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Individual Differences in Ideational Behavior: Can the Big Five and Psychometric Intelligence Predict Creativity Scores?

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This study explored the extent to which ideational behavior (IB; Runco, Plucker, & Lim, 2000–2001), an indicator of creativity, is related to established individual differences in personality traits (Five Factor Model or FFM; Costa & McCrae, 1992), fluid (*gf*) and intelligence (IQ). A total of 158 (112 female) college students from British and American universities took part in this study. Bivariate correlations showed that IB was significantly associated with Openness to Experience, Conscientiousness (negatively), and *gf*. Hierarchical regression analysis showed personality to be a better predictor of IB than was intelligence. Cognitive ability measures only accounted for 4% of the variance in IB, whereas the Big Five superfactors explained an additional 22% of the variance (with gender explaining a further 3%). Furthermore, selected personality facets of Openness to Experience, Agreeableness, and Conscientiousness, explained the largest amount of variance in IB, namely 35%. Results are discussed with regard to the theoretical implications of the taxonomic place of IB in the wider realm of individual differences constructs.

The assessment of trait creativity (Eysenck, 1993; Guilford, 1950) has proven to be a difficult undertaking, in part due to the difficulty in selecting appropriate measures (Batey & Furnham, 2006; Plucker & Renzulli, 1999). Inconsistent definitions of the creativity construct (Parkhurst, 1999) have obfuscated the selection of appropriate assessments of creativity. However, a recent review of the creativity literature concluded that "over the course of the last decade, however, we seem to have reached a general agreement that creativity involves the production of novel, useful products" (Mumford, 2003, p. 107).

There is a convergence among researchers that creativity in the individual will be reliant upon multiple components (Amabile, 1996; Eysenck, 1995, Mumford & Gustafson, 1988; Woodman & Schoenfeldt, 1989). These components usually include cognitive ability, personality factors, cognitive style, motivation, knowledge, and the environment as sources of stimulation (Dodds, Smith, & Ward, 2002; Moss, 2002) and evaluation (Csikszentmihalyi, 1999). Although it has been argued that studies of creativity should focus on eminent creators (Csikszentmihalyi, 1999), Mumford (2003) indicated that studies of creativity in normative samples are an important future avenue of creativity research. Runco et al. (2000–2001) suggested creative ideation (or Ideational Behavior; IB) to be a universal component of creativity, in that creativity at all levels involves ideation. The Runco Ideational Behavior Scale (RIBS) was devised to assess self-reported creative ideation or "behavior that clearly reflects the individual's use of,

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appreciation of, and skill with ideas'' (Runco et al., 2000–2001, p. 394).

Runco et al. (2000–2001) suggested that the product approach to creativity assessment, although popular (Hocevar & Bachelor, 1989), may be considered flawed. The product approach to creativity assessment may not be suitable for children and nonprofessionals, does not elucidate upon the processes involved in product creation, and the discriminant validity of judge's ratings of creativity in some domains is contentious (Lindauer, 1990). Last, in practical terms the assessment of creative products is time-consuming and open to considerable bias in judgment.

To take account of the difficulties of a product-oriented approach to creativity assessment, Runco et al. (2000–2001) suggested the RIBS as an alternative measure. Their primary contention was that ''ideas can be treated as the products of original, divergent, and even creative thinking'' (p. 394). From this perspective, ideas are seen as common products related to creativity across domains and, therefore, suitable for understanding normally distributed traits or everyday creativity (Runco & Richards, 1998). The benefits of assessing IB are that ideas are products created by everyone; IB will be domain-general and that the processes underlying the production of ideas have been described (Guilford, 1967; Mednick, 1962). To capture the essence of IB, Runco et al. (2000–2001) developed the RIBS to provide a self-report measure of an individual's perceived ''ability to be original, flexible and fluent—with ideas'' (p. 394); facets of divergent thinking (DT). Runco et al. (2000–2001) developed an initial pool of 100 questionnaire items. Following *a priori* item selection, the pool was reduced to 23 items that reflected the principles of ideation. Typical items include; ''I come up with an idea or solution other people have never thought of,'' ''I am good at combining ideas in ways that others have not tried,'' and ''I have always been an active thinker—I have lots of ideas.'' The questionnaire items are responded to using a 5-point scale ranging from 1 (*never*) to 5 (*very often*).

