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Personality, hypomania, intelligence and creativity

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Abstract

This study examined the relationship between fluid intelligence, the Big Five traits, hypomania and three measures of creativity: Divergent Thinking fluency, Self-rated creativity and the Biographical Inventory of Creative Behaviours (BICB). One hundred and twenty eight sixth-form students took part. Fluid intelligence was found to be positively associated with DT fluency, but unrelated to both Self-rated creativity and the BICB. Hypomanic traits were significantly correlated to all three creativity criteria. The combination of hypomanic traits and fluid intelligence demonstrated the strongest association with DT fluency, accounting for 11% of the variance. Hypomania was the best predictor of Self-rated creativity accounting for 17% of the variance. The Big Five accounted for incremental validity of 5–8% depending on the creativity measure used.

Keywords: Big Five; Fluid intelligence; Hypomania

1. Introduction

More than 60 definitions of creativity can be found in the psychological literature (Taylor, 1988). There is no single, authoritative definition of creativity, nor is there a standardized measurement technique or agreed upon set of valid measures. Several attempts have been made

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to develop a Creativity Quotient (CQ) of an individual similar to the Intelligence Quotient (IQ), however these have generally been unsuccessful (Plucker & Renzulli, 1999). This difficulty has been attributed in part to the lack of objectivity in assessing creativity hence rendering a widely accepted standardized measure problematic to develop.

Nevertheless, the production of an idea or product that is both *novel* and *useful* is commonly accepted as a core characteristic of creativity (Barron, 1955; Mumford, 2003). Various researchers have argued that the theoretical perspective of the creativity researcher will generally define how they attempt to assess the construct (Batey, 2007; Runco, 2004). Those that emphasise a person-centered view of creativity usually assess creativity with reference to personal attributes, like intelligence or personality (e.g. Guilford, 1950). There are also those who see creativity in an almost pathological light, i.e. as a result of unusual personality processes (Eysenck, 1993, 1995). Those who emphasise a process-centered view will often assess creativity with reference to thought-processes like problem-solving (Mednick, 1962), and those emphasising the role of the environment concentrate on the circumstances in which creativity arises (Simonton, 1977, 1984).

Creativity is definitely multi-faceted and there is increasing consensus amongst researches that creativity in the individual will be reliant upon multiple components (Amabile, 1983, 1996; Eysenck, 1993, 1995; Guilford, 1950; Woodman & Schoenfeldt, 1989). These components include cognitive ability, personality factors, cognitive style, motivation, knowledge and the environment, both as a source of stimulation (Dodds, Smith, & Ward, 2002; Moss, 2002) and evaluation (Runco, 2004). The interaction between components and environment necessary for creative performance in different domains is necessarily complex. As a result, to examine trait or cognitive ability correlates in isolation could be misleading and lead to unreplicable results (Batey, 2007). Thus, the use of *multiple tests* of the *different criteria* of creativity is thought necessary to try and capture its many nuances. It does appear though that despite the complexity and number of variables involved there is surprisingly high agreement on individual differences correlates of creativity (Batey, 2007).

This study will use divergent thinking tests as measures of creativity. They have been demonstrated to consistently predict who will produce novel and useful products (Batey, 2007; Guilford, 1950, 1967). Defined as testing the ability to generate a wide range of ideas, divergent thinking is a construct thought to include components such as fluency, flexibility, originality and elaboration (Runco, 1991; Torrance, 1974). They are usually assessed quantitatively which incorporates fluency, or alternatively using the Consensual Assessment Technique (CAT) in which judges subjectively rate the products. Studies in the 1980s have revealed DT to be a measure of creative intelligence (Batey & Furnham, submitted for publication, in press), although some are prone to linguistic bias (Plucker, 1999). The tests themselves "require individuals to produce several responses to a specific prompt, in sharp contrast to most standardised tests of achievement or ability that require one correct answer" (Plucker & Renzulli, 1999, p. 38).

According to Hargreaves (1927) and Thurstone (1938), the starting point for modern investigations of creativity concerned investigations of fluency as a component of intellectual ability. Hargreaves (1927) administered a battery of fluency tests finding average correlations around $r = 0.30$ with IQ, suggesting that fluency is related, but not identical to general intelligence (g). Guilford (1981) himself treated creativity as a subset of overall intelligence, with DT one of the intellectual factors that constituted the structure of intellect (Batey, 2007). It seems fluency is a necessary, but not sufficient, trait for achievement in creativity. Various studies have been performed (reviewed

in Barron & Harrington, 1981) the results of which seem to indicate that DT and creativity in student samples are indeed related.

The multi-faceted nature of creativity necessitates that multiple criteria must be used to yield a more comprehensive assessment (Wolfradt & Pretz, 2001). Another test that has been used is *self-rated creativity*. There is evidence from several studies that creative people possess insight into, or awareness of, their own creativity (Barron & Harrington, 1981; MacKinnon, 1978). Batey (2007) found self-rated creativity was found to be significantly and positively related to several measures of creative potential. Overall, self-rating was demonstrated to be a valid measure of creativity and the relationship of self-ratings to established individual differences is similar to that found with other better-known measures of creativity and creative potential. It emerged that self-rated creativity appears to be related more strongly to measures that tap into creative attitudes or opinions than actual creative ability (DT).

Although Runco (2004) states that the hypothesis of creativity and intelligence being independent concepts appears to have been accepted by many, there is still a prevailing notion that a basic level of intelligence is a necessary requirement for creativity in the generation and analysis of novel ideas (Sternberg, 1997). However, the exact nature of the relationship; between creativity and intelligence remains unclear (Sternberg & O'Hara, 1999). One conclusion that can be taken from the research on IQ and creativity is that IQ or DT skills *alone* cannot account for much of the variance in creative achievement (Batey, 2007).

Over the years there are a large number of studies that have investigated personality correlates of creativity (Gelade, 2002). Eysenck (1993, 1995) identified Psychoticism as the trait most closely linked to creativity. Similar numerous Big Five researchers have found creativity linked the high Openness, low Agreeableness, low Conscientiousness and high Neuroticism (Batey, 2007). This study will look at personality correlates of creativity but will add more specific "abnormal" dimensions to see if measuring some traits at the primary, rather than super factor, level improves the amount of variance accounted for.

Hypomania, a primary feature of bipolar disorder, is defined by DSM-IV as: elevation of mood identified by the usual criteria for mania: irritability, racing thoughts, distractibility, pressured speech, decreased need for sleep, high self-esteem, feeling of grandiosity, increase in goal-orientated activity, risk taking – but lesser in intensity and duration.

Although suffering from bipolar disorder is certainly no guarantee of higher than average levels of creative production, in the above categorical diagnosis of bipolar disorder, there are qualities that could conceivably enhance creativity (Jamison, 1993). It seems plausible that these would most likely benefit those experiencing milder states of bipolar disorder since severe depression is too debilitating and mania results in overly chaotic, restless and impatient behaviour that is not conducive to producing anything that is original and useful. It is conceivable that people who are not classified mentally ill, but exhibit subclinical hypomania may be more creative (Lloyd-Evans, Batey, & Furnham, 2006). In particular, psychological attributes such as greater access to unusual associations and thoughts or increased motivation in pursuing unconventional or risky ventures appear to be related to creativity (Barron & Harrington, 1981).

Wender et al. (1986) had found high levels of creativity in first-degree normal relatives of bipolar disorder patients and cyclothymics (cyclothymia is a milder form of bipolar disorder) than in patients suffering from bipolar disorder themselves, suggesting that familial liability for bipolar disorder was associated with increased creative potential. The "inverted U" model was proposed

to explain this relationship (Richards, Kinrey, Benet, & Merzel, 1988). This states that there is a curvilinear (inverted U) relationship between hypomania and creativity: that is, mild hypomania leads to a moderate increase in creativity and severe bipolar disorder leads to a decrease.

Much of the research in this field has comprised biographical and eminence studies, which do support a positive relationship between bipolar disorder and creativity (Jamison, 1993). However, it is difficult to discern whether it is creativity itself, or other factors such as intelligence that are correlated with psychopathology (Lloyd-Evans et al., 2006). It is also difficult to perform comparisons as a result of a lack of controls as well as a dearth of research on the base rates of psychopathology and a deficiency in biographical studies on ordinary, non-eminent people. Biographical studies are also open to retrospective and selectivity biases (Lloyd-Evans et al., 2006).

The aim of this study was to examine, through step-wise regressions, the incremental variance of the Big Five, over hypomania and (fluid) intelligence in predicting different measures of creativity. The first aim was to look at different measures of creativity to examine the replicability of individual difference correlates. Secondly, we examined intelligence, Big Five, and hypomania correlates of the various creativity measures predicting that (fluid intelligence) hypomania and openness would be significant correlates. Thirdly, using step-wise regressions in order to assess incremental validity we examined the incremental validity of hypomania over fluid intelligence as well as the Big Five over both hypomania and the Big Five.

2. Method

2.1. Participants

The participants were 128 sixth-form students, which comprised 67 males and 61 females. The mean age 16.6 yr (SD = 1.52). The vast majority were white British school children at a well-known London based school. All had English as a first language and were volunteers.

2.2. Measures

1. *Fluid intelligence*: (g_f) was measured by the Baddeley Reasoning Test (BRT) (Baddeley, 1968). This 60-item test is administered in 3 min and measures fluid intelligence through logical reasoning. Each item is presented in the form of a grammatical transformation that has to be answered with "true" or "false", e.g. "A precedes B – AB" (true) or "A does not follow B – BA" (false). Studies have reported good validity and reliability indicators for this measure (Chamorro-Premuzic, Furnham, & Moutafi, 2004; Furnham, Zhang, & Chamorro-Premuzic, 2006).
2. *Hypomanic personality scale*: (Eckblad & Chapman, 1986) was developed to measure hypomanic traits where 35 items were positive and 13 items were negative. The range was 0–48 and the questionnaire was not timed. The scale is extensively used in research (Meyer, Rahman, & Shepherd, 2007).
3. *NEO-FFI*: Big Five personality traits were assessed through the short personality inventory of Costa and McCrae (1992). The 60-item scale is a self-report version of the NEO-PI-R and

assesses the five major dimensions of personality, namely neuroticism (low Emotional Stability), Extraversion, Openness to Experience, Agreeableness and Conscientiousness. There is wide agreement among personality researchers that these five personality factors are representative of cross-cultural individual differences in normal behaviour and studies have replicated this taxonomy in a diversity of samples (Chamorro-Premuzic et al., 2004).

Three different creativity measures were used in an attempt to produce a more comprehensive assessment of the multi-faceted construct of creativity.

1. Three, 3-min *Divergent Thinking Tests* were individually administered under strictly timed conditions. The tests were Guilford's (1967) unusual uses; asking the participants to list as many unusual uses as they can for three inanimate objects; a paperclip, a blanket and a barrel.
2. The *Biographical Inventory of Creative Behaviours* (BICB). This is an assessment of spontaneous everyday creativity/creative achievement. The students were required to indicate, from a list of 34 activities, those in which they had been actively involved over the past 12 months. The BICB demonstrated adequate reliability ($\alpha = 0.74$) (Batey, 2007).
3. A *Self-rating of creativity*. This non-timed questionnaire required the participants to rate how each adjective from a list of 11 best described themselves, on a ten-point Likert-type scale (Batey, 2007). There were contraindicative items designed to reduce response bias. For example, they were asked "in comparison to others, on a scale of 1–10, how creative do you consider yourself?"

2.3. Procedure

The pencil and paper tests were completed individually in a group administration session. The students were invigilated by teachers and experimenters and the test performed under the examination conditions to which they were accustomed. The tests were administrated in several sessions; no more than about 50 students were tested in any one session. The tests lasted a total of around 30 min. The timed tests, i.e. the Baddeley and divergent thinking tests were administered first. The participants were then allowed to complete the remainder of the test in their own time.

3. Results

Table 1 shows that the three divergent thinking tests strongly and significantly inter-correlate with each other ($.65 < r > .59$). A composite DT score was also computed. Table 2 shows intelligence was only correlated with composite DT score, which was significantly correlated with the other two measures of creativity, as well as Extraversion and Openness. Both self-rated creativity and DT total was also related to Extraversion and Openness. Hypomania too, was significantly correlated strongly with Openness and Extraversion but significantly negatively correlated with Agreeableness.

Table 1
Descriptive statistics and inter-correlations for creativity measures

	M (SD)	2	3	4	5
1. DT 1	7.89 (2.98)	.65**	.59**	.24**	.12
2. DT 2	8.91 (3.41)		.64**	.31**	.23*
3. DT 3	7.13 (2.49)			.32**	.17*
4. BICB	11.00 (6.28)				.24**
5. Self-rated creativity	6.48 (2.34)				

Note. $N = 128$.
BRT = Baddeley Reasoning Test, *gf* = fluid intelligence, DT = Divergent Thinking, BICB = Biographical Inventory of Creative Behaviours.
* $p < .05$.
** $p < .01$.

Table 2
Descriptive statistics and inter-correlations for all measures

	M (SD)	2	3	4	5	6	7	8	9	10
1. (*gf*) BRT	21.00 (10.3)	.28**	−.14	−.03	−.04	.04	−.06	.06	−. 13	.01
2. Composite DT Fluency	24.00 (7.78)		.20*	.33**	.20*	−.10	.26**	.22**	−.09	.15
3. Self-rated creativity	6.48 (2.34)			.24**	.41**	−.09	.35***	.36***	.11	.08
4. BICB	11.00 (6.28)				.38**	−.09	.34***	.38***	−.01	.00
5. Hypomanic traits (HPS)	21.60 (7.92)					.11	.40***	.45***	−.21**	−.04
6. Neuroticism	23.10 (7.86)						−.38***	.01	−.29**	−.06
7. Extraversion	30.50 (6.25)							.24**	.32**	.21**
8. Openness	28.78 (6.04)								.18*	.09.
9. Agreeableness	28.47 (6.33)									.18**
10. Conscientiousness	28.39 (6.01)									

Note. $N = 128$.
BRT = Baddeley Reasoning Test, *gf* = fluid intelligence, DT = Divergent Thinking, BICB = Biographical Inventory of Creative Behaviours.
* $p < .05$.
** $p < .01$.

Table 3 shows the results of three step-wise regression. The results show that together the three criterion variables (fluid intelligence, hypomania and the Big Five) account for around a fifth of the variance in predicting all three measures of creativity. Second, intelligence is only a significant predictor in the DT total. Third, whilst hypomania always shows incremental validity over fluid intelligence (11–17%) when the Big Five enter the regression, hypomania ceases to be predictive except for the self-rating of intelligence. Fourth, the final regressions indicate that whilst all are significant and account for similar amounts of the variance the way the criterion variable (i.e. creativity) is measured considerably influence which predictor variables predict it.

Finally the scores on all five creativity tests were combined to yield an overall score. The same stepwise regression was then performed. In this analysis the Baddeley Reasoning Test was not a significant predictor but the Hypomania Scale was ($F(2, 120) = 12.08$, $p < .001$; Adj $R^2 = .15$). The final regression adding the Big Five was also significant ($F(7, 115) = 8.05$, $p < .001$, Adj $R^2 = .29$)

Table 3
Result of the step-wise multiple regression on the three creativity measures

		DT		Self-rating		Hobbies	
		β	t	β	t	β	t
1.	*gf* (BRT)	.27	3.18**	−.14	1.58	−.03	0.29
	$F(1,124)$	10.13**		2.50		0.08	
	Adj R^2	.07		.01		.00	
2.	*gf* (BRT)	.28	3.35***	−.12	1.30	−.01	0.16
	Hypo (HPS)	.21	2.46**	.40	4.91***	.37	4.36***
	$F(2,123)$	8.29***		13.56***		9.51***	
	Adj R^2	.11		.17		.12	
3.	*gf* (BRT)	.25	3.04**	−.12	0.59	−0.04	.49
	Hypo (HPS)	.08	0.16	.28	2.55**	.13	1.13
	Neu (N)	−.08	0.62	−.06	0.70**	−.07	0.72
	Ext (E)	.30	2.70**	.13	1.25	.24	2.20*
	Open (O)	.17	1.79	.20	2.15*	.30	3.15***
	Agre (A)	−.23	2.30*	.05	0.47	−.13	1.30
	Con (C)	.10	1.12	.03	0.39	−.05	0.56
	$F(7,118)$	4.97***		6.05***		5.47***	
	Adj R^2	.18		.22		.20	

* $p < .05$.
** $p < .01$.
*** $p < .001$.

adding an additional 13% of the variance. These results indicated three (personality) predictors: Open ($\beta = 3.37$), Extraverted ($\beta = 3.17$), Disagreeable ($\beta = -2.12$), individuals were most creative.

