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Running Title: Personality and Malevolent Creativity

Psychopathy and Openness-to-Experience as Predictors of
Malevolent and Benevolent Creativity

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Abstract

This study examined personality antecedents of idea generation when pursuing either benevolent or malevolent goals. Specifically, 308 participants completed two Divergent Thinking tests. A malevolent divergent thinking test (MDT) in which participants generated ideas to inflict revenge and a benevolent divergent thinking test (BDT) in which participants generated well-meaning ideas. In addition, participants provided self-ratings of their Openness-to-experience and Psychopathy. Drawing upon the Blind Variation Selective Retention Combinatorial model, we proposed a dual pathway model, in which openness-to-experience was hypothesised to relate to BDT performance and psychopathy was hypothesised to relate to MDT performance. Structural Equation Models were consistent with hypotheses. Openness-to-Experience was related to BDT but not MDT whereas Psychopathy was related MDT but not BDT. We also explored facet-level and aspect-level models, which revealed some interesting insights. In addition, we provide four key principles underlying the development of our MDT test that can serve as a guide for the construction of future tests.

Key Words: Creativity; Malevolent Creativity; Divergent Thinking; Personality; Psychopathy

The central component of “creativity concerns the cognitive and behavioural processes applied when attempting to generate novel ideas” (Hughes, Lee, Tian, Newman, & Legood, 2018). To date, researchers have predominantly focussed on positively motivated or benevolent creativity and neglected malevolent creativity.

Malevolent creativity, defined as “creativity that is deliberately planned to damage others” (Cropley, Kaufman, & Cropley, 2008, p.106), has explored creativity in areas such as terrorism, abuse and counterproductive work behaviors (Cropley & Cropley 2011; Gutworth, Cushenbery & Hunter, 2016; Harris, Reiter-Palmon & Kaufman, 2013). Nevertheless, malevolent creativity research remains “in its infancy” (Harris & Reiter-Palmon, 2015, p. 54) with calls for further scrutiny (e.g., Harris et al., 2013; Jonasson et al., 2017; Kapoor & Khan, 2016). Specific calls have suggested that “developing a strong foundation of [the] antecedents [of malevolent creativity] is paramount” (Harris & Reiter-Palmon, 2015, p.54). Accordingly, this study examined the personality antecedents of ideas generated in response to two divergent thinking tests that differed in goal-valence. A benevolent condition in which participants generated well-meaning ideas and a malevolent condition in which participants generated ideas to inflict revenge.

Assessing DT and MDT

Creativity is most commonly assessed using Divergent Thinking (DT) tests (Batey, Rawles & Furnham, 2009). Though not synonymous with creativity, DT tests provide the best assessment of idea generation (Zeng, Proctor & Salvendy, 2011) which is the crucial aspect of creativity. DT tests have also been used to assess malevolent creativity. Typically, participants are presented with scenario-based measures (Harris & Reiter-Palmon, 2015; Harris et al., 2013; Kapoor & Khan, 2018a) or object-based tests of Alternate Uses (Kapoor & Khan, 2016; Kapoor & Khan, 2018a, 2018b; Lee & Dow, 2011), without any exhortation to be malevolent. Accordingly, previous tests have assessed malevolence in an opaque

manner. However, these methods result in the generation of very small numbers of malevolent responses per person, with mean malevolent responses ranging from 0.07 to 1.12 (Harris & Reiter-Palmon, 2015; Harris et al., 2013; Kapoor & Khan, 2016; Lee & Dow, 2011). Because these methods produce very little variance, that is heavily skewed, and restricted in range (violating key assumptions of the statistical methods used), they do not provide the most useful measurement tool. Indeed, it is difficult to explain variance when the outcome variable has very little variance.

Because previous methods for assessing malevolent creativity are sub-optimal, and elicit few responses, we developed a novel malevolent goal-valenced DT test (referred to as Malevolent Divergent Thinking: MDT). The MDT test was developed using four key principles based on best-practice recommendations from general DT research and recent work discussing the assessment of malevolent creativity (e.g., Harris & Reiter-Palmon, 2015; Kapoor & Khan, 2016, 2018a, 2018b). These principles can be summarised as follows:

1. MDT tests should be based on realistic scenarios in order to enhance respondent motivation (Plucker, 2017), “facilitate the generation of creative thought” (Kapoor & Khan, 2016, p408), and ensure greater ecological validity (Hughes et al., 2018). Kapoor and Khan (2018a) found that real world scenario DT test items yielded more negative and original responses than object-oriented DT test items.
2. MDT tests should contain goal-valenced instructions that prime participants towards malevolent goals (Gutworth et al., 2016; Harris & Reiter-Palmon, 2015) thereby increasing participants’ “intent to cause harm or damage” (Cromptley, 2010, p339). Kapoor and Khan (2018b) found that negative instructions produced more negative and original responses than positively-valenced instructions.

