee (1994) argues that self-judgment can be improved even by taking the psychological position of an observer. Peer-ratings consistently show a substantial correlation with self-rating data (Funder & Colvin, 1997), and their validity was widely demonstrated (e.g. Funder, 1987; Kenny, 1991). Therefore, adding peer- to self-ratings seems useful and may tell us more about the personality than either could separately.

The above reviewed literature shows that (a) although some personality traits are consistent predictors of AP, the predictive validity of most big five traits remains to be replicated; (b) few studies have controlled for ability when examining the predictive validity of the big five in the context of school education; and (c) no study examined the incremental validity of peer-ratings of the

big five personality traits as predictors of school grades. Thus the following hypotheses will be tested:

H1: Conscientiousness (H1a), Autonomy (H1b), and Emotional Stability (H1c) will be positively correlated with school grades, whilst Extraversion (H1d) will be negatively related to school grades.

H2: Correlations between personality traits and AP will be significant even when intelligence is partialled out and included in the regression, indicating that personality has incremental validity in the prediction of AP.

H3: Peer-ratings of personality will account for additional variance in school grades because socially desirable responding and faking are more likely to occur in self than in other-assessed personality.

## 2. Method

### 2.1. Participants and procedure

Participants were 255 (88 males and 167 females) Croatian school pupils, of which 158 attended a general, 52 a scientific, and 45 a humanistic curriculum. All pupils however undertook the same courses, differing only in the number of hours per week for each subject matter. Participants' age ranged from 15 to 18 years ( $M = 16.2$ ;  $SD = .70$ ). Personality and ability data were collected during the first week of the second semester in two sessions, each comprising 1 h. Self- and peer-ratings of personality were collected during the first session, where each target was rated by a classmate sitting next to him/her. All raters knew the target for at least one year, and stated ("yes/no") that they were able to rate the targets' personality accurately. Ability data was collected during the second session. School grades were collected from the archives.

### 2.2. Measures

(1) School achievement: Grades (from 1 = lowest to 5 = highest) were collected blindly for 15 courses: Croatian language and literature, English language and literature, German language and literature, music, painting, psychology, logic, sociology, history, geography, mathematics, physics, chemistry, biology, and informatics. PCA of the 15 mean course grades yielded three Eigenvalues  $>1$  (7.78, 1.23, and 1.16). The first component accounted for 52% of the grades' variability, and its correlation with course grades was larger than .60 for all of the courses' grades, except for painting (.26), and informatics (.42). Therefore, MSG was calculated for each of the participants as mean of the 15 mean course grades.

(2) Intelligence: Participants completed the following ability tests:

(a) The fourth sub-test of the Multifactor Test Battery – MFBT (Tarbuk, 1977), which is a Croatian adaptation of the fourth sub-test of The General Aptitude Test Battery (GATB) and measures vocabulary – i.e., knowledge and meaning of the words. It comprises 60-items that consist of four words, which participants need to identify as either synonyms or antonyms. The test has split-half reliability of .92 (Tarbuk, 1977).

(b) Serial numbers (Bujas & Petz, 1967), which measures reasoning ability through numerical symbols. Its 15 items consist of numerical sequences organized according to a hidden algorithm which participants must identify by adding 2 or 4 missing numbers. The sub-test is reliable (.90), and highly saturated with the *g* factor (Bujas & Petz, 1967).

(c) The Surface Development Test – Vz 3 (French, Ekstrom, & Price, 1963), which measures visualization – the ability to manipulate or transform the image of spatial pattern into other visual arrangements. This test is significantly correlated with fluid intelligence and its reliability is .90 (Bratko, 1996).

(d) An adaptation of the Thurstone First Letter Test (Momirović & Kovačević, 1970), which measures word fluency – the ability to produce isolated words (without reference to their meaning). Participants were given a 3-min period to write as many words beginning with the letter P as they could. The procedure was repeated with the letter S. The estimated reliability of this test is .92 (Bratko, 1996).

The four ability tests correlated substantially and PCA yielded one factor with an Eigenvalue >1 (1.50), which accounted for 37.5% of the variance and was labelled intelligence and retained for further analyses. The correlation of the first unrotated component with the four tests was .62, .73, .39, and .66 for the vocabulary, serial of numbers, word fluency, and visualization sub-tests, respectively.

(3) Personality: The Five Factor Personality Inventory – FFPI (Hendriks et al., 1999) assesses the five major dimensions of personality (Extraversion, Agreeableness, Conscientiousness, Emotional Stability, and Autonomy) through 100-items which are answered on a five point Likert-type scale (“not at all applicable” to “entirely applicable”). High scorers on Extraversion tend to be active, uninhibited, and sociable. High scorers on Agreeableness tend to be generous, soft-hearted, warm and forgiving. High scorers on Conscientiousness tend to be organized, achievement-oriented, reliable and hard-working. High scorers on Emotional Stability tend to be stable, confident, and content. High scorers on Autonomy tend to be critical, non-conforming, and philosophical. Recent cross-cultural evidence indicates that the FFPI has an invariant five-factor structure in 13 different countries, including Croatia (Hendriks et al., 2003). The reliability estimates for the Croatian normative sample showed Cronbach  $\alpha$ 's of .91, .84, .87, .86, and .84 for self-reported Extraversion, Agreeableness, Conscientiousness, emotional stability, and Autonomy scales, respectively. The respective estimates for peer-ratings were .91, .89, .89, .84, and .84 (Bratko, unpublished, based on a sample of  $N = 680$ ). The raw scale scores of FFPI scales were highly inter-correlated, up to  $r = .68$  in the self-rating and  $r = .57$  in the peer-rating data. To minimize the risk of spurious correlations, the raw scores were transformed into the anchored factor scores (Hofstee & Hendriks, 1998), using the item weights established across 13 cultures (Hendriks et al., 2003). After transformation, the inter-correlations of the FFPI scales were smaller, up to  $r = .30$  in the self-ratings, and  $r = .29$  in the peer-ratings.

### 3. Results

MSG, intelligence, and personality were normally distributed. The zero-order correlations between self- and peer-ratings were .63, .42, .56, .38, and .41 for Extraversion, Agreeableness, Conscientiousness, Emotional stability, and Autonomy dimensions, respectively ( $p < .01$  for all

correlations). Whereas these correlations could be considered as validity indices, the present study was partly aimed at comparing the predictive power of self- and peer-ratings and it should therefore be emphasized that these correlations were smaller than the reliabilities of the particular dimensions. Thus, both self- and peer-ratings have a substantial portion of reliable unique variance.

Zero-order correlations of all variables included in the study are presented in Table 1. The correlation between intelligence and MSG was high ( $r = .49$ ;  $p < .01$ ). Partial correlations (controlling for intelligence) between self-ratings and MSG were  $-.19$ ,  $-.06$ ,  $.46$ ,  $-.19$ , and  $-.01$  for Extraversion, Agreeableness, Conscientiousness, Emotional stability, and Autonomy, respectively ( $p < .01$  for Extraversion, Conscientiousness, and Emotional stability dimensions). The same correlations for peer-ratings were  $-.13$ ,  $.00$ ,  $.57$ ,  $-.01$ , and  $.14$  for Extraversion, Agreeableness, Conscientiousness, Emotional stability, and Autonomy, respectively ( $p < .01$  for Conscientiousness;  $p < .05$  for Extraversion and Autonomy). Thus, MSG was positively correlated with both self- and peer-assessed Conscientiousness (confirming H1a), as well as peer-rated Autonomy (partly supporting H1b); there were also negative correlations between MSG and self-rated Emotional Stability (H1c was therefore not supported<sup>1</sup>), as well as self-rated Extraversion (partial support for H1d). Support for H1 was mixed, but correlations between personality and MSG tended to increase when intelligence was partialled out, yielding support for H2.

