Personality and Intelligence

The Relationship of Eysenck's Giant Three with Verbal and Numerical Ability

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Abstract. This paper explores the relationship between Eysenckian personality, as operationalized by the Eysenck Personality Profiler (EPP), and verbal and numerical ability. A total of 118 (87 female) working adults participated in the study. Bivariate correlations showed that numerical ability was negatively associated with Caution, whereas verbal ability was negatively associated with Neuroticism, Introversion, and Dissimulation. Two hierarchical regressions showed that the EPP variables (primarily Dissimulation) were significant predictors of verbal, but not Numerical ability, accounting for 30% of the total variance. Theoretical and applied implications for the personality-intelligence interface are discussed, particularly in regards to Chamorro-Premuzic and Furnham's (2004) intellectual competence model.

Keywords: personality, Eysenck, Giant Three, intelligence, verbal ability, numerical ability

Psychological conceptualizations in differential psychology have traditionally distinguished between personality and ability in terms of psychometric methods, i.e., self-report vs. objective performance tests (Cronbach, 1949), as well as underlying noncognitive and cognitive processes (Matthews, Davies, Westerman, & Stammers, 2000). Thus, empirical correlations between the two domains are primarily understood in terms of the "stylistic effects" of personality traits on IQ test performance (Eysenck & Eysenck, 1985; Wechsler, 1950; see also Furnham, Forde, & Cotter, 1998a, b), although long-term effects of personality on the development of crystallized intelligence (*gc*) have also been emphasized (Chamorro-Premuzic & Furnham, 2003a, b; Cattell, 1971; Snow, 1995).

In an attempt to integrate findings and provide a conceptual framework for understanding not only the personality and intelligence interface, but also different individual difference determinants of human performance, notably in academic and occupational settings, Chamorro-Premuzic and Furnham (2004) proposed a two-level hierarchical model for understanding interactions between cognitive abilities and personality traits (see Figure 1). This model, recently referred to as "intellectual competence" (IC; Chamorro-Premuzic & Furnham, 2006), distinguishes between actual ability or ability as capacity (which cannot be measured directly) and tested ability or ability as performance output, which is measured through standardized psychometric tests, such as IQ.

Theoretically, this distinction is important to explain how certain personality traits, i.e., Neuroticism and Extraversion, may only affect test performance/ability as output, while others, i.e., Openness, Typical Intellectual Engagement, and Conscientiousness, may have a wider impact on "actual" intelligence/ability as capacity, influencing the development and acquisition of adult skills and knowledge (notably *gc*).

IC also conceptualizes the possible influence of cognitive ability, particularly biological or fluid intelligence (*gf*), on personality, expanding the scope of the relationship between nonability and ability traits by reversing the causal direction of the relationship. Thus, Conscientiousness (a trait which refers to individual differences in responsibility, achievement striving, and dutifulness) has been partly regarded as a compensational effort resulting from lower levels of *gf*, particularly in highly competitive settings (Moutafi, Furnham, & Paltiel, 2004).

Although most aspects of this model have already been tested (Ackerman & Heggestad, 1997; for a review see Chamorro-Premuzic & Furnham, 2006), studies have tended to focus on the Big-Five personality framework, notably the NEO-PI-R or NEO-FFI inventories. There remains some debate as to the number of personality dimensions required for a comprehensive and parsimonious account of normal adult personality, with some researchers advocating three-factor solutions (e.g., Eysenck, 1991, 1992) and others advocating five-factor solutions (Costa & McCrae, 1992a, b). While the past 10 years have been characterized by a growing preference for a five-factor framework, and even though Chamorro-Premuzic and Furnham's (2004) model is based mainly on

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the Big Five (largely because of the central role of the "investment" traits of Openness and Conscientiousness), the effects of personality traits on tested intelligence can equally be examined with the Giant Three (Jackson, Furnham, Forde, & Cotter, 2000; Petrides, Chamorro-Premuzic, Frederickson, & Furnham, 2005; Roy, 2003).

On the other hand, few studies have jointly examined the relationship between established personality traits and different aspects of cognitive ability, such as *gf* and *gc* (which represent a central aspect in the two-level model), and such studies have largely focused on student samples, in particular psychology undergraduates. Hence, the present study will look at an adult, working, population, seeking to investigate the relationship of the Giant Three personality dimensions (e.g., Eysenck & Eysenck, 1985) with verbal and numerical abilities. The latter two are broadly viewed as proxies for *gc* and *gf*, respectively.