Exploratory factor analysis using principle axis factoring and a scree test suggested a single factor solution. The reliability of the RIBS was established in two samples of 97 and 224 students, respectively, yielding internal consistency coefficients on the order of $\alpha = .92$ and .91, respectively. Discriminant validity of the RIBS was established in a sample of 91 students with regards to two measures of attitudes and student grade point average (GPA). Basadur's (Runco & Basadur, 1993) self-report 8-item measure of *openness to divergence* and 6 item measure of *tendency toward premature closure* were found to share 10–12% of variance with the RIBS ($r's = .34$ and .32, respectively, $ps < 0.1$). Student GPA was not significantly related to the RIBS. Subsequent studies of the validity of the RIBS have used the original 23-item version of the RIBS and, in the case of Ames and Runco (2005), a 37-item variant (cf. Runco et al., 2000–2001). These studies have found the measure to be correlated with DT (Ames & Runco, 2005; Plucker, Runco, & Lim, 2006), levels of successful entrepreneurship (Ames & Runco, 2005) and to be largely invariant in a sample of Korean and American students (Plucker, Runco, & Lim, 2006). However, the extent to which the RIBS overlaps with intelligence and the Five-Factor Model (FFM) of personality is unknown.

The primary aim of this study was to ascertain the relationship of IB to validated (Matthews, Deary, & Whiteman, 2003; Neisser et al., 1996) measures of individual differences: personality and intelligence. This analysis will allow an investigation of the taxonomic location of IB in relation to established individual differences measures and to ascertain further the construct validity of the measure.

Studies of the creative personality using the FFM have repeatedly found a relationship between creativity and Extraversion (E), Openness to Experience (O) and, to a smaller extent, Conscientiousness (C, negatively; Feist, 1998; Furnham, Batey, Anand, & Manfield, 2008; King, Walker, & Broyles, 1996; McRae, 1987; Wolfradt & Pretz, 2001; see Batey & Furnham [2006] for a review). It is likely that IB possesses differential relationships to personality and intelligence. From the FFM, the factors E, O, and C will most likely be related to IB scores. E and O may be positively related to IB, and C will likely be negatively related to IB. E may be postulated to provide both the energy for creative pursuits and the sociability that increases the likelihood that an individual's creative ideas have been appreciated in the past; leading to a self-appraisal of superior creative ideation. An important caveat to these findings is that most of the studies that have revealed a significant positive relationship between E and creativity have employed group-administered, timed tests of DT. It is possible that the observed relationships of E to DT may be a result of the nature of the creativity criterion employed. In timed tests of DT, E traits such as sensation-seeking and gregariousness will favor performance. Extraverts might use the divergent thinking test scenario as a means of seeking excitement and may be more comfortable with a group administration. The RIBS was not a performance measure of creativity, but rather focuses on the internal world of ideas, with this in mind it is possible that Introversion, rather than E, might predict IB.

O is likely to influence the richness of ideas an individual holds, thereby increasing the chances that remote ideas may be associated; resulting in improved creative thinking (Mednick, 1962). This perceptual and ideational openness may, in part, be due to a decreased

ability to inhibit irrelevant stimuli (Peterson, Smith, & Carson, 2002). Decreased C may be postulated to promote creativity, in that low C individuals are more likely to disregard instruction, avoid order, and act impulsively. These behaviors may improve the chances of finding new and useful ways of approaching tasks and ideas. It is expected that IB will be positively correlated with O (H1a) and E (H1b), but negatively with C (H1c).

