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Intelligence in Relation to Jung's Personality Types

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ABSTRACT - The present study investigated the relationship between Jung's personality types and psychometric intelligence. A total of 4758 participants completed the Critical Reasoning Test Battery 2 and the Jung Type Indicator (JTI). General intelligence was significantly correlated with Extraversion-Introversion (EI), Sensing-Intuition (SN), Thinking-Feeling (TF) and Judging-Perception (JP), indicating an advantage for Introversion, Intuition, Thinking and Perceiving. Regressing personality and demographic factors on general intelligence indicated that they account for 14% of its variance. The investigation of personality and demographic predictors of specific mental abilities (numerical, verbal and abstract reasoning) revealed that EI, TF and JP can be used to predict scores on all three mental abilities, whereas SN can be used to predict verbal reasoning only.

The present study is an investigation of the extent to which Jung's personality types (Jung, 1921) are related to psychometric intelligence. Although intelligence and personality were usually treated as independent constructs in the research of individual differences, recent studies have signified the importance of studying these constructs in conjunction, as significant correlations occur between them (Goff & Ackerman,1992; Zeidner, 1995; Ackerman & Heggestad, 1997; Kyllonen, 1997; Furnham, Forde & Cotter, 1998; Austin, Deary, Whiteman, Fowkes, Pedersen, Rabbitt, Bent & McInnes, 2002; Moutafi, Furnham & Crump, 2003). Most studies investigating the relationship between personality and intelligence have focused on measures of intelligence in relation to the personality factors of the Five Factor Model (FFM), proposed by McCrae and Costa (1987). However, although the FFM is perhaps the most prominent model within in the academic research area, the test that is mostly used in the applied field of counseling and management training, is the Myers-Briggs Type Indicator (Myers, 1962), which is measure of Jung's personality types (Devito, 1985).

This study will investigate the relationship between intelligence and Jung's Personality types, not only to extent the knowledge of how the constructs of

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personality and intelligence are interrelated, but also to provide psychologists within the occupational field with an understanding of how the measure they commonly use for selection and counseling purposes, could also provide some information on the individual's intelligence.

There are various personality tests which are based on Jung's theory of personality types, two of which are the Myers-Briggs Type Indicator (Myers, 1962), and the Jung Type Indicator (Budd, 1993b). Both of these were developed to measure the four personality dimensions, which were proposed by Jung in his theory of personality types. These dimensions are Extraversion-Introversion (EI), Sensing-Intuition (SN), Thinking-Feeling (TF) and Judgment-Perception (JP). Extraversion refers to a person whose mental processes are directed at the external world whereas Introversion refers to an orientation towards the internal world. Judging and Perceiving are two processes by which individuals perceive and then act upon information; Perceiving is concerned with directly receiving information without evaluation, whereas Judging is concerned with organizing and processing information. Sensing and Intuition are two alternative ways of perceiving information; Sensing involves receiving information directly through the senses, whereas Intuition involves discovering possibilities which might not be immediately obvious from sensory data. Thinking and Feeling are two alternative ways of judging information; Thinking involves the logical analysis of information in terms of the strict principles of cause and effect and Feeling involves identifying the emotional value that is attached to objects or events.

McCrae and Costa (1989) observed that the MBTI dimensions overlap with the Big 5 factors to such an extent that they suggested that the MBTI could be reinterpreted from the perspective of the FFM. More specifically, they found that EI was correlated with Extraversion, SN with Openness, TF with Agreeableness and JP with Conscientiousness. These findings were replicated by later studies (McDonald, Anderson, Tsagarakis & Holland, 1994; Furnham, Moutafi & Crump, 2003) and Furnham (1996) further found Neuroticism to be negatively correlated to both EI and TF. Due to the high overlap between the two measures, hypotheses made here on the relationship between Jung's personality types and intelligence, will be based on findings of the relationship between the Big 5 and intelligence, as research on the relationship between intelligence and Jung's personality types is scarce.