3. MDT tests, in order to maximise idea generation, should contain explicit instructions to be both malevolent (Gutworth et al., 2016; Kapoor & Khan, 2018b) and creative (Zeng et al., 2011).
4. MDT tests should, in order to increase their readability, use simple language and follow best-practice psychometric test item-writing guidelines (e.g., Irwing & Hughes, 2018).

Following these principles, we developed similar length Malevolent Divergent Thinking (MDT) and Benevolent Divergent Thinking (BDT) tests (see appendix) where variations in goal-valence prompted for either malevolent or benevolent responses. In the MDT test, participants were instructed to seek revenge on a callous flatmate who had knowingly organised a party before an important exam. In the BDT test participants were instructed to generate creative revision methods. Scant research has examined the relationship between BDT and MDT, but we hypothesise that BDT and MDT will share a modest, positive, and significant correlation (H1) because both assess idea generation under timed conditions and thus will share some overlapping intellectual underpinnings (e.g., knowledge, speed of retrieval and processing; Batey & Furnham, 2006).

Personality antecedents of BDT and MDT

We anticipate that different personality traits will correlate with idea generation in the pursuit of malevolent and benevolent goals, for two reasons. First, the few studies that have included metrics of both benevolent and malevolent creativity support this contention, in that performance on the different tests correlate differentially with other variables, including some personality variables (Harris & Reiter-Palmon, 2015; Kapoor & Khan, 2016, 2018b; Lee & Dow, 2011).

Second, the Blind Variation Selective Retention Combinatorial Model (BVSr; Simonton, 2010) of idea generation posits, “creativity, discovery, invention, and problem

solving all entail the recombination of ideas by various combinatorial processes and procedures” (Simonton, 2015, p263). Essentially, creative thinking may be characterised by combinations of knowledge to produce novel ideas that are selectively retained by an individual as suitable for solving a problem. We contend that personality influences the BVSR mechanism in accordance with an input-process-output account of the creative process. That is, personality traits influence the acquisition of knowledge (input), the associations or combinations made with acquired knowledge (process) and influence the ideas people are prepared to share (output).

The personality predictors of DT are well known; a substantial body of research shows that Openness-to-experience is the most consistent and largest correlate of rated DT (Puryear, Kettler, & Rinn, 2017). In part this is because those higher in Openness-to-experience tend to try new things, consider alternate perspectives, and enjoy accumulating new knowledge (e.g. Batey & Furnham, 2006). As a result, those high in Openness-to-experience have more interconnected and flexible semantic networks that likely facilitate mental associations and combinations of thought that help produce novel ideas (Christensen et al., 2018). Further, in accordance with BVSR theory, those with elevated Openness-to-experience are more likely to consider, retain and express unusual ideas (Simonton, 2010). Analysis of the structure of Openness-to-experience (DeYoung, Quilty, & Peterson, 2007) suggests that it has two main aspects – aesthetic interests (Openness) and intellectual stimulation (Intellect), both of which might facilitate idea generation in the domain of novel revision techniques. The Openness aspect inclines people to engage in the arts and sensory experiences and perhaps creates a self-concept that they are ‘arty’ and because arty people are creative it serves as a self-fulfilling prophecy that enhances their interest in creative endeavours (Batey & Hughes, 2017; Hughes, Furnham, & Batey, 2013). The Intellect aspect is associated with enjoyment of deliberate and sustained complex thought (e.g.,

philosophical/scientific debate; DeYoung et al., 2007), questioning existing paradigms (e.g. problem-finding; Abdulla, Paek, Cramond, & Runco, 2018), and the development of extensive general and domain-specific knowledge (Batey, Chamorro-Premuzic & Furnham, 2009). These tendencies provide a greater and more interconnected knowledge base for idea generation in accordance with BVSR (Simonton, 2010). Thus, we hypothesise that Openness-to-experience will be positively and significantly correlated with creativity assessed via BDT (H2). We will also separate Openness-to-experience into its two aspects, Openness and Intellect, to explore their relationships with BDT and MDT.

