



How the Five Factor Model and revised Reinforcement Sensitivity Theory predict divergent thinking



Benjamin R. Walker*, Chris J. Jackson

School of Management, Australian School of Business, University of New South Wales, Sydney, NSW 2052, Australia

ARTICLE INFO

Article history:

Received 16 April 2013

Received in revised form 2 September 2013

Accepted 9 September 2013

Available online 30 September 2013

Keywords:

Creativity

Revised Reinforcement Sensitivity Theory

Five Factor Model

Fear

ABSTRACT

From the Five Factor Model (FFM), we hypothesized openness to experience would positively predict divergent thinking. From revised Reinforcement Sensitivity Theory (r-RST), we hypothesized revised Behavioural Approach System (r-BAS) would positively predict divergent thinking and revised Fight/Flight/Freezing System (r-FFFS) would negatively predict divergent thinking. Moreover, we hypothesized that r-FFFS would incrementally predict divergent thinking after controlling for significant FFM traits. Consistent with Elliot and Thrash (2010), we also hypothesized an indirect effects model with r-BAS predicting divergent thinking through mastery. Using 130 participants, we found support or partial support for all hypotheses. Our results indicate that biological factors of personality associated with r-RST as well as openness to experience predict divergent thinking. The distinction between fear and anxiety in r-RST was also supported with fear and not anxiety negatively predicting divergent thinking.

© 2013 Elsevier Ltd. All rights reserved.

1. Introduction

Creative thinking concerns the cognