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Why is Conscientiousness negatively correlated with intelligence?

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Abstract

The aim of the present study was to investigate the nature of the negative relationship which has been observed between the trait of Conscientiousness and intelligence, using different measures of both variables (Furnham, Chamorro-Premuzic, & Moutafi, under review; Moutafi, Furnham, & Crump, 2003; Moutafi, Furnham, & Paltiel, under review). A total of 201 participants completed the Fifteen Factor Questionnaire (15FQ) and the General Reasoning Test Battery (GRT1), which included both measures of fluid and crystallized intelligence. Conscientiousness (Control) was significantly negatively correlated with abstract reasoning (fluid intelligence), but not with verbal reasoning (crystallized intelligence). This was interpreted as indicating that the negative relationship between intelligence and Conscientiousness is due to fluid intelligence affecting the development of Conscientiousness, in an educated and need-achieving population.

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1. Introduction

Researchers in the field of individual differences have, over the last decades, been investigating the relationship between two major constructs in their field of (individual differences) psychology; personality and intelligence (Ackerman & Heggestad, 1997; Austin et al., 2002; Furnham et al., under review; Furnham, Forde, & Cotter, 1998a, 1998b; Goff & Ackerman, 1992; Hembree, 1988; Kyllonen, 1997; Matthews, 1986; Moutafi et al., 2003; Moutafi et al., under review;

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Zeidner, 1995). Most of the research within this area has been conducted by observing correlations of IQ test scores with the various personality factors. A drawback of this approach is that although it helps to reveal *how* the two constructs are linked, it does not provide sufficient information so as to understand *why* the constructs are linked. That is, there is little understanding of the process explaining the relationships, particularly with respect to specific Big 5 personality factors like Conscientiousness.

The most consistent findings concerning the relationship between intelligence and personality are that intelligence is negatively correlated with Neuroticism (Ackerman & Heggestad, 1997; Furnham et al., 1998a; Moutafi et al., 2003; Zeidner & Matthews, 2000) and positively correlated with Openness to Experience (Austin et al., 2002; Brand, 1994; Chamorro-Premuzic, Moutafi, & Furnham, under review; Goff & Ackerman, 1992; McCrae, 1994; Moutafi et al., 2003; Zeidner & Matthews, 2000). Recent studies have also observed that intelligence is negatively correlated with Conscientiousness (Furnham et al., under review; Moutafi et al., 2003; Moutafi, Furnham, & Crump, under review; Moutafi et al., under review), although earlier studies had not found this correlation to be significant (Ackerman & Heggestad, 1997; Austin et al., 2002). These correlations may mean that personality is related to actual intelligence, but they could also mean that personality is primarily related to intelligence test performance. Furthermore, in the case when personality is related to actual intelligence, it is important to understand if the causal relationship is from personality to intelligence, vice versa, or bi-directionally.

It is important to clarify the distinction between fluid (gf) and crystallized intelligence (gc) in order to understand why personality is related to intelligence. This distinction was first proposed by Raymond Cattell (1941, 1963, 1971), and the gf–gc theory has since then become one of the most widely accepted psychometric paradigms of intelligence (Stankov, Boyle, & Cattell, 1995). Fluid intelligence has been defined as our “on-the-spot reasoning ability, a skill not basically dependent on our experience” (Belsky, 1990, p. 125). It involves things like quick thinking, reasoning, seeing relationships between ideas, approaching new problems, and is considered to be biologically based (Brody, 1992). According to Cattell (1963), gf tends to increase up to the age of about 16–20 and steadily decrease thereafter. Belsky (1990) proposed that this is because gf is associated with the central nervous system (CNS), and is therefore at its peak when the CNS is at its physiological peak. It should also be noted that according to some researchers gf is also understood as real g (Stankov, 2000).

Crystallized intelligence on the other hand has been defined as “the extent to which a person has absorbed the content of culture” (Belsky, 1990, p. 125). It is the accumulation of information, of facts, figures, skills and knowledge, over time, and is usually measured by vocabulary tests. Gc is believed to be influenced by education and cultural exposures (Brody, 1992), and is at its peak at around the age of 45–54 years, beginning to decline during the eighth decade of life. It is therefore important in the investigation of the relationship between personality and intelligence, to look at whether a personality factor is related to gf or gc, as this can shed light on how the relationship occurred.