Few studies have examined the relationship between personality variables and markers of malevolent creativity. Those that have report weak or null relationships with Openness-to-experience both when malevolent creativity was assessed by coding malevolent responses to a traditional DT test (Lee & Dow, 2011) and when assessed by a DT-like test which deliberately invoked malevolent responses (Gutworth et al., 2016; Kapoor & Khan, 2018b). Thus, we might expect a small and non-significant relationship between Openness-to-experience and MDT, and therefore need to identify a personality variable that more closely influences the BVSR mechanism in pursuit of malevolent ends. Lee and Dow (2011) found that the number of malevolent creative ideas generated in response to DT tests was positively associated with trait physical aggression, and negatively associated with conscientiousness. Similarly, Harris and Reiter-Palmon (2015) found that rated malevolent creativity was positively correlated with implicit aggression and negatively correlated with premeditation (i.e., forethought and planfulness). These two classes of traits (i.e., low agreeableness and low conscientiousness) are commonly considered to be core components of perhaps the most malevolent personality variable: Psychopathy (Miller, Hyatt, Maples-Keller, Carter, & Lynam, 2016).

Numerous models of Psychopathy exist (see Hare & Neumann, 2005). However, a substantial body of theoretical and empirical evidence now supports Hare's four factor model (Hare & Neumann, 2005; Neumann, Hare, & Newman, 2007) which suggests Psychopathy manifests in four domains: interpersonal relationships, affective functioning, lifestyle, and antisociality. From a personality perspective, a recent study (Tokarev, Phillips, Hughes, & Irwing, 2017) demonstrated that these domains can be operationalized by assessing the personality traits of manipulateness (interpersonal relationships), callousness (affective functioning), impetuosity (lifestyle), and conduct problems (antisociality). The latter two traits overlap with aggression and conscientiousness/premeditation respectively, and thus, it appears that previous studies of malevolent creativity have selectively assessed components of Psychopathy and found associations.

Thus, based on current evidence if those high in Psychopathy are at all creative, then it is likely their creativity will manifest in a malevolent manner; elicited through opportunities to enact revenge, manipulate, or deceive (Galang et al., 2016). Turning to BVSR, we hypothesise the mechanism by which Psychopathy leads to enhanced MDT is that those high in Psychopathy will have engaged in more experiences related to manipulation, callousness, impetuosity and antisociality, leading in turn to a greater acquired knowledge regarding behaviours that will lead to the deliberate intent to cause harm or damage (input). As a result, when faced with a malevolently-valenced scenario there will be a great number of creative combinations to be made with this acquired knowledge (process). Lastly, those with elevated Psychopathy will be more likely to retain and express malevolent ideas in response to the MDT test (output).

However, two recent studies reported conflicting and inconclusive results. Jonasson et al., (2017), using two abbreviated scales, found that one Psychopathy scale correlated positively with idea-harmfulness but negatively with creativity, whereas the Psychopathy

scale showed the opposite relationships. Kapoor and Khan (2018b) found that Psychopathy was unrelated to negative-original ideas but this study used a small sample and the sub-optimal Levenson Self-report Psychopathy Scale (Tokarev et al., 2017). It is possible that the conflicting results stem from the fact that both studies used abbreviated and/or sub-optimal Psychopathy scales and the fact that both studies used DT tests that, as discussed earlier, produce very few responses (i.e., median ideas generated = 0) resulting in restriction of range. In contrast, the current study is well poised to build upon and improve our knowledge of the antecedents of MDT by utilising psychometrically robust measures of psychopathy.

Given the conflicting results of past empirical studies, we follow theoretical argument and hypothesise that Psychopathy will correlate with malevolent creativity assessed via MDT in a positive and significant manner (H3). Further to build upon and extend previous research (e.g., Lee & Dow, 2011; Harris & Reiter-Palmon, 2015; Kapoor & Khan, 2018b) we will explore the associations between MDT and the four sub-components of Psychopathy.

Method

Participants

In total, 308 participants, aged 18-65 years ($M=32$, $SD=12$), completed the study online. Of these, 194 were female, 113 were male, and 1 did not respond. English was the first language for all of the participants. All participants had education to the age of 16; 97 had completed non-university post-school education, 112 had a bachelors degree, 42 had a masters degree, 3 had doctoral degree, and 7 did not respond. Regarding employment status, 112 were employed full-time, 49 were employed part-time, 33 were self-employed, 68 were full-time students, 6 were unemployed, and 15 did not respond.

Measures

Openness-to-experience: In accordance with big five theory, we assessed Openness-to-experience as a second-order factor loaded by items for the personality aspects of

Openness (e.g. “I enjoy the beauty of nature”) and Intellect (e.g. “I think quickly”) from the Big Five Aspect Scale (De Young et al., 2007). We used 5 positively keyed items from each scale to avoid measurement artefacts. The items were responded to using a six point Likert-type scale from Strongly Disagree (1) to Strongly Agree (6).