Studies of creative intelligence using DT tests have found a weak to moderate relationship to psychometric intelligence (Batey & Furnham, 2006). Early research indicated that there may be a curvilinear relationship between intelligence and DT (Guilford, 1981; Torrance, 1962; Yamamoto, 1964). However, recent research has suggested that the data do not support the threshold theory as weak linear relationships between DT and intelligence have been observed (Kim, 2005; Silvia, 2008). Studies relating rated creativity to measures of intelligence have found nonsignificant relationships (MacKinnon, 1961). The RIBS is a behaviorally anchored self-report measure of IB, therefore a positive relationship between IB and IQ and *gf* is expected. It is likely that the relationship between IB and *gf* will be of greater magnitude than that observed between IB and IQ. This is because self-reported creative ideation or IB will be more reliant upon efficient cognitive function, than accumulated knowledge; though both will be required in real-life creative problem-solving. Were the IB measure to assess actual ideational performance (as opposed to perceived ideational behavior), it is likely that a test of crystallized intelligence or knowledge would be predictive. It was hypothesized that there would be a significant positive relationship between IB and *gf* (H2a) and a significant positive relationship between IB and IQ (H2b). Of the two intellectual constructs, the magnitude of the relationship between *gf* and IB will be greater than that observed between IQ and IB (H2c).

METHOD

Participants

A total of 158 undergraduate students from a large British university took part in this study. All participants possessed a high degree of English language proficiency, in accordance with university admission requirements. There were 112 females and 46 males. Their ages ranged from 18 to 27 ($M = 20.43$, $SD = 2.45$).

Measures

Ideational behavior. Ideational behavior was assessed through the RIBS (Runco et al., 2000–2001). This is a 23-item self-report scale that assesses differences in individuals' recalled tendency to generate novel and original ideas. Participants respond on a 5-point Likert-type scale. The theoretical rationale underlying this scale is based on Guilford's (1967) comprehensive structure of intellect (SOI) model, in particular the belief that ideas are the result of original, divergent, and creative thinking processes. Despite the novel aspect of this scale, it has been reported to have good internal reliability (Runco et al., 2001). The internal consistency of the scale for this study was found to be acceptable ($\alpha = 0.88$). The construct validity of this measure in relation to established measures of individual differences was the aim of this investigation.

Personality. Personality was assessed through the Revised NEO Personality Inventory (NEO-PI-R) (Costa & McCrae, 1992), which is a well-established and widely used 240-item, nontimed questionnaire that assesses the Big Five personality factors, namely, Neuroticism, Extraversion, Openness to Experience, Agreeableness, and Conscientiousness, as well as the 30 underlying facets. Items involve questions about typical behaviors and are answered on a 5-point Likert-type scale (*strongly disagree*, *disagree*, *neutral*, *agree*, and *strongly agree*). The manual shows impressive indexes of reliability and validity (Costa & McCrae, 1992).

Intelligence (IQ). IQ was measured through the Wonderlic Personnel Test (Wonderlic, 1992). This omnibus IQ test consists of 50 items and is administered in 12 min. Scores can range from 0 to 50. Items include word and number comparisons, disarranged sentences, serial analysis of geometric figures, and story problems that require mathematical and logical solutions. The test has been normed extensively and correlates very highly ($r = .92$) with the Wechsler Adult Intelligence Scale–Revised (WAIS-R).

Fluid intelligence (gf). Fluid intelligence (gf) was measured through the Baddeley Reasoning Test (Baddeley, 1968). This 64-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/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 (e.g., Furnham, Chamorro-Premuzic, & Moutafi, 2005).

Procedure

Data were collected as part of an introductory class on personality psychology (students had no previous formal background in psychology) and participants were debriefed, including feedback on their scores. Tests were

TABLE 1
Descriptive Statistics and Inter-Correlations for All Measures

	M	*SD*	*1*	*2*	*3*	*4*	*5*	*6*	*7*	*8*
Ideational Behavior	72.1	12.0	−.15	−.08	.10	.30**	−.12	−.18*	.19*	.03
1. Gender			—	.09	.07	.05	.16*	.06	−.02	−.22**
2. Neuroticism	122.4	28.7		—	.46**	.40**	.54**	.61**	.02	.22**
3. Extraversion	133.2	21.7			—	.59**	.59**	.67**	.11	.31**
4. Openness	135.8	20.8				—	.55**	.46**	.13	.31**
5. Agreeableness	133.7	23.7					—	.72**	.05	.28**
6. Conscientiousness	133.2	27.7						—	−.02	.20**
7. *gf* (BRT)	30.8	12.8							—	.60**
8. *IQ* (WPT)	25.7	6.5								—

Note. $N = 158$. Gender coded: 1 = male, 2 = female. *gf* = fluid intelligence, BRT = Baddeley Reasoning Test, WPT = Wonderlic Personnel Test. *$p < .05$. **$p < .01$.

administered by three experimenters in a large and quiet lecture theater. Participants completed the ability measures first, followed by the self-report scales of personality and ideational behavior.