The present study is based on the Eysenck Personality Profiler (EPP), which assesses Emotional Stability, Introversion, Caution, and Dissimulation. The last of these variables attempts to assess the extent to which participants provide sociably desirable or exaggeratedly agreeable responses. The present study also looks at the association between cognitive ability and number of "can't decide" responses, as previous studies found that the "can't decide" score from the EPP was negatively correlated with cognitive ability, as operationalized by the Wonderlic Personnel (intelligence) Test (Furnham et al., 1998a).

Based on the two-level framework of IC (Chamorro-Premuzic & Furnham, 2004), we hypothesized the following:

1. Emotional Stability (low Neuroticism) and Introversion (low Extraversion) will be positively related to cognitive ability test scores, both verbal and numerical. This would confirm the greater tendency of both neurotic and introverted individuals to experience higher test anxiety and lower confidence and self-assessed intelligence, both of which impair IQ test performance and moderate the effects of actual ability on cognitive test performance (see also Moutafi, Furnham, & Tsaousis, 2006). For the same reason, the number of "can't decide" responses will be negatively related to cognitive ability scores, as dithering should impair performance on IQ tests.
2. Caution (low Psychoticism) will be negatively related to numerical intelligence, which is a component of *gf*. This would be consistent with the idea that higher Conscientiousness (a component of Caution) would partly develop as a compensatory mechanism for lower innate ability (see Chamorro-Premuzic & Furnham, 2004; Moutafi, Furnham, & Crump, 2003). No significant correlations between Caution and verbal intelligence are predicted.
3. Dissimulation will be negatively related to both measures of cognitive ability. This would confirm previous findings showing that lying and faking are more typical in low IQ individuals (e.g., Furnham, 2002; Furnham et al., 1998a).

Method

Participants and Procedure

A total of 118 job applicants (87 female) in New Zealand took part in this study. Gender differences in psychometric measures are reported in Table 1. Age ranged from 17 to 53 years ($M = 32.2$, $SD = 9.88$). All respondents completed the three inventories as part of a staff selection procedure and were offered individualized feedback weeks after completing the measures.

Materials

Eysenck Personality Profiler (EPP; Eysenck, Barrett, Wilson, & Jackson, 1992). This self-report inventory assesses Emotional Stability (low Neuroticism), Introversion (low Extraversion), and Caution (low Psychoticism). It also includes a scale relating to Dissimulation or "faking-good." The EPP comprises 420 items, measuring the three Eysenckian personality dimensions via 21 primary facets. Participants respond on a three-point scale ("yes," "no," and "can't decide"). Evidence in support of the validity and reliability of this instrument has been published is several studies in the literature (Eysenck, 1992; Wilson & Jackson, 1994).

Employee Aptitude Survey (EAS; verbal intelligence). This is a timed test of verbal ability, a component of *gc*. More specifically, this subtest of the full EAS includes 10 distinct ability scales. Participants are given a series of facts and must choose whether the conclusions presented are true or false. Reliability and validity data for this subtest can be found in Ruch & Ruch (1980).

Employee Aptitude Survey (EAS; numerical intelligence). This is a timed measure of numerical ability, a component of *gf*. The scale represents another subtest of the full EAS and presents participants with a series of multiple-choice problems. Data about the reliability and validity of this subtest can be found in Ruch and Strang (1983).

Results

Verbal ability scores were positively correlated with Emotional Stability ($r = .32, p < .01$) and Dissimulation ($r = .41$, $p < .01$), and negatively with Introversion ($r = –.21$, $p < .05$), whereas numerical ability scores were negatively correlated with Caution ($r = –.21$, $p < .05$) and number of "can't decide" responses ($r = –.19$, $p < .05$). In addition, the number of incorrect responses on the numerical ability test correlated positively with Dissimulation ($r = .22$, $p < .05$). Partialing out gender had no effect on the correlations between personality and intelligence. All correlations are shown in Table 1.

Table 1. Correlations between the EPP major factors, EAS scores (V = verbal; N = numerical), and gender

	EAS (V) correct		EAS (V) incorrect		EAS (V) total		EAS (N) correct		EAS (N) incorrect		EAS (N) total	
Stability	.27**	(.25**)	–.28**	(–.27**)	**.32****	(.31**)	.10	(.09)	.01	(.01)	**.10**	**(.09)**
Introversion	–.10	(–.07)	.28**	(.26**)	**–.21***	(–.19*)	.10	(.10)	.17	(.17)	**.06**	**(.06)**
Caution	–.11	(–.08)	–.03	(–.05)	**–.05**	(–.03)	–.22*	(–.21*)	.04	(–.04)	**–.21***	**(–.20*)**
Dissimulation	–.34**	(–.33**)	.37**	(.36**)	**.41****	(–.40**)	–.11	(–.12)	.22*	(.21*)	**–.15**	**(–.16)**
Can't decide	–.10	(–.10)	.07	(.08)	**–.14**	(–.10)	–.15	(–.15)	.19*	(.19)	**–.19***	**(–19*)**
Gender	–.02		.04		**–.04**		.06		.04		**.05**	

Note. n = 118. Gender coded 1 = males, 2 = females. *p < .05. **p < .01 (parenthesis show partial correlations controlling for gender).