Psychopathy: To assess Psychopathy we used the recently published scale from Tokarev et al. (2017). This scale was generated according to Hare’s theory (e.g., Hare & Neumann, 2005), which models Psychopathy as a higher-order factor loaded by four sub-factors, namely, Callousness (corresponding to Hare’s affective functioning domain, with an example item being “I do not feel guilty when I hurt someone’s feelings”), Manipulativeness (corresponding to Hare’s interpersonal relationships domain, with an example item being “I cheat to get ahead”), Impetuosity (corresponding to Hare’s lifestyle domain, with an example item being “I make rash decisions”), and Conduct-Problems (corresponding to Hare’s antisocial tendencies domain, with an example item being “When rules are inconvenient, I break them”). We used 4 items for each sub-factor bar Impetuosity which had 7 items. This measure has high levels of internal consistency, a robust factorial structure, convergent relationships with other Psychopathy measures, and strong predictive properties (Tokarev et al., 2017). The items were responded to using a six point Likert-type scale from Strongly Disagree (1) to Strongly Agree (6).

Benevolent Divergent Thinking (BDT) test: Participants had 3 minutes to generate creative revision methods for an important exam. The participants recorded their responses before selecting their perceived most creative responses in accordance with Silvia (2008). The creativity of the selected responses was independently rated by 3 trained raters on a 5 point Likert scale (1 = least creative, 5 = most). BDT responses were also scored for fluency.

Malevolent Divergent Thinking (MDT) test: Participants had 3 minutes to generate as many creative ideas to inflict revenge on a callous flatmate who had knowingly organised a

party before an important exam (see appendix). Participants recorded their responses before selecting their perceived most creative, malevolent acts of revenge (Silvia, 2008). The malevolent creativity of the selected responses was independently rated by 3 trained raters on a 5 point Likert scale; 1 being the least malevolently creative and 5 being the most. MDT responses were also scored for fluency.

Because BDT and MDT were assessed using novel tests developed using the principles outlined in the introduction, we conducted a validation study using a novel sample (n=200). We estimated the convergent validity of the MDT and BDT tests in relation to the most widely used DT test, the alternative uses of a brick test (Puryear, Kettler & Rinn, 2017). Convergent validity evidence (i.e., bivariate correlations and confirmatory factor analysis) was strong. The full BDT and MDT tests, instructions for raters, and convergent validity evidence are displayed in the Appendix.

Procedure

Participants were recruited and conducted the assessments online. Once briefed and after providing informed consent, participants completed demographic information, the BDT and MDT tests (which were counterbalanced in administration), and the personality assessments. MDT and BDT responses were rated by three trained raters, blind to the study aims, in accordance with the Consensual Assessment Technique (CAT: Amabile, 1982). See appendix for details.

Results

The Weighted Least Squares Means and Variances adjusted estimator, within Mplus 7.4, was used for all analyses. Values $\geq .90$ for the Comparative Fit Index (CFI), Tucker-Lewis Index (TLI), and values $\leq .08$ for the Root Mean Square Residual (RMSEA) were taken as indicative of close fit to the data (Hu & Bentler, 1999).

We estimated confirmatory factor analysis models for Openness-to-experience ($\chi^2(53)=195.01$, $p<.001$; CFI=.942; TLI=.928; RMSEA=.056) and Psychopathy ($\chi^2(148)=438.78$, $p<.001$; CFI=.962 TLI=.956; RMSEA=.064), both of which provided close fit to the data. Next, we estimated a full measurement model to examine the combined fit of all study variables and estimate their inter-correlations. The model provided close fit to the data ($\chi^2(840)=1427.03$, $p<.001$; CFI=.935; TLI=.930; RMSEA=.048). Table 1 contains the factor correlations and reliabilities derived from the standardised measurement model.

Consistent with previous studies (e.g., Lee & Dow, 2011), the correlations between personality and rated and fluency scored BDT and MDT are typically modest in magnitude (<.2) but do support our hypotheses. Specifically, rated BDT and rated MDT are moderately and positively correlated as are fluency scored BDT and MDT (H1). Further, Openness-to-experience is significantly and positively correlated with rated BDT but is uncorrelated with MDT (H2), the difference between these correlations was statistically different ($z=1.97$, $p=.048$) whereas, Psychopathy is positively and significantly correlated with rated and fluency-scored MDT but is uncorrelated with BDT (H3). In addition, the correlation between Openness-to-experience and BDT was significantly stronger than that of Psychopathy ($z=1.97$, $p=.048$) and the correlation between Psychopathy and MDT was significantly stronger than that of Openness-to-experience ($z=3.23$, $p=.001$).

Regarding the aspects of Openness-to-experience, the Openness aspect was correlated with rated BDT but Intellect was not. Intellect did, however, share a small correlation with fluency scored MDT. Regarding the sub-factors of Psychopathy, Callousness and Conduct-problems were correlated with rated and fluency scored MDT but impetuosity and manipulativity were not. Interestingly, conduct-problems was also associated with rated BDT.