Hierarchical regressions were then performed to test the incremental validity (over intelligence) of self and peer-ratings of personality (see Table 2). Sex and age were introduced in the first step and predicted only 1% of the variance of MSG. Intelligence was introduced in the second step and predicted 24%. When self-ratings of the big five were added in the third step, the amount of predicted variance increased substantially, explaining an additional 17% of the total variance (this further supported H2). When peer- instead of self-ratings were entered in the third step, the prediction was more accurate, accounting for 26% of unique variance. In the fourth step, when peer-ratings were added after the self-ratings, the amount of explained variance increased by 9%. On the other hand, introducing self- over peer-ratings only marginally increased prediction (this supported H3). Although significant at the  $p < .05$  level, this model only accounted for 3% of unique variance.

#### 4. Discussion

Despite the limitations of the present study, which analyzed correlational data from a relatively small sample in a specific educational system, our findings suggest that the impact of personality traits on school performance is independent of cognitive ability, and that personality is a more accurate predictor of AP when assessed through peer- rather than self-ratings of the big five. As in previous studies, Conscientiousness was the most significant personality correlate of AP – and in fact the only trait to match the predictive power of intelligence and be significantly associated with MSG in both self- and peer-ratings. It is noteworthy that the predictive power of

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<sup>1</sup> The possibility of a curvilinear relationship between Emotional Stability (ES) and AP was also discarded as an intermediate level of ES was associated with a MSG of 3.89, which was higher than the MSG for the upper 15% of ES scorers (3.76), but lower than the MSG for the lower 15% of ES scorers (3.97).

Table 1  
Zero-order correlations between sex, age, MSG, intelligence, and self- and peer-ratings of personality

	Sex	Age	Intelligence	MSG	Self-ratings					Peer-ratings					
					E	A	C	ES	A	E	A	C	ES	A	
Sex		-.04	-.22**	.08	.10	.15*	.14*	-.30**	-.19	.15*	.17**	.17**	-.11	.07	
Age			-.03	-.09	-.02	-.02	-.01	-.03	.02	-.06	.04	.06	.01	-.01	
Intelligence				.49**	-.09	-.02	-.04	.08	.06	.00	.12	.13*	.09	.29**	
Mean school grades					-.19**	-.06	.38**	-.13*	-.03	-.11	.05	.54**	.05	.26**	
Self-ratings															
Extraversion							-.14*	-.30**	.11	.07	.62**	-.22**	-.34**	.06	.09
Agreeableness								.03	-.05	.02	-.09	.39**	.00	-.12	-.12
Conscientiousness									-.04	-.16**	-.23**	-.00	.54**	-.12	-.01
Emotional stability										-.09	-.05	-.06	-.17**	.42**	-.10
Autonomy											.22**	-.11	-.11	-.08	.29**
Peer-ratings															
Extraversion												-.12	-.29**	.07	.27**
Agreeableness													.18**	.08	.11
Conscientiousness														.01	.02
Emotional stability															-.10
Autonomy															

$N = 255$ .

\*  $p < .05$ .

\*\*  $p < .01$ .

Table 2  
 Hierarchical regressions: intelligence, self- and peer-rated personality as predictors of MSG