With regard to Openness, it has been proposed that individuals who are high in Openness have a higher motivation to engage in intellectual activities, which leads them to expand their gc (Brand, 1994). Another suggestion, which further explains the relationship between Openness and gf, is that individuals with lower gf may become less curious and have narrower interests, due to their lower ability to handle novel experiences, which discourages Openness. Also, individuals

with higher *gf* may have sought to stimulate and challenge themselves, by exposing themselves to novel experiences, and thus becoming more curious and with wider interests, and therefore, in turn, more Open (Moutafi et al., 2003).

With regard to Neuroticism, it has been found that its negative relationship with intelligence is partly due to the Anxiety component of Neuroticism, which impairs intellectual functioning in several contexts (Hembree, 1988; Sarason, 1980). Therefore Neuroticism correlates negatively with intelligence primarily by affecting intelligence test performance. It has also been proposed that individuals with low *gf* may develop Anxiety through time, due to their inability to cope with novel situations (Moutafi et al., 2003), which means that intelligence may also affect the development of Neuroticism.

The relationship between intelligence and Conscientiousness has not been investigated to a great extent, possibly due to the fact that a major meta-analytic study (Ackerman & Heggestad, 1997) did not find the correlation between Conscientiousness and intelligence to be significant. However, a number of recent studies have shown that there is a significant negative correlation between Conscientiousness and IQ (Furnham et al., under review; Moutafi et al., 2003; Moutafi, Furnham & Crump, under review; Moutafi et al., under review). Furthermore this has been found on different populations using a variety of measures of both personality and intelligence. The negative relationship between Conscientiousness (C) and intelligence is the least investigated, although it seemingly is the most counterintuitive. This relationship seems inconsistent with the fact that Conscientiousness has been consistently found to positively correlate with job performance (Barrick & Mount, 1991; Barrick, Mount, & Judge, 1999; Blickle, 1996; De Raad, 1996; Goff & Ackerman, 1992; Hough, Eaton, Dunnette, Kamp, & McCloy, 1990; Judge, Higgins, Thoresen, & Barrick, 1999) and academic performance (Chamorro-Premuzic & Furnham, 2003a, 2003b).

There also appears to be no specific theoretical explanation for more Conscientious individuals to become less intelligent, or for less Conscientious individuals to become more intelligent. It has however been suggested that the causal relationship is that intelligence affects the development of C. This seems plausible given that relatively less intelligent individuals may become more Conscientious to cope with their disadvantage, or that more intelligent individuals do not become so Conscientious over time, as they are able to rely on their intelligence to accomplish most cognitive tasks (Moutafi et al., 2003). In a competitive academic environment filled with highly (fluid) intelligent people, the (comparatively) less intelligent may be able to 'keep up' by working harder. Their Conscientiousness pays off better on 'continuous assessment' examined courses than those which are more likely to test understanding and thinking (*gf*) rather than knowledge per se (*gc*). This suggestion views C as being adaptive, i.e. hard work, persistence, dutifulness and deliberation develop to compensate for quick-wittedness.

The aim of the present study is to investigate the relationship between Conscientiousness and intelligence. It aims at providing evidence to support the proposed explanation for the negative relationship between intelligence and C, by Moutafi et al. (2003), which views C as being adaptive and compensating. It is hypothesized that if this suggestion is correct, C should be more highly correlated with *gf* than with *gc*. This is proposed because since *gf* is biologically based, whereas *gc* is developed through education and cultural exposures, it must be *gf* which influences the development of personality (which occurs early in life), as *gc* will not have fully developed. Furthermore, one would expect more Conscientious individuals (who are more organized, thorough, persistent and methodical) to be more devoted students during school education.

This would lead them to develop their *gc* more than individuals low in *C*, as *gc* is developed through education (Brody, 1992). Therefore, the negative relationship which will have developed between *gf* and *C*, would be somewhat counterbalanced by the positive effect *C* would have on the development of *gc*. Therefore, *C* is expected to be more highly negatively linked to *gf* than to *gc*.

The first hypothesis (H1) is that *C* will be negatively correlated with both *gf* and *gc*, as measured by abstract and verbal reasoning respectively. The second hypothesis (H2) is that *C* will be more highly correlated with abstract reasoning (*gf*) than with verbal reasoning (*gc*). The sub-factors of *C* will also be investigated here with respect to their relationship with the intelligence measures, so as to further explain the relationship of *C* and intelligence. Therefore, the third hypothesis (H3) is that the sub-factors of *C* will significantly (negatively) correlate with abstract and verbal reasoning.