Table 1.

Zero-order correlations between all study variables derived from standardized measurement models.

	M	SD	ω^1	1	2	3	4	5	6	7	8	9	10	11
1 Openness-to-Experience	4.80	0.71	.76	-										
2 Openness (aspect)	4.39	0.86	.78	-	-									
3 Intellect (aspect)	4.41	0.81	.73	-	.31**	-								
4 Psychopathy	2.59	0.59	.91	-.07	-.15*	.10	-							
5 Callousness	2.11	0.83	.91	-.19*	.26**	.11	-	-						
6 Conduct-problems	2.55	0.91	.88	.22*	.03	.25**	-	.63**	-					
7 Manipulativeness	2.68	0.59	.90	-.27*	-.25**	.01	-	.71**	.78**	-				
8 Impetuousness	3.02	0.92	.89	.09	-.09	-.01	-	.20**	.53**	.40**	-			
9 Rated BDT	2.07	0.89	.79 ²	.25*	.21**	.05	.09	.02	.16*	.03	.08	-		
10 BDT Fluency	5.44	2.37	.97 ²	.03	-.05	.10	.10	.06	.08	.09	.07	.03	-	
11 Rated MDT	2.27	0.97	.82 ²	-.08	-.08	.01	.19*	.27**	.15*	.12	.05	.34**	-.04	-
12 MDT Fluency	4.95	2.67	.98 ²	.01	-.11	.14*	.11*	.11*	.12*	.09	.02	.08	.56**	.18**

Note. ¹ = Omega estimates of internal consistency; ² = Intraclass correlation coefficient estimate of reliability; * p<.05; ** p<.001.

BDT = Benevolent Divergent Thinking; MDT = Malevolent Divergent Thinking

Next, we estimated a structural equation model to examine the study hypotheses in a single model. This model, depicted in Figure 1, fit the data well ($\chi^2(618)=1194.84$, $p<.001$; CFI=.994; TLI=.930; RMSEA=.055) and accounted for 7% of the variance in Divergent Thinking and 5% of the variance in Malevolent Thinking. Although modest, the variance explained is in line with that explained in previous research, sometimes using much more complicated models (e.g., Harris et al., 2013; Harris & Reiter-Palmon, 2015; Lee & Dow, 2011).

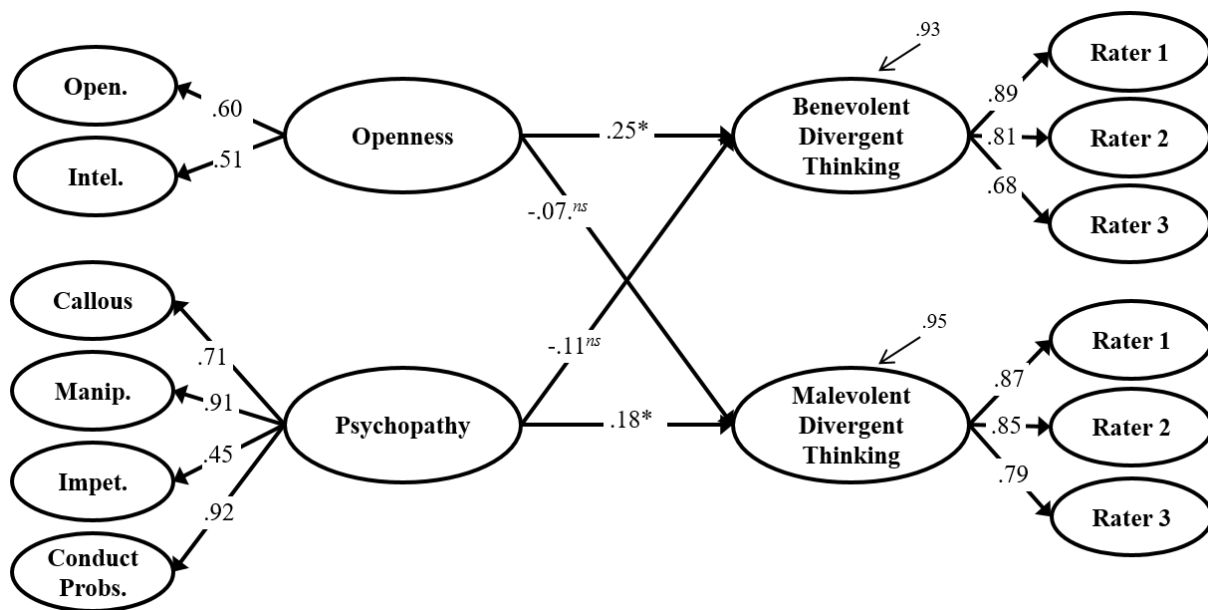


Figure 1. Structural model of the effects of Openness-to-Experience and Psychopathy on rated Benevolent Divergent Thinking and rated Malevolent Thinking. Standardized WLSMV parameter estimates. Correlations between Openness-to-Experience and Psychopathy and between BDT and MDT are omitted for presentational purposes (see Table 1). All factor loadings are significant at $p<.001$. The residual variance indicates the amount of unexplained variance. Thus for each latent variable, $R^2 = (1 - \text{error variance})$. * $p<.05$; ns=non-significant.