RESULTS

Bivariate Correlations

Descriptive statistics and intercorrelations for all measures are reported in Table 1. As can be seen, IB was significantly correlated with two personality factors, namely O (positively), and C (negatively). This confirmed H1a and H1c. IB was also positively and significantly correlated with *gf*, confirming H2a. It is noteworthy that, despite the high correlation between IQ and *gf*, IB was only significantly correlated with fluid aspects of intelligence.

TABLE 2
Hierarchical Regression: Intelligence, Personality, and Gender as Predictors of Ideational Behavior

Model		*St.β #1*	*St.β #2*	*St.β #3*	*t*
#1	IQ (WPT)	−.13			1.37
	gf (BRT)	.27			2.76**
	$F(2, 155) = 3.89$**	Adj. $R^2 = .04$			
#2	IQ (WPT)		−.18		1.97*
	gf (BRT)		.22		2.46*
	Neuroticism		−.01		.15
	Extraversion		.20		1.96*
	Openness		.49		5.43*
	Agreeableness		−.21		1.92*
	Conscientiousness		−.34		2.89**
	$F(7, 150) = 8.85$**		Adj. $R^2 = .26$		
#3	IQ (WPT)			−.27	2.81**
	gf (BRT)			.26	2.97**
	Neuroticism			.01	.07
	Extraversion			.22	2.15*
	Openness			.49	5.51**
	Agreeableness			−.14	1.34
	Conscientiousness			−.38	3.24**
	Gender			−.20	2.73**
	$F(8, 149) = 9.01$**			Adj. $R^2 = .29$	

Note. $N = 158$. Gender coded: 1 = male, 2 = female. *gf* = fluid intelligence, BRT = Baddeley Reasoning Test, WPT = Wonderlic Personnel Test. *$p < .05$. **$p < .01$.

Multiple Regressions

Next, a series of hierarchical regressions using the SPSS enter method were performed on the data to test the extent to which personality and intelligence, as well as gender, could predict differences in IB. Personality was a better predictor of IB than was intelligence, although the model that included both personality and intelligence scores was most successful at predicting differences in IB. Moreover, the amount of variance explained in IB increased when gender was added to the equation. The significant individual predictors of IB were (in decreasing order): O, C, *IQ*, *gf*, gender, and Agreeableness (see Table 2).

Regressions were also performed with facets of personality, and then specifically the primary factors of the Big Five that were significantly correlated with IB. The results of these analyses are presented in Tables 3 and 4, respectively. As can be seen, angry hostility, vulnerability (negatively), aesthetics, ideas, and deliberation (negatively) were significant predictors of IB, and in fact the selected primary factors explained more variance in IB than did the personality factors, intelligence, and gender combined, namely 35%.

DISCUSSION

This study demonstrated, as predicted, that intelligence and personality traits were systematically related to creativity as measured by IB. Indeed, together they

TABLE 3
Hierarchical Regression: Facets of the NEO-PI-R as Predictors of Ideational Behavior