	$\beta$	$t$	Model summary
<i>Step 1</i>			
Sex	.08	1.21	Adj. $R^2 = .01$ $F(2, 249) = 1.66$
Age	-.08	-1.32	(MS = .77, .46)
<i>Step 2</i>			
Sex	.19	3.5**	Adj. $R^2 = .28$ $F(3, 248) = 32, 28^{**}$
Age	-.06	-1.15	(MS = 10.94, .34)
Intelligence	.53	9.51**	$R$ square change ( $\Delta R$ ): intelligence – $\Delta R = .27^{**}$
<i>Step 3</i>			
Sex	.16	2.96**	Adj. $R^2 = .42$ $F(6, 246) = 30.32^{**}$
Age	-.07	-1.41	(MS = 6.59, .26)
Intelligence	.53	10.92**	$R$ square change ( $\Delta R$ ): self-rated personality – $\Delta R = .17^{**}$
Self-rated extraversion	-.12	2.39*	
Self-rated agreeableness	-.08	-1.60	
Self-rated conscientiousness	.35	6.86**	
Self-rated emotional stability	-.09	-1.69	
Self-rated autonomy	.04	.76	
<i>Step 3</i>			
Sex	.10	2.06	Adj. $R^2 = .49$ $F(6, 246) = 41.44^{**}$
Age	-.08	-1.81	(MS = 7.58, .22)
Intelligence	.41	8.34**	$R$ square change ( $\Delta R$ )
Peer-rated extraversion	-.06	-1.25	Peer-rated personality – $\Delta R = .24^{**}$
Peer-rated agreeableness	-.06	-1.23	
Peer-rated conscientiousness	.48	9.87**	
Peer-rated emotional stability	.04	.94	
Peer-rated autonomy	.13	2.60**	
<i>Step 4</i>			
Sex	.10	1.93	Adj. $R^2 = .52$ $F(13, 238) = 22.00^{**}$
Age	-.08	-1.74	(MS = 4.91, .22)
Intelligence	.43	8.79**	
Self-rated extraversion	-.04	1.57	$R$ square change ( $\Delta R$ )
Self-rated agreeableness	-.02	-.45	Peer-rated Personality – $\Delta R = .09^{**}$
Self-rated conscientiousness	.17	2.97**	
Self-rated emotional stability	-.05	1.05	
Self-rated autonomy	.02	.30	$R$ square change ( $\Delta R$ )
Peer-rated extraversion	.00	.01	Self-rated personality – $\Delta R = .03^*$
Peer-rated agreeableness	-.05	-.98	
Peer-rated conscientiousness	.36	6.34**	
Peer-rated emotional stability	.08	1.54	
Peer-rated autonomy	.11	2.11*	

$N = 255$ .

Note: MS = mean square for particular  $F$ -value.

\*  $p < .05$ .

\*\*  $p < .01$ .



Conscientiousness increased substantially when assessed by peer-ratings, suggesting that socially desirable responding may undermine the validity of self-rated Conscientiousness. Results also indicated that combining measures of Conscientiousness with intelligence is likely to be advantageous when it comes to predicting AP.

Whether and how other big five traits contribute to/ought to be included in the prediction of school success remains a question for future research. From the present results, it seems unlikely that Emotional Stability, Extraversion, and Autonomy are (even if combined) as relevant in educational settings as are Conscientiousness or intelligence: Either because their associations with MSG are likely to be modest (in the case of Extraversion and Autonomy), or because of the “changing” direction of these associations (in the case of Emotional Stability). An interesting finding emerging from this study is that, whilst cognitive ability seems unlikely to moderate the effects of personality on AP, such effects are partly a function of the way in which personality traits are assessed.

Most notably, the relationship between Autonomy and MSG changed from non-significant in self-ratings to significant in peer-ratings, whereas the opposite occurred with Emotional Stability and Extraversion. Thus pupils’ potential for AP was reflected more clearly in other- than self-ratings of Autonomy, whereas self-ratings of Emotional Stability were more accurate predicting MSG than were peer-ratings of the same dimensions. In the case of autonomy, the higher validity of peer-ratings may suggest that self-ratings of this trait (as those of Conscientiousness) tend to be inflated by socially desirable responding. Conversely, one may interpret the higher validity of self-rated Emotional Stability and Extraversion in terms of the lower desirability of *low* scores on these traits. Thus targets may attempt to “look” more extraverted and stable in the eyes of their classmates, but more conscientious and autonomous in the “eyes” of personality tests. Our recommendations for applied and theoretical educational researchers are to include measures of social desirability, alongside both peer- and self-ratings of personality, in future designs aimed at exploring the determinants of educational success and failure.

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