Finally, we explored the associations between BDT, MDT and the aspects of Openness-to-experience and the sub-factors of Psychopathy. To do this, we estimated a further structural model in which rated BDT and MDT were regressed directly onto both aspects and all four sub-factors. The model provided good fit to the data: ($\chi^2(601)=1034.87$, $p<.001$; CFI=.954; TLI=.949; RMSEA=.048). The Openness aspect was a significant predictor of rated BDT whereas callousness significantly predicted rated MDT (see Table 2).

Table 2

Standardized parameter estimates obtained from a SEM in which rated BDT and MDT were regressed on to the aspects of Openness-to-Experience and the sub-factors of psychopathy

Personality	Benevolent Divergent Thinking	Malevolent Thinking
	β	β
Openness (aspect)	.19*	-.05
Intellect (aspect)	-.08	-.05
Callousness	-.01	.36*
Conduct-problems	.31	.12
Manipulativeness	-.14	-.25
Impetuousness	-.04	.02
R^2	.08	.09

* $p < .05$

Discussion

This study developed and partially validated novel BDT and MDT tests, explored the relationship between BDT and MDT, and examined a dual pathway model, whereby Openness-to-Experience was hypothesised to be associated with BDT, but not MDT and Psychopathy was hypothesised to be associated with MDT, but not BDT. The results obtained from estimating zero-order bivariate correlations and SEM supported all study hypotheses. Taken together, the study findings suggest BDT and MDT are correlated with unique personality variables.

In support of H1, the fluency counts for BDT and MDT, as well as the ratings of BDT and MDT responses correlated positively. Thus, BDT and MDT were systematically related, most likely because both assess idea generation under timed conditions and therefore share similar intellectual underpinnings such as fluid and crystallised intelligence, and speed of retrieval and processing (Batey & Furnham, 2006). There was also evidence of some shared personality underpinnings. Both BDT and MDT were correlated with the Psychopathy sub-factor of Conduct-problems, which is consistent with the notion that to be creative in any

manner typically involves questioning norms and challenging accepted conventions (Cropley et al., 2008; Cropley, 2010).

However, our results suggest that despite some similarities, BDT and MDT tests are not synonymous. Specifically, idea generation in pursuit of a benevolent goal is associated with Openness-to-experience whereas idea generation in pursuit of a malevolent goal is associated with Psychopathy. The positive relationship between Psychopathy and MDT is in accordance with recent theoretical reasoning (Galang et al., 2016) and in contrast to previous empirical work (Kapoor & Khan, 2016).

Further, this dual-pathway finding is in accordance with BVSR and is consistent with the notion that personality predisposes individuals to perform better when generating ideas in scenarios that are trait-concordant. In other words, different personality traits facilitate creativity in domains where they are relevant or ‘activated’ (e.g., Kaufman et al., 2016). With BVSR as an underlying theory it may be contended that those with elevated Psychopathy are typically more interested in and thus acquire more of knowledge concerning manipulation, callousness, impetuosity, and antisociality (e.g., reading/watching violent or malevolent content). As a result, they have a larger semantic store of ideas involving malevolence, find it easier and more enjoyable to combine such ideas, and are more likely to retain and share malevolent responses. In contrast, those with elevated Openness will invest efforts in acquiring information pertaining to aesthetic (Openness) and intellectually complex (Intellect) activities and seem to find it relatively easier to produce creative ideas in non-malevolent scenarios.

Thus, it is perhaps the case that personality-driven differences in attentional focus, knowledge acquisition, combinatorial knowledge-processing and the retention of solutions, lead to separate pathways in the expression of creative potential. This possibility also suggests that past creativity research might have been unwittingly biased. Most tests of

creativity have implicitly or explicitly benevolent goals, which would seem to have given an advantage to those high in Openness-to-experience. Future creativity research should consider, very carefully, the role of goal-valence.