The major replicated findings on the relationship between intelligence and the Big 5 factors of personality are that intelligence is positively correlated with Openness to Experience (Ackerman & Heggestad, 1997; Austin et al., 2002; Brand, 1994; Chamorro-Premuzic, Moutafi & Furnham, 2005; McCrae, 1994; Moutafi et al., 2003a; Moutafi, Furnham & Paltiel, 2004; Zeidner & Matthews, 2000), negatively correlated with Neuroticism (Ackerman & Heggestad, 1997; Furnham, Forde & Cotter, 1998; Kyllonen, 1997; Moutafi, Furnham & Tsaousis, 2004; Zeidner & Matthews, 2000) and Conscientiousness (Demetriou, Kyriakides, & Avramidou, 2003; Moutafi et al., 2003a; Moutafi, Furnham & Crump, 2004; Moutafi et al. 2004) and correlated with Extraversion, the sign of

the correlation depending on the testing conditions (Ackerman & Heggestad 1997; Austin et al., 2002; Furnham et al., 1998; Lynn, Hampson & Magee, 1982; Moutafi et al., 2003a; Moutafi et al., 2004).

The studies that have investigated the relationship between Jung's personality types and intelligence have mostly used the MBTI instrument. The most consistent finding in this literature is that intelligence is positively correlated with the SN dimension. Myers and McCaulley (1985) reported that students who scored higher on the Intuition pole, also tended to score higher on the California Test of Mental Maturity and on the Scholastic Aptitude Test-Verbal (SAT-V). This finding was supported by Kaufman, McLean and Lincoln (1996) and Moutafi et al. (2003) who found that individuals who scored higher on the Intuition pole also tended to score higher on measures of general intelligence.

The other dimension that has been found to be related to intelligence is JP, although researchers have not concluded on how precisely they are related. Myers and McCaulley (1985) proposed that Perceiving types average somewhat higher on intelligence tests than Judging types, whereas Judging types average somewhat higher in academic achievement (grades). Kaufman et al. (1996) argued that individuals at both poles are especially equipped to score highly on intelligence tests, as Judging individuals are concerned with decision making, planning and organizing, and Perceiving individuals are curious, adaptable and open to new events, characteristics which are related to intelligence. However, Moutafi et al. (2003a) found g to be negatively correlated with Judgment whilst positively correlated with Perception.

Of the MBTI dimensions, those that have been found to be the least related to intelligence are TF and EI. Kaufman et al. (1996) reported no significant differences between the Thinking and the Feeling poles, and Moutafi et al. (2003a) found that although Thinking was negatively correlated with g, it was not a significant predictor of it. With respect to the EI dimension, Kaufman et al. (1996) found no significant correlations with intelligence. However, Moutafi et al. (2003a) found Extraversion to be negatively correlated, and a significant negative predictor of g. Similarly, Myers and McCaulley (1985) found that Introverts show greater academic aptitude (which is highly correlated with intelligence; Elshout & Veenman, 1992), due to their capacity to deal intensively with concepts and ideas.

The aim of this study was to investigate the relationship between intelligence and personality, as measured by Jung's personality factors. In order to obtain a more comprehensive picture, four measures of intelligence were used (general intelligence, numerical, verbal and abstract reasoning), and these were related to Jung's personality types as measured by the Jung Type Indicator. Gender and age were controlled for in the statistical analysis, in order to take into account their effect on intelligence. The general consensus on the effect of age on intelligence is that there is a decline of intelligence scores with age, with fluid intelligence peaking around the age of 17 and crystallized intelligence peaking around the age of 50 (Ryan, Sattler & Lopez, 2000). The general consensus on sex differences

in intelligence is that although males do not differ from females on measures of general intelligence (APA Public Affairs Office, 1997), males tend to score higher on tests measuring visuo-spatial and mathematical ability, whereas females tend to score higher on tests measuring verbal ability (Maccoby & Jacklin, 1978; Hyde & Linn, 1988; Voyer, Voyer & Bryden, 1995).

Hypotheses were based on previous findings on the relationship between Jung's personality dimensions with intelligence, in combination with findings on the relationship between the Big 5 factors and intelligence, by considering how the Big 5 are linked to the JTI dimensions. The first hypothesis (H1) was that SN would be significantly correlated with general intelligence (g) and with verbal reasoning. This would support the finding that SN is positively correlated with g (Kaufman et al., 1996; Moutafi et al., 2003) and the finding that Openness (which is positively correlated with SN) is specifically correlated with crystallized intelligence (Brand, 1994; Geoff & Ackerman, 1992; Kyllonen, 1997). The second hypothesis (H2) was that JP would be significantly correlated with g. This would support the finding that Judgment is negatively, and Perception is positively correlated with g (Moutafi et al., 2003), and the finding that Conscientiousness (which is positively correlated with Judgment) is negatively correlated with g (Demetriou et al., 2003; Moutafi et al., 2003; Moutafi et al., 2004; Moutafi, Furnham & Paltiel, 2004b).