	St.β	*T*
N1: Anxiety	.05	.42
N2: Angry hostility	.28	2.03*
N3: Depression	.00	.00
N4: Self-consciousness	−.10	−.73
N5: Impulsiveness	.10	.96
N6: Vulnerability	−.38	−2.39*
F (6,151) = 1.83	*Adj.* R^2 = .03	
E1: Warmth	.01	.06
E2: Gregariousness	−.17	−1.59
E3: Assertiveness	.16	1.36
E4: Activity	−.01	−.10
E5: Excitement-seeking	.04	.38
E6: Positive emotions	.09	.82
F (6,151) = .95	*Adj.* R^2 = − .00	
O1: Fantasy	.12	1.51
O2: Aesthetics	.30	3.32**
O3: Feelings	.11	1.34
O4: Actions	−.37	−4.32**
O5: Ideas	.26	2.97**
O6: Values	.10	1.27
F (6,151) = 9.78**	*Adj.* R^2 = .25	
A1: Trust	.09	.84
A2: Straightforwardness	−.10	−.99
A3: Altruism	.03	.29
A4: Compliance	−.17	−1.47
A5: Modesty	−.18	−1.83
A6: Tender-mindedness	.13	1.01
F (6,151) = 2.12	*Adj.* R^2 = .04	
C1: Competence	.32	2.40*
C2: Order	−.13	−1.16
C3: Dutifulness	.01	.08
C4: Achievement striving	.18	1.29
C5: Self-discipline	−.20	−1.39
C6: Deliberation	−.38	−3.00*
F (6, 151) = 3.76*	*Adj.* R^2 = .10	

Note. N = 158.
*$p < .05$. **$p < .01$.

TABLE 4
Hierarchical Regression: Selected Facets of the NEO-PI-R as Predictors of Ideational Behavior

	St.β	*t*
N2: Angry hostility	.27	2.54*
N6: Vulnerability	−.30	−2.35*
O2: Aesthetics	.38	4.74**
O4: Actions	−.16	−1.58
O5: Ideas	.33	4.13**
C1: Competence	.09	.87
C6: Deliberation	−.37	−3.46**
F (7, 150) = 13.10**	Adj. R^2 = .35	

Note. N = 158.
*$p < .05$. **$p < .01$.

account for approximately a third of the variance. Furthermore, personality (notably Openness) possesses major incremental validity over intelligence, as might be expected since both the RIBS and NEO-PI-R were self-report measures.

The first hypotheses (H1a–c) were partially supported. The correlational analyses revealed a positive correlation between IB and O, and a negative correlation between IB and C, confirming H1a and H1c. No significant relationship was observed between the measure of IB and E, failing to confirm H1b. The results of the regressional analysis provided further support for the hypotheses. The personality factors O and E were positively related to IB, while C was negatively related, confirming H1a–c. Of these, O accounted for the greatest amount of variance.

An examination of the facets of the NEO-PI-R significantly related to IB was able to provide a finer detailed consideration of the relationships between personality facets and ideational behavior. The findings that *angry hostility* and *ideas* (positively), and *deliberation* (negatively) were related to IB indicate that the construct would appear related to an inability to restrain impulses. These primary factors suggest that self-perceived fluent and flexible ideational behavior is partly a result of disinhibition. This theme is recurrent in the literature. Psychoticism has been demonstrated to relate to fluent performance in DT tests (Woody & Claridge, 1977) and real-world artistic achievement (Gotz & Gotz, 1979a, 1979b). It is likely that disinhibition plays an important role in creative cognition, in that less cognitively inhibited individuals will be more likely to proffer unusual ideas. Conversely, individuals that inhibit or censor their ideas will be less fluent and perceive themselves to be so (Batey & Furnham, 2008). The negative relationship between the *actions* facet of O and IB may be allied to the notion that openness to actions involves physical action (whereupon ideation presumably desists), whereas IB focuses more upon continued ideation. Interestingly, the regression of the selected facets of the NEO-PI-R against IB accounted for greater variance than the broad traits. This may be explained with reference to the finding that there were not unidirectional relationships between the facets and IB. That is, within the broad traits some facets were found to be positively significantly related to IB, and others were significantly negatively related to IB. This was the case for two facets of N (where *angry hostility* was positive and *vulnerability* negative), three facets of O (where *aesthetics* and *ideas* were positive and *actions* negative), and two facets of C (where *competence* was positive and *deliberation* negative). In effect, when examining the relationships between primary factors and IB, some of the facets would have cancelled each other out in the process of producing the primary factor scores.