2. Method

2.1. Participants

A total of 201 participants were recruited for this study. Of these, 85 were female and 115 were male (one did not specify gender). Their age ranged from 16 to 61, with a mean of 38.05 and a standard deviation of 9.19. In the statistical analysis of the IQ measures, participants who scored below 3 (out of 35) on any IQ test were excluded from the analysis. This meant that in total 192 participants were included, of which 84 were female and 108 were male. Their age ranged from 16 to 61 with a mean of 37.88 and a standard deviation of 9.03.

2.2. Materials

The General Reasoning Test Battery (GRT1) (Budd, 1993). This is a timed (28 min) ability test, measuring numerical (NR2), verbal (VR2) and abstract (AR2) reasoning. Numerical reasoning measures the ability to use numbers in a logical and efficient way. Verbal reasoning measures basic vocabulary, verbal fluency, and the ability to reason using words. Abstract reasoning measures the ability to understand abstract logical problems, and use new information outside the range of previous experience. Examination of the alpha coefficients for all three sub-tests of the GRT1 showed that they were all above 0.8, demonstrating a high level of reliability of the test. Furthermore, the sub-scales of the GRT1 have been found to favorably correlate with the sub-scales of Alice Heim 5 ($r = 0.69$ for GRT1 verbal and AH5 verbal/numerical; $r = 0.70$ for GRT1 numerical and AH5 verbal/numerical; $r = 0.72$ GRT1 abstract and AH5 abstract), demonstrating high levels of construct validity (Budd, 1993).

Fifteen Factor Questionnaire (15FQ) (Budd, 1992). This is an un-timed questionnaire, taking approximately 30 min to fill, measuring 15 bipolar personality dimensions. The 15FQ was developed in the UK on a large sample of applicants drawn from a wide range of occupational groups, and is used for personnel assessment and selection (Budd, 1992). As the manual explains, the items were selected with the criteria that they cover the construct adequately, while maintaining acceptable levels of scale cohesiveness and minimum overlap with other scales. The dimensions measured by the test are Outgoing, Stable, Assertive, Enthusiastic, Conscientious,

Socially bold, Intuitive, Suspicious, Conceptual, Restrained, Self-doubting, Radical, Self-sufficient, Disciplined, Tense driven.

Factor analysis has shown that a further five broad underlying characteristics can be derived from the 15FQ, which have been found to be favorably compared to the Big 5 factors of personality. These are Extraversion (corresponding to NEO Extraversion), Anxiety (corresponding to NEO Neuroticism), Tough-mindedness (corresponding to NEO Openness), Independence (corresponding to NEO Agreeableness) and Control (corresponding to NEO Conscientiousness).

The technical manual provides evidence for the test's reliability and validity (Budd, 1992). All the 15FQ dimensions were found to have reliability coefficients above 0.64, (Smith, 1994), with test–retest reliability coefficients ranging from 0.70 to 0.88. Evidence for the test's construct validity comes from comparisons between the 15FQ and other personality measures such as the 16PF, the NEO short form, the Myers–Briggs Type Indicator, the Jung Type Indicator, the Professional Personality Questionnaire, the Occupational Personality Profile and the FIRO-B (Budd, 1992).

2.3. Procedure

Participants were all job applicants tested by Psytech International as part of an assessment center.

3. Results

3.1. Second-order factors of the 15FQ

It has been established by factor analysis that the 15FQ dimensions can be summarized in five broad dimensions of personality, which correspond to each of the five dimensions of the Five Factor Model (Budd, 1992). The Big 5 factors were computed for the present sample by using the formulae presented in the 15FQ manual (Budd, 1992).

3.1.1. Correlations

Correlations between the Big 5 factors, and the three intelligence measures used are presented in Table 1. Abstract reasoning significantly correlated with Conscientiousness ($r = -0.26$, $p < 0.001$), and verbal reasoning significantly correlated with Neuroticism ($r = -0.17$, $p < 0.05$), Agreeableness ($r = 0.24$, $p < 0.01$) and Conscientiousness ($r = -0.23$, $p < 0.001$).

3.1.2. Regressions

Three regression models were used, in order to investigate the extent to which the Big 5 factors (and specifically Conscientiousness) can predict intelligence. The dependent variables used were abstract, verbal and numerical reasoning. The independent variables used in all three regression models were the Big 5 factors. The β coefficients for these regressions are presented in Table 2.