Method

Participants

A total of 4758 participants were recruited for this study. In the statistical analysis of the IQ measures, participants who scored 3 or below (out of 35) on any IQ test were excluded from the analysis. This meant that in total 4547 participants were included, of which 3720 were male and 819 were female (8 did not specify their gender). Their age ranged from 21 to 63 with a mean of 35.56 and a standard deviation of 8.36.

Materials

The General Reasoning Test Battery (GRT2) (Budd, 1993a). This is a timed (28 minutes) ability test, measuring numerical (25 items), verbal (35 items) and abstract (25 items) reasoning. Numerical reasoning (NR) measures the ability to use numbers in a logical and efficient way. Verbal reasoning (VR) measures basic vocabulary, verbal fluency, and the ability to reason using words. Abstract reasoning (AR) 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 GRT2 showed that they were all above .8, demonstrating a high level of reliability of the test. Furthermore, test-retest coefficients were all above .7. In order to test the validity of the GRT2, its sub-scales and total score were compared to the sub-scales and total score of the Alice Heim reasoning test (AH5). Correlation coefficients ranged from .56 to .76 for the sub-scales, and for the total scores of the two tests it was .82,

demonstrating that the GRT2 measures the same trait of reasoning ability which is assessed by the AH5.

Jung Type Indicator (JTI) (Budd, 1993b). This is an un-timed questionnaire, taking approximately 10 minutes to complete, assessing a person's psychological type, using the categories first proposed by Jung (1921). These categories are Extraversion vs. Introversion (EI[1]), Thinking vs. Feeling (TF), Sensing vs. Intuiting (SN), and Judging vs. Perceiving (JP). The JTI technical manual provides evidence for the test's reliability and validity (Budd, 1991). JTI subscales were found to have a high level of reliability across a number of different samples, ranging from psychology and business undergraduates to technician applicants and personnel professionals, with Alpha coefficients ranging from .81 to .87. JTI subscales also demonstrate high levels of test-retest reliability, with coefficients ranging from .79 to .92 after a three-month period. Validity of the JTI was assessed by correlating the JTI and the MBTI subscales, which yielded corrected correlation coefficients ranging from .93 to 1 in absolute value.

Procedure

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

Results

A measure of general intelligence was computed, by performing principal component factor analysis on the three intelligence measures. This yielded one factor (g), with loadings of .87 (numerical reasoning), .84 (abstract reasoning) and .83 (verbal reasoning).

Table 1

Pearson Product Moment and Partial Correlations Between Intelligence Measures, Personality and Demographic Factors

	g		*NR*		*VR*		*AR*	
	r	$r_{partial}$	r	$r_{partial}$	r	$r_{partial}$	r	$r_{partial}$
NR	.87*							
VR	.83*		.57*					
AR	.84*		.61*		.53*			
EI	.04	.09*	.06*	.08*	.04	.07*	.01	.08*
SN	.06*	.07*	-.01	.01	.12*	.13*	.04	.06*
TF	-.14*	-.11*	-.17*	-.11*	-.04	-.04	-.15*	-.11*
JP	.19*	.19*	.15*	.15*	.20*	.20*	.14*	.14*
Sex	-.07*		-.16*		.04		-.04	
Age	-.24*		-.10*		-.15*		-.36*	

*p<.001

Correlations: In order to investigate the relationship between personality and intelligence, Pearson product moment correlations were computed between

measures of intelligence and personality dimensions. Due to the large sample size, the .001 significance level was adopted, to diminish the probability of making a Type I error. Correlations were also computed on intelligence measures and demographic factors (gender and age). The majority of these correlations were significant, therefore, partial correlations were also computed between intelligence measures and personality dimensions, controlling for demographic factors. These Pearson product moment and partial correlation coefficients are presented in Table 1.

Table 2
Beta Values for Multiple Regression Coefficients of Intelligence Measures (Model 3)

	g		NR		VR		AR	
	β	t	β	t	β	t	β	t
EI	.12	8.49*	.10	6.90*	.11	7.13*	.10	7.30*
SN	.04	2.30	-.03	-1.72	.09	5.12*	.04	2.55
TF	-.17	-11.14*	-.16	-9.94*	-.12	-7.12*	-.17	-10.94*
JP	.21	13.63*	.20	12.49*	.19	11.50*	.15	10.14*
Gender	-.06	-3.64*	-.12	-8.04*	.04	2.61	-.05	-3.54*
Age	-.26	-18.11*	-.13	-8.73*	-.15	-10.23*	-.38	-27.21*
Regression model	F(6,4532)=122.53*		F(6,4532)=80.48*		F(6,4532)=65.99*		F(6,4532)=175.25*	
Adj. R^2	.14		.10		.08		.19	

*p<.001

Regressions: A series of multiple regressions were performed in order to investigate the relationship between intelligence and personality, gender and age. The dependent variables were the g, NR, VR and AR. The same independent variables were used in all regression models: the four dimensions of the JTI, gender (coded 1 for male and 2 for female), and age. Again the .001 level was adopted, as a more appropriate significance level.