To explore the data more fully a series of other regressions were done with the same criterion variables (see Table 3). Thus the Big Five were entered *before* the hypomania variable to examine the issue of incremental validity. All regressions were significant and hypomania only showed evidence of incremental variance over the Big Five (Adj $R^2 = .13$–$.21$) only for hobbies ($F(6,122) = 6.38$, $p < .001$) and self-ratings (Adj $R^2 = .17$–$.21$) for self-rated creativity ($F(6,122) = 6.60$, $p < .001$). It did not show any evidence of incremental validity for the DT composite.

4. Discussion

This study examined ability and non-ability correlates of three distinct but related measures of creativity: test scores on DT; self-estimates; and a form of biodata. Predictably they were all modestly correlated ($.20 < r < .41$).

Intelligence in both correlational and regression analyses proved only modestly related to only one of the creativity measures namely the totalled DT score. In the regression equation it accounted for seven per cent of the variance. One reason for these two variables to be related (DT and BRT) is that they were both power type (i.e. ability vs preference-type) tests. That is

it could be argued it was as much a method, as a measurement factor, that was operating in this study. Ability measures correlate with ability measures, self-report with self-report measures.

Whilst DT is often regarded as a good measure of creativity it has been acknowledged to have short-comings (Batey & Furnham, in press). However, what the first regression showed that was fluid intelligence accounted for 7% of the variance in DT but that hypomania accounted for an additional 4%. Yet in the final regression where the Big Five together accounted for an additional 7% of the variance hypomania ceased to be significant. These results showed three significant predictors of DT: bright, disagreeable, Extraverts scored highest.

Many studies have linked Disagreeableness to creativity (Eysenck, 1995; Gelade, 2002), though the Big Five factor most consistently related is Openness. In this study Extraversion was the strongest predictor of DT. One possible explanation for this is that DT was measured by three short 3 min tests. It is known that Extraverts often perform better at short tests and this may have led to the emergence of this factor as being a significant predictor. Openness failed to reach significance though it was in the predicted direction. It is possible that had the tests been of longer duration Extraversion would have a reduced impact while Openness would have accounted for more of the variance.

The second measure of creativity was self-rated creativity. There have been a few studies on self-rated creativity. Furnham (1999) found Openness significantly predicted self-rated creativity. Furnham et al. (2006) found Openness and Conscientiousness predicted self-estimated creativity which was positively related to test-measured creativity. Similarly studies on the relationship between self-estimated and valid to be test-derived scores of intelligence suggest correlations of around $r = .40$ which attests to the validity of self-assessment (Chamorro-Premuzic et al., 2004).

This study showed fluid intelligence was unrelated to self-assessed creativity but hypomania was. Indeed hypomania accounted for most of the variance (17%) with only Openness adding a further 5%. Thus hypomanic Open individuals believe they have high creativity. This would certainly make sense from other studies on normal and abnormal studies of creativity (Eysenck, 1995; Jamison, 1993; Lloyd-Evans et al., 2006).

The final regressions showed results fairly similar to the analysis of self-rated creativity. Here the criterion variable was a list of hobbies/leisure activities usually associated with creativity. It is unlikely that this measure would be as prone to impression management and self-delusion bias as the previous measure of self-estimated creativity. Nevertheless results were reasonably similar. For the BICB whilst fluid intelligence was, not a significant predictor, hypomania was and alone accounted for 12% of the variance. However in the final equation there were only two significant predictors both from the Big Five. It showed Open, Extraverts tended to have more creative hobbies.

Interestingly the only factor that was significant across all the three analyses was hypomania. However, in the final regression with all three sets of variables it was personality traits that had most predictive validity. It seemed that the overlap between the traits of Extraversion and Openness with Hypomania meant in the final regression it was those personality traits which accounted for all the variance.

What this study has demonstrated is that correlates of creativity are clearly different depending on how creativity is measured. Although results from different creativity tests tend to be significantly and positively inter-correlated they have different correlates. It also showed that whilst intelligence is only modestly related to creativity, hypomania as a single trait can account for

as much as 15% of the variance. Hypomania is probably related to DT creativity because of the associative thinking associated with mania and to self-reported and hobby-related creativity because of sensation-seeking and risk taking elements of mania. However it is unlikely that hypomania is linked to traditional academic achievement and may in fact inhibit it. This may mean that in populations similar to those tested here creativity in young people is associated with poorer academic results in many subjects.

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