The second set of hypotheses (H2a–c) were that there would be significant positive relationships between IB and *gf* (H2a) and between IB and IQ (H2b). These hypotheses were partially supported. A correlational analysis indicated there to be a positive correlation between IB and *gf*, confirming H2a. In the first model where cognitive ability measures alone were regressed against IB, *gf*, as anticipated revealed a positive relationship, but IQ was unrelated. However, in the second and third models (with the addition of personality factors and gender as independent variables) IQ was revealed to be a significant negative indicator of IB.

Perhaps this negative relationship may be explained with reference to the concept of the cognitive styles of divergent versus convergent thinking (Hudson, 1966). It has been suggested that divergent thinking tests "require individuals to produce several responses to a specific prompt, in sharp contrast to most standardized tests of achievement or ability that require one correct answer" (Plucker & Renzulli, 1999, p. 38). If a preference for divergent thinking lies on a continuum with a preference for convergent thinking at its opposite pole (Guilford, 1967), then we may hypothesize that participants who reported divergent creative ideation preferences would not score highly on tests of convergent thinking as they would experience diminished motivation to complete the tests of IQ and *gf* as this would not be their preferred cognitive style. However, stylistic differences indicate a preference for handling information in certain ways (e.g., divergent thinking), this is not the same as lacking the ability to process information in a different way (e.g., convergent thinking).

Another possible explanation for the finding that IB is negatively related to IQ may be that the cognitive characteristics that accompany IB are antithetical to convergent thinking. So, rather than style being the issue, it is a matter of ability. It has been suggested that the cognitive style of the divergent, creative thinker is *overinclusive* (Eysenck, 1993) and involves remote associations (Mednick, 1962). Such cognitive characteristics may be different to those used during convergent thinking (Folley & Park, 2005). Therefore, we may hypothesize that IB is negatively related to IQ not because of preference, but because the cognitive characteristic of IB interferes with the rapid retrieval and manipulation of contextual information (cf. Powers & Kaufman, 2004). The same processes that allow diverse ideas to be combined in unusual ways in conceptual space may interfere with the unhindered retrieval of information used in timed tests of *g*. Conversely, the processes that allow for rapid retrieval and focused abstract reasoning (and therefore elevated IQ scores) may be poorly suited for the purposes of creative ideation.

There is evidence that the thinking of *creatives* is similar to that of those suffering from psychopathologies (cf. Andreasen & Powers, 1974; Eysenck, 1993) and to those who possess subclinical manifestations of psychopathology (Batey & Furnham, under review; Furnham et al., 2008; Furnham, Crump, Batey, & Chamorro-Premuzic, 2009; Green & William, 1999; Nettle, 2006; Schuldberg, 1990). The thought disorder is characterized by "overinclusivity" or a "widening of the associative horizon" (Eysenck, 1993, p. 165). This widening of conceptual relevance may be hypothesized to result in slower performance in tests of intelligence where contextual information must be retrieved. An analysis of some of the items used in the RIBS indicate that they appear to be assessing ideational behaviors related to overinclusive thinking (e.g., "When writing papers or talking to people, I often have trouble keeping with one topic because I think of so many things to write or say" and "Some people think me scatterbrained or absentminded because I think about a variety of things at once"). It could be that circuitous thinking may prove to be of benefit during the production of creative products, but be a disadvantage in standardized tests of IQ (Powers & Kaufman, 2004).

There are limitations to this analysis of IB. First, the relationship of IB to established individual differences measures was explored in a sample of (predominantly female) undergraduates, limiting the generalizability of the results. Second, the two measures of intelligence employed, although possessing adequate validity, could have been more robust. Both tests were verbal and short, therefore the relationships observed with IB and intelligence might differ should a nonverbal test of *gf* be employed. Third, although the primary aim of this study was to analyze IB in the context of established individual differences measures, other constructs may have been able to explain variance in IB scores. For example, a measure of schizotypy (e.g., OLIFE; Mason, Claridge, & Jackson, 1995) may have explained significant variance and also have indicated whether IB is related to cognitive disorganization. Fourth, that both the RIBS and NEO-PI-R are self-report measures could indicate that observed correlations were in part attributable to method overlap. Fifth, item content overlap between items on the RIBS and NEO-PI-R could explain observed correlations.

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