Limitations and Future Research

Despite notable improvements from previous studies concerning the sample size, measures of Psychopathy, Openness-to-experience and MDT, limitations in three areas are noteworthy. First, although our sample was larger than many used to study malevolent creativity (e.g., Harris & Reiter-Palmon, 2015; Kapoor & Kahn, 2016; 2018b; Lee & Dow, 2011) it was still smaller than would be ideal and not representative. Thus, the findings, in particular the magnitude of effect sizes, should not be generalized to other populations. Similarly, because MDT was assessed via responses to realistic but fictitious scenarios it is unclear whether or how the results might translate to specific behavioural acts of malevolence, beyond having malevolently creative ideas. Thus, it would be interesting for future research to examine the predictive validity of MDT tests in relation to malevolent actions.

Second, we used novel tests of BDT and MDT, which proved to be psychometrically robust and fit-for purpose (see validation study in Appendix). However, each test contained just a single scenario to assess BDT and MDT. It is likely that assessing BDT and MDT across multiple scenarios and domains would give a fuller reflection of participants' potential for benevolent and malevolent creativity. Similarly, although we assessed the most fundamental aspect of creativity, namely idea generation (Hughes et al., 2018), we did not assess other important peripheral aspects, including problem finding, idea evaluation, and implementation planning. It would be interesting to examine the antecedents of these stages when pursuing benevolent or malevolent goals.

Third, although we conducted the most thorough joint examination of BDT, MDT, Openness-to-experience (and its aspects), and Psychopathy (and its sub-factors) we did not include many other known antecedents. Accordingly, future research could look to assess other key individual differences (e.g., intelligence) and contextual variables.

In sum, we found support for a dual pathway model in which Openness-to-experience was associated with benevolent idea generation and Psychopathy was associated with malevolent idea generation. Thus, in accordance with BVSR, it appears that personality traits are associated with creativity when creative goals are trait-concordant.

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Appendix

Supplementary Study to Assess Convergent Validity Evidence

The goal of this supplementary study was to establish baseline ‘validity’ for the Benevolent Divergent Thinking (BDT) and Malevolent Divergent Thinking (MDT) tests employed within the main study. Construct validity evidence was assessed by examining correlations with the most widely used DT test, the alternative uses of a brick test (Guilford, 1967; Puryear, Kettler & Rinn, 2017).

Method

Sample

A novel sample of 200 adult participants whose first language was English were recruited via the research panel organisation Prolific.co. The sample comprised 134 females, 66 males; with a mean age of 31.4 (SD=11.06). Of these, 48.5% had non-university education; 49.5% had university education, 2% had doctoral level education.

Measures

Benevolent Divergent Thinking (BDT) test: Participants had 3 minutes to generate creative revision methods for an important exam. The participants recorded their responses before selecting their perceived most creative responses in accordance with Silvia (2008). The creativity of the selected responses was independently rated by 3 trained raters on a 5 point Likert scale; 1 being the least creative and 5 being the most. BDT responses were also scored for fluency. *Participant instructions are shown below:*

“Part 1: Please read the scenario below and answer the questions that follow.

“Imagine that you have a very important exam to take in 24 hours’ time. You have not been able to do any revision until now.”

Write down all the things that you could do to get the highest mark possible. Try to be as creative as you can

Part 2: Please choose **TWO** ideas from **above** that you think are your BEST

Write these ideas in the box below”

Malevolent Divergent Thinking (MDT) test: Participants had 3 minutes to generate as many creative ideas to inflict revenge on a callous flatmate who had knowingly organised a party before an important exam (see appendix). Participants recorded their responses before selecting their perceived most creative, malevolent acts of revenge (Silvia, 2008). The malevolent creativity of the selected responses was independently rated by 3 trained raters on a 5 point Likert scale; 1 being the least malevolently creative and 5 being the most. MDT responses were also scored for fluency. *Participant instructions are shown below:*

“Part 1: Please read the scenario below and answer the questions that follow.

“Imagine that your flatmate has organised a big party in your flat the night before a very important exam, knowing that this will have a serious impact on your performance.”

Write down all the things that you could do to inflict revenge on your flatmate. Try to be as creative as you can.

Part 2: Please choose **TWO** ideas from **above** which you think are your **BEST**

Write these ideas in the box below”

Divergent Thinking was assessed using the Alternate Uses of a Brick test (Guilford, 1967), which was administered under strictly timed conditions (i.e., maximum 3 minutes). Specifically, participants were asked to list as many uses as they could think of for a brick and to be ‘as creative as possible’.

Procedure

Participants were invited via Prolific.co, provided informed consent, and received a payment of \$5 upon successful completion of the study.

Once data collection was completed, responses to the three DT measures were rated by 3 independent raters, who were blind to the design of the study. The raters received training and scored the responses accordingly. The raters rated the responses in a randomised

order in attempt to avoid order effects (Amabile, 1982). The rating instructions are shown below.