General intelligence (g): The first model which used g as the dependent variable was significant ($F(6, 4532) = 122.53$, $p < .001$) with Adj. $R^2 = .14$. Significant predictors of general intelligence were EI, TF (-), JP, sex (-) and age (-).

Numerical reasoning (NR): The model which used NR as the dependent variable was significant ($F(6, 4532) = 80.48$, $p < .001$) with Adj. $R^2 = .10$. Significant predictors of NR were EI, TF (-), JP, sex (-) and age (-).

Verbal reasoning (VR): The model which used VR as the dependent variable was significant ($F(6, 4532) = 65.99$, $p < .001$) with Adj. $R^2 = .08$. Significant predictors of VR were EI, SN, TF (-), JP and age (-).

Abstract reasoning (AR): The model which used AR as the dependent variable was significant ($F(6, 4532) = 172.25$, $p < .001$) with Adj. $R^2 = .19$. Significant predictors of AR were EI, TF (-), JP, sex (-) and age (-).

The Beta coefficients and their corresponding t values for these regression models are presented in Table 2.

Discussion

The aim of this study was to investigate the relationship between Jung's personality dimensions and psychometric intelligence. Together, personality dimensions and demographic factors accounted for 14% of the variance in g, and between 8% and 19% of the variance in specific abilities. A series of hypotheses were tested, investigating the individual contribution of specific variables.

The first hypothesis (H1), which was that SN would be significantly correlated with verbal reasoning and with g, was supported by the results. The finding that SN was correlated with g, supports previous studies which found that individuals who scored higher on the Intuition pole also tended to score higher on measures of general intelligence (Kaufman et al., 1996; Moutafi et al., 2003). This indicates that individuals higher on g tend to go beyond the information provided by their senses, to discover possibilities which may not be directly obvious from sensory data (Intuition). One possible explanation for this is that g is required in order to understand relationships that are not directly evident. This implies that g leads to the development of Intuition. Evidence for this suggestion can also be found by looking at how SN is related to Openness, and how Openness is in turn related to g.

Of the sub-factors of Openness, the one that most highly correlates with SN is Ideas (Furnham et al., 2003). This is also the sub-factor that most highly correlates with g (Moutafi et al., 2004). Ideas refers to intellectual curiosity, and is related to an active pursuit of intellectual interests, to open-mindedness and a willingness to consider new, perhaps unconventional ideas. What is therefore proposed, is that it is individuals with high g who will be open-minded, and who will go beyond the information provided by their senses to discover underlying relationships, as they are the ones who have the ability to do this efficiently. The difficulty with exploring this idea further, is that longitudinal studies would be essential in order to test a causal relationship between Openness and g, and most importantly g should be measured prior to the full development of personality characteristics, which would be very difficult at such an early age.

It can further be argued that individuals who actively pursuit intellectual interests will thus develop their crystallized intelligence. This suggestion was also supported by the results, as SN was positively correlated with, and a significant predictor of verbal reasoning. The present findings therefore support the argument that Openness correlates with crystallized intelligence (Geoff & Ackerman, 1992; Brand, 1994, Kyllonen, 1997), but not that it specifically and exclusively correlates with it, as SN was also correlated with g. Therefore, this finding is also in line with Austin et al. (2002), Furnham et al. (2005), and Moutafi et al. (2003), who reported significant correlations between Openness and g.

The second hypothesis (H2), which was that JP would be significantly correlated with g, was supported by the results, in line with Moutafi et al. (2003). JP was further found to be positively correlated with, and a significant predictor of all intelligence measures. This finding indicates that individuals high on g, tend to directly perceive information (Perceiving) instead of being concerned with organizing it (Judging). This relationship can be more easily comprehended by looking at the relationships of JP with Conscientiousness, and Conscientiousness with g.

