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Intelligence and personality as predictors of divergent thinking: The role of general, fluid and crystallised intelligence

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ABSTRACT

Two studies examined the relationships between measures of intelligence, personality and divergent thinking (DT) in student samples. Study one investigated the incremental validity of measures of IQ and fluid intelligence with the Big Five Personality Inventory with regards to DT. Significant relationships of DT to fluid intelligence, Extraversion and Disagreeableness were observed. Study two investigated the incremental validity of measures of fluid and crystallised intelligence (as assessed by a test of general knowledge) with the Big Five Personality Inventory with regards to DT. Hierarchical regression analyses revealed a significant relationship between crystallised intelligence and DT. The nature of the relationships of IQ, fluid and crystallised intelligence, in addition to personality traits to tests of DT were considered.

The psychological study of creativity has intrigued researchers for decades (Runco, 2004). One of the most popular research methodologies is to investigate intellectual or personality traits with reference to creativity (c.f. Batey & Furnham, 2006 for a review). However, researchers have traditionally tended to study *either* intelligence *or* personality in relation to creativity. More studies that use multiple predictor variables for normative samples are required (Mumford, 2003). This paper reports two studies of the relationships of IQ, fluid and crystallised intelligence, with a measure of personality to divergent thinking (DT) test performance. The aim of the two studies was to investigate the extent to which IQ, fluid and crystallised intelligence, in addition to a measure of the five factor model (FFM) of personality could account for performance on tests of DT.

DT tests "require individuals to produce several responses to a specific prompt" (Plucker & Renzulli, 1999. p.38). The analysis of longitudinal creative achievement data by Plucker (1999) indicates that DT abilities are an important factor for real-world achievement. In this paper DT was assessed by a measure of fluency, as other forms of scoring have been demonstrated to be unreliable (Carroll, 1993; Harvey, Hoffmeister, Coates, & White, 1970; Hocevar, 1979; Plass, Michael, & Michael, 1974; Runco, 1986). The use of DT fluency has become popular (Furnham & Bachtiar, 2008; Furnham, Batey, Anand, & Manfield, 2008; Holling & Kuhn, 2008) as has word fluency (Tsakanikos & Claridge, 2005).

Most theories of intelligence trace their roots back to the hierarchical model first proposed by Spearman (1904) who suggested intelligence to consist of a general factor (IQ) in addition to a set of specific factors (*s*). Cattell (1971) posited there to be a distinction between fluid (*gf*) and crystallised (*gc*) intelligence: *gf* represents reasoning ability. Conversely, *gc*

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represents abilities used in the organisation and conceptualisation of information. Measures of intelligence have been found to predict DT (Batey & Furnham, 2006). Torrance (1967), conducted an early meta-analysis of 388 correlations between intelligence measures and the Torrance Tests of Creative Thinking (TTCT; Torrance, 1974). He found a median correlation between the verbal DT tests and IQ of $r = 0.21$. In a large study, Richards (1976) administered elements of both Guilford's (1967) and Wallach and Kogan (1965) DT tests to almost 500 naval officers. Data were available for three types of IQ test. The mean correlation between the battery of creativity tests and IQ tests was $r = 0.27$. In a recent study Silvia (2008) found DT to be substantially related ($\beta = .43$) to a higher-order intelligence factor. An explanation for the relation between creativity and intelligence may reside in the neurophysiology of intellect. It is likely that the efficient neural basis of intelligence (e.g. Eysenck & Barrett, 1985; Jensen, 1993) explains some of the variance in DT test scores. DT tests are timed, therefore under these conditions, neural efficiency contributes to an increase in DT performance. First, speed of retrieval of information from memory will allow a participant to consider more ideas in a short period of time. Second, *gf* will allow for rapid manipulation of ideas to produce fitting responses to the DT items. Lastly, a rich store of knowledge that is effectively organised (*gc*) will be required in order to combine ideas to produce responses to the DT test items.

Recent studies have examined the relationship of the five factor model of personality (FFM: Costa & McCrae, 1992) to DT, which is comprised of Neuroticism (N), Extraversion (E), Openness to Experience (O), Agreeableness (A) and Conscientiousness (C). Most studies of the FFM and DT have found a positive relationship with Extraversion, Openness to Experience and some negative relationships to Agreeableness (c.f. Batey & Furnham, 2006 for a review).

However, very few studies have investigated the incremental validity of the FFM of personality over ability (e.g. Furnham et al., 2008). McRae (1987) found that DT was consistently associated with self-reports and peer ratings of Openness. King, Walker, and Broyles (1996) examined the relations between creative ability, creative accomplishments, and personality. The Pearson correlations indicated that verbal creativity was significantly correlated with Extraversion and Openness. A negative relationship between Agreeableness and creative accomplishments was also observed. In a recent study, Furnham et al. (2008) found that DT was predicted Extraversion and negative Agreeableness. Lastly, Furnham, Crump, Batey, and Chamorro-Premuzic (2009) found that the Consequences DT test (Christensen, Merrifield, & Guilford, 1953) was predicted by Emotional Stability, Extraversion, Openness and negative Agreeableness. It may be hypothesised that Extraversion confers an advantage in DT tests in that Extraverts would use the test-taking scenario as an opportunity to raise arousal and would benefit from the group administration of the test (Batey & Furnham, 2006). The role of Openness may be explained with reference to the greater propensity towards imagination and openness to new ideas (Costa & McCrae, 1992), as well as the links to reduced cognitive inhibition (Peterson & Carson, 2000; Peterson, Smith, & Carson, 2002). It may be hypothesised that negative Agreeableness is related to DT performance, in that disagreeable individuals are less likely to be concerned about providing socially acceptable responses (which would increase the number provided) and possess the self-confidence to provide responses that might not be immediately obvious.

1. Study 1. Intelligence and personality as predictors of DT fluency: the role of IQ and fluid intelligence

The primary aim of this first study was to investigate the ability of IQ and fluid intelligence, alongside the FFM of personality traits to predict performance on a test of DT fluency. The study was conducted to test several hypotheses. The hypotheses related to the role of intelligence and personality in predicting DT fluency test scores.

Previous studies have demonstrated relationships between intelligence and DT (Batey & Furnham, 2006). This indicates that both IQ (a mixture of fluid and crystallised intelligence) and fluid intelligence should be found to positively and significantly relate to DT fluency. It was hypothesised that both IQ (H1a) and fluid intelligence (H1b) would be positively and significantly correlated with DT fluency. It was expected that the magnitude of the correlation between fluid intelligence and DT fluency would be greater than that observed for IQ (H1c).

Prior research has demonstrated relationships between the FFM of personality and DT (e.g. King et al., 1996). This suggests that personality traits will be found to be significantly related both positively and negatively to DT fluency. It was hypothesised that Extraversion (H2a) and Openness to Experience (H2b) would be positively and significantly correlated with DT fluency, whilst Agreeableness was expected to be negatively and significantly correlated with DT fluency (H2c).

1.1. Method

1.1.1. Participants

A total of 82 undergraduate students from University College London took part in this study. The large majority were British and all participants possessed a high degree of English language proficiency. There were 71 females and 11 males with ages ranging from 17 to 40 ($M = 19.88$, S.D. = 3.42).

1.1.2. Measures

(a) *Divergent thinking* (*DT*): was measured by a variant of Guilford's (1967) *Uses* test. Unusual Uses were sought for six different items (brick, a tin of polish, mobile phone, balloon, safety pin and laptop computer) the reliability of these measures was acceptable ($\alpha = .74$). Participants were given 2 min for each item to provide as many unusual uses as they