The regression model which used abstract reasoning as the dependent variable was significant ($F(5, 186) = 2.75$, $p < 0.01$) with Adj. $R^2 = 0.04$. Conscientiousness was a significant predictor of abstract reasoning ($\beta = -0.27$, $p < 0.01$). The regression model which used numerical reasoning

Table 1

Correlations between the Big 5 factors and the three intelligence measures (and partial correlations for Conscientiousness, controlling for the remaining Big 5)

	Abstract reasoning	Numerical reasoning	Verbal reasoning
Neuroticism	-0.10	-0.11	-0.17*
Extraversion	0.09	-0.09	0.01
Openness	0.03	-0.05	-0.06
Agreeableness	0.12	-0.01	0.24**
Conscientiousness	-0.26*** (-0.21**)	-0.12 (-0.13)	-0.23*** (-0.09)

* $p < 0.05$.

** $p < 0.1$.

*** $p < 0.001$.

Table 2

Beta coefficients for regressions of the Big 5 factors on the three intelligence measures

	Abstract reasoning	Numerical reasoning	Verbal reasoning
Neuroticism	-0.03	-0.11	-0.06
Extraversion	0.01	-0.14	-0.09
Openness	0.06	0.05	-0.10
Agreeableness	-0.05	-0.08	0.24**
Conscientiousness	-0.27**	-0.16	-0.11
Regression model	$F(5, 186) = 2.75^{**}$	$F(5, 186) = 1.59$	$F(5, 186) = 4.04^{**}$
Adj. R^2	0.04	0.02	0.07

** $p < 0.1$.

as the dependent variable was not significant. The regression model which used verbal reasoning as the dependent variable was significant ($F(5, 186) = 4.04$, $p < 0.01$), with Adj. $R^2 = 0.07$. Agreeableness was a significant predictor of verbal reasoning ($\beta = 0.24$, $p < 0.01$).

3.1.3. Partial correlations

Although Conscientiousness was significantly correlated with verbal reasoning, it was not a significant predictor of it once the shared variance among the predictor variables was taken into account. Therefore partial correlations were also performed among the three intelligence measures and Conscientiousness, controlling for the remaining Big 5 factors (Neuroticism, Extraversion, Openness and Agreeableness). Conscientiousness was significantly correlated with abstract reasoning ($r = -0.21$, $p < 0.01$), but not with numerical or verbal reasoning. These partial correlations are also presented in Table 1.

In order to test whether Conscientiousness correlated significantly differently with abstract and verbal reasoning, a one-tailed t -test for non-independent partial correlations was conducted¹. The t value was significant $t(183) = -1.74$, $p < 0.05$.

¹ The formula used was $t = (r_{12} - r_{13}) * \sqrt{[(N - 1) * (1 + r_{23})]} / \sqrt{\{2 * [(N - 1)/(N - 3)] * [(1 - r_{12}^2 - r_{13}^2 - r_{23}^2) + 2 * r_{12} * r_{13} * r_{23}] + [(r_{12} + r_{13})^2 * (1 - r_{23})^3 / 4]\}}$, the ratio being distributed as t on $N - 3$ df, where r_{12} : partial correlation of C with AR, r_{13} : partial correlation of C with VR and r_{23} : correlation of AR with VR.

Table 3

Correlations (and partial correlations) between the Conscientiousness sub-factors and the three intelligence measures

	Abstract reasoning	Numerical reasoning	Verbal reasoning
Conscientious	−0.26*** (−0.22)**	−0.21** (−0.23)**	−0.29 *** (−0.18)**
Radical	0.13 (0.04)	−0.02 (0.01)	0.07 (−0.11)
Disciplined	−0.16* (−0.10)	−0.07 (−0.05)	−0.16* (0.01)

* $p < 0.05$.** $p < 0.1$.*** $p < 0.001$.

In order to further investigate the relationship between Conscientiousness and intelligence, correlations were computed for the sub-factors of Conscientiousness (Conscientious, Radical and Disciplined) and the three intelligence measures. Conscientious was significantly correlated with abstract ($r = -0.26, p < 0.001$), numerical ($r = -0.21, p < 0.01$) and verbal reasoning ($r = -0.29, p < 0.001$), and Disciplined was significantly correlated with abstract ($r = -0.16, p < 0.05$) and verbal reasoning ($r = -0.16, p < 0.05$). Partial correlations were also computed, controlling for Neuroticism, Extraversion, Openness and Agreeableness. Conscientious was significantly correlated with abstract ($r = -0.22, p < 0.01$), numerical ($r = -0.23, p < 0.01$) and verbal reasoning ($r = -0.18, p < 0.01$). These correlations and partial correlations are presented in Table 3.