Of the sub-factors of Conscientiousness, the one that most highly correlates with JP is Order (Furnham et al., 2003), and this is also the sub-factor that most highly correlates with g (Moutafi et al., 2004). Order refers to being organized, thorough, efficient, precise and methodical. It has been proposed that individuals low on g may develop these characteristics of Conscientiousness, in order to cope efficiently with circumstances in which individuals high on g would be able to cope with simply by relying on their intelligence. By the same line of reasoning, individuals high on g may not develop these characteristics of Conscientiousness as they are able to accomplish most tasks without them. This implies that g may affect the development of Conscientiousness in a competitive environment. Here the finding that individuals high on g tend to directly perceive information instead of organizing it can also be explained in that they may not organize the information simply because they have the ability to comprehend and deal with it without having to organize it first.

The remaining two JTI personality dimensions (TF and EI) were also found to be related to intelligence. TF was negatively correlated with g, NR and AR, and it was further a significant predictor of all intelligence measures. This indicates that individuals high on g tend to logically analyze information in terms of the strict principles of cause and effect instead of identifying the emotional value that is attached to objects or events. This finding is odd considering that TF is most highly correlated with Agreeableness out of the Big 5 dimensions (McCrae & Costa, 1989; McDonald et al., 1994; Furnham et al. 2003b), and the fact that no relationship has been observed between Agreeableness and intelligence (Ackerman & Heggestad, 1997). However, it has been proposed that TF also correlates positively with Neuroticism (Furnham, 1996), and Neuroticism has often been correlated (negatively) with measures of intelligence (Ackerman & Heggestad, 1997; Furnham, et al. 1998; Kyllonen, 1997; Zeidner & Matthews, 2000). It may therefore be the case that Thinking individuals tend to score more highly on intelligence tests as they consider less the emotional value that is attached to events, which means that they are more emotionally stable and therefore less Neurotic.

Finally EI was significantly correlated with all intelligence measures, when sex and age were controlled for, and was also a significant predictor of these. This indicates that individuals whose mental orientation is towards the internal world instead of the external, tend to score higher on intelligence tests. A relationship has often been reported between Big 5 Extraversion, which highly

correlates with EI (McCrae & Costa, 1989; McDonald et al., 1994; Furnham et al. 2003), and measures of intelligence. However, it has been proposed that Extraversion actually correlates with intelligence test performance instead of intelligence per se (Moutafi, Furnham & Crump, 2003). This is because the resting level of cortical arousal is higher for Introverts than for Extraverts (Eysenck & Eysenck, 1985). Consequently, Extraverts tend to perform better on speeded tasks, which invoke arousal (Rawlings & Carnie, 1989) whereas Introverts tend to perform better on tasks requiring insight and reflection (Matthews, 1992). However, the GRT2 can be considered more as a speeded task than one requiring insight and reflection, as participants have to respond to 85 items in 28 minutes. It would therefore be expected that Extraverts should outperform Introverts on this test, however results were in the opposite direction. Future studies should examine whether there is indeed a difference in the resting levels of cortical arousal of Extraverts and Introverts as measured by the JTI. If this is not the case, the present results could be explained in that individuals whose mental processes are directed towards the internal world may have a better ability to concentrate while taking the test and therefore perform better.

In summary, when sex and age were controlled for, all of the JTI dimensions were significantly correlated with g, accounting for 14% of its variance. JTI dimensions further accounted for 8% of the variance in crystallized abilities (verbal reasoning), and 19% of the variance in fluid abilities (abstract reasoning). Investigation of the relationship between personality dimensions and specific intellectual abilities revealed that the only dimension which was differentially related to specific abilities was SN. SN was significantly correlated and a significant predictor of VR but not of NR or AR, supporting the suggestion that Openness specifically correlates with crystallized abilities (Goff & Ackerman, 1992). Future studies could further investigate this, in order to provide a better understanding of how personality dimensions differentially correlate with gf and gc.

The present findings contribute to research in two ways. Firstly they attest to the relationship between personality and intelligence, indicating that they should be studied in conjunction instead of as independent constructs. The relationship between personality and intelligence is also important in the occupational field, as measures of these constructs are used as predictors of job performance (Salgado, 1997; Barrick, Mount & Judge, 2001). Therefore an understanding of the underlying relationship between them can be used to improve their predictive validity. Secondly, the present study extends previous research on personality and intelligence, which has mostly focused on the Big 5 personality factors, and reveals how Jung's personality dimensions, are related to general intelligence and to specific mental abilities. This is of special interest for occupational psychologists, as Jung's personality types are very frequently used for selection, training and promotion purposes.

Footnotes

1. High score on EI indicates high Introversion whereas low score indicates high extroversion, similarly for SN, TF, JP.

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