Table 2. The EPP personality factors and "can't decide" responses as predictors of verbal (EAS[V]) and numerical (EAS[N]) ability test scores.

	EAS (N) Total		EAS (V) Total	
	St.B	*t*	St.B	*t*
Stability	**.14**	**1.40**	**.31**	**3.76****
Introversion	**.02**	**.23**	**–.14**	**1.70**
Caution	**–.21**	**1.87**	**.04**	**.45**
Dissimulation	–.10	.91	–.47	5.42**
Can't decide	–.09	.89	–.08	–.82
F (4, 102)	2.11		13.48**	
AdjR2	.04		.31	
Gender	.02	.18	.01	.86
F (5, 100)	1.70		11.42**	
AdjR2	.04		.31	

**p < .01

Subsequently, two hierarchical regressions were performed on the data to test the joint effects of Emotional Stability, Introversion, Caution, Dissimulation, and number of "can't decide" responses (Block 1) on the two types of cognitive ability (verbal and numerical). Gender was added as a predictor in Block 2. These results, summarized in Table 2, indicate that personality was a significant predictor of verbal, but not numerical, ability, accounting for 31% and 4% of the variance, respectively. Emotional Stability and Dissimulation were the only significant predictors of verbal ability scores.

Discussion

This study investigated the relationship between Eysenckian personality traits and verbal and numerical cognitive ability. In line with the recently proposed theoretical framework of IC (Chamorro-Premuzic & Furnham, 2004), as well as Ackerman and Haggestad's (1997) meta-analysis, the results revealed some significant, albeit modest, correlations between personality and cognitive ability measures.

In line with expectations, both stable and extraverted individuals scored somewhat higher on verbal ability than their more neurotic counterparts did. Although these results are consistent with the idea that Neuroticism and Introversion are likely to impair cognitive performance, thus moderating the effects of "actual" cognitive ability on tested intelligence – mainly because of their likelihood to elicit test anxiety and lack of confidence (Chamorro-Premuzic, 2004, 2006). However, they were not replicated with the numerical intelligence measure. Thus Hypothesis 1 was only partly supported.

On the other hand, the negative correlation between caution and numerical ability, which yielded support to Hypothesis 2, is in line with the idea that Conscientiousness (a component of Caution) may develop partly as an attempt to compensate for lower *gf* levels. The fact that this correlation was not replicated with the verbal intelligence measures is unsurprising, as verbal ability represents a measure of *gc*, which confounds both the negative effects of *gf* on Conscientiousness and the positive effects of Conscientiousness on *gc*.

The clearest support was arguably found for Hypothesis 3, as Dissimulation was the strongest correlate and predictor of Cognitive ability (particularly verbal). Although negative associations between Dissimulation and Cognitive ability have been reported in the past (Furnham, 2002), the size of the correlation in the present study was considerably larger. This may result from the fact that the present data was based on a sample of job applicants, where applicants of comparatively low ability would have been particularly likely to attempt to present exaggeratedly positive profiles. Accordingly, impression management on self-report inventories may be used to compensate for lower intelligence levels and IQ test performance.

Naturally, there are limitations to the present study, which was based on a relatively small and female-dominant sample. Yet, previous studies in this area have rarely been conducted on nonstudent samples. A more important consideration is that our design was correlational, which means there can only be limited support for the causal paths between personality and intelligence proposed by Chamorro-Premuzic and Furnham (2004). Although results were partly congruent with the hypothesized paths, the specific mechanisms by which ability and nonability traits may be linked would be more adequately tested by experimental and longitudinal data.

Indeed, the present data epitomizes the problem of finding objective empirical evidence for the two-level model of IC, as scores on the ability tests may confound both in-

telligence as actual ability and intelligence as performance. Thus, the negative correlation between numerical ability and Caution is interpreted as evidence for the developmental effects of the "actual" *gf* on Conscientiousness (i.e., less able individuals become more conscientious over time), whereas the positive correlations of Stability and Extraversion with verbal intelligence would simply reflect the fact that Neuroticism and Introversion have detrimental effects on ability test "performance."

Despite these limitations, however, our results add further evidence to the idea that, at both psychometric and latent levels, personality and intelligence are different but related constructs. This nexus of relationships between personality traits, test-taking style, and performance on cognitive ability tests requires further investigations and is clearly incompatible with the traditional psychometric "divorce" between personality and intelligence research in the realm of individual differences.

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