“Rating instructions for the Benevolent Divergent Thinking Task:

Benevolent Creativity is “creativity that is deliberately planned to be helpful”. A highly benevolent, creative idea is very original and very helpful, and an idea that has very little benevolent creativity is not original and is not very helpful.

Using your best judgment, please use a 5 point rating scale ranging from 1 (‘the idea is not a creative way to deliberately help’) to 5 (‘the idea is a very creative way to deliberately help others’) to rate the responses”

“Rating instructions for the Malevolent Divergent Thinking Task:

Malevolent Creativity is “creativity that is deliberately planned to cause damage”. A highly malevolent, creative idea is very original and very harmful, and that an idea that has very little malevolent creativity is not original and is not very harmful.

Using your best judgment, please use a 5 point rating scale ranging from 1 (‘the idea is not a creative way to deliberately cause damage’) to 5 (‘the idea is a very creative way to deliberately damage others’) to rate the responses”

Results and Discussion

The Weighted Least Squares Means and Variances adjusted estimator, within Mplus 7.4, was used for all analyses. Values $\geq .90$ for the Comparative Fit Index (CFI), Tucker-Lewis Index (TLI), and values $\leq .08$ for the Root Mean Square Residual (RMSEA) were taken as indicative of close fit to the data (Hu & Bentler, 1999).

Correlations: The bivariate correlations between the Alternate Uses of a Brick test and the BDT test and MDT test were $r=.32$ and $r=.41$, respectively. These correlations are

consistent with previous research on the relationships between different measures of divergent thinking (Batey & Furnham, 2006; Puryear et al., 2017; Reiter-Palmon, Forthmann & Barbot, 2019).

Confirmatory Factor Analysis: As an additional and more stringent examination of construct validity, we estimated a CFA model. Specifically, we estimate a hierarchical CFA model. At level 1, BDT, MDT and the Alternate Uses of a Brick test were loaded onto the three CAT ratings. At level 2, BDT, MDT and the Alternate Uses of a Brick test were used as indicators of a single latent variable, representing general DT, or overall creativity. See Figure A1. This model provided close fit to the data ($\chi^2(618)=56.354, p<.002; CFI=.979; TLI=.969; RMSEA=.082; SRMR=.052$) and each test loaded substantially and significantly ($\lambda=.BDT=.43;MDT=.53; BrickDT=.77$).

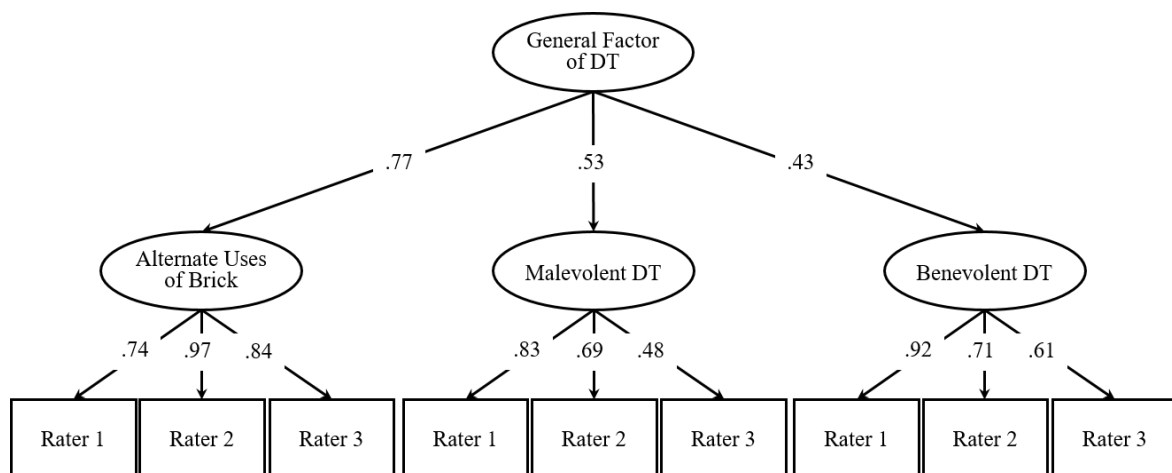


Figure A1. Hierarchical CFA of Divergent Thinking (DT)

Conclusion: In summary, construct validity evidence as assessed by examining correlations with the most widely used DT test, the alternative uses of a brick test, was strong. Bivariate correlations were consistent with those reported within the divergent thinking literature (e.g., Puryear et al., 2017) and a CFA model provided good fit to the data with all model indices suggesting that each test could be considered an indicator of overall divergent thinking/creativity.