4. Discussion

The aim of the present study was to investigate the relationship between Conscientiousness and intelligence. The first hypothesis (H1), which was that C would negatively correlate with abstract (AR) and with verbal (VR) reasoning, was partly supported by the results. Although the correlation of C with AR and VR was negative, it was not significant for VR once the effect of Neuroticism, Extraversion, Openness and Agreeableness were partialled out.

The second hypothesis (H2) was that C would be more highly correlated with AR than with VR, suggesting that C is more highly correlated with fluid than with crystallized intelligence. Partial correlations between C and the intelligence measures showed that C was significantly correlated with AR, but not with VR. Furthermore these correlations were found to be significantly different, thus supporting the second hypothesis, which predicted that C would more highly correlate with AR than with VR, indicating that it is more highly correlated with gf than with gc. Numerical reasoning was not included in the hypothesis, because although it is considered by most researchers to be a measure of gc (Kaufman, 2000) (due to the fact that it is dependent on the accumulation of knowledge), it is also considered by some researchers to be highly related with gf (Lohman, 2000) (due to the fact that mathematical problems require reasoning ability, seeing relationships and approaching new problems, which are characteristics of gf). Therefore it was thought that looking at how C related to numerical reasoning would not help clarify whether it is more correlated to gc or to gf.

The finding that C was significantly correlated with gf but not with gc, indicates that the direction of causality in the relationship between intelligence and C must be that intelligence affects the development of C. This is based on the fact that gf is biologically based, it is less

susceptible to influences of the environment (Brody, 1992) and “not basically dependent on our experience” (Belsky, 1990). It is consequently not likely that an external factor, such as personality, would influence its development. Moreover, there appears to be no logical theoretical explanation for more Conscientious individuals to become less intelligent, or for less Conscientious individuals to become more intelligent. This finding supports the suggestion of Moutafi et al. (2003), who proposed that the negative relationship observed between intelligence and C is because in a competitive environment less intelligent individuals become more Conscientious in order to cope with their disadvantage, or that more intelligent individuals do not become so conscientious, as they can rely on their fluid intelligence to accomplish most tasks.

The lower negative relationship observed between C and gc could be due to the counterbalancing effect which was proposed earlier. This implies a causal relationship from C to gc, which would be due to the fact that certain characteristics of C (like being more organized, thorough, persistent and methodical) lead individuals to be more devoted students during school education, thus increasing their gc. It would be interesting for future research to investigate this suggestion, by looking for example at how these characteristics of C are related to school performance. More importantly longitudinal studies which would look at the development of C and of gc from an early stage of life would be essential in order to provide conclusive evidence that it is gf that affects the development of C.

The second hypothesis of this study was that the sub-factors of C would also be significantly correlated with AR and VR. This hypothesis was only partly supported, as it was only the Conscientious (vs. Expedient) sub-factor which was significantly correlated with the intelligence measures. The Disciplined (vs. Informal) sub-factor was also significantly correlated with AR and VR, but the partial correlations (controlling for Neuroticism, Extraversion, Openness and Agreeableness) were not significant. Looking at the characteristics of the Conscientious sub-factor provides further insight into which particular characteristics of Conscientiousness are related to intelligence.

Individuals who score highly on the Conscientious sub-factor tend to be persistent, persevering and meticulous in their work habits. They have high standards of work and behaviour and often have strong beliefs about the correct way of doing something. These characteristics would be beneficial in the school environment for obtaining high grades and also a high level of education, which would in turn lead to an increase in the individual's gc. Therefore this supports the suggestion that the lower negative correlation between C and gc could be due to the fact that certain characteristics of Conscientious individuals may lead them to increase their gc, counterbalancing the negative effect which gf has on C. Furthermore, these characteristics also support the suggestion that individuals low on gf may compensate for it by working harder (and thus develop structured and persevering working habits), or that individuals high on gf may feel they do not need to work so hard to accomplish things and therefore do not develop these characteristics.

The present study investigated the relationship between C and intelligence by looking at primary and secondary factors of the 15FQ. It would be useful for future studies to attempt to replicate the present results by looking at different personality tests, which include measures of C². Further-

² There are measures of Conscientiousness in several personality inventories, e.g. NEO Personality Inventory-Revised, 16 Personality Factors, Thematic Apperception Test.

more, simultaneously looking at more than one measures of C, would provide more conclusive evidence on which specific sub-factors of C are related to intelligence, which would further explain the mechanisms leading to the negative relationship between C and intelligence. Most importantly however, to truly test causality, longitudinal or experimental studies need to be done to accompany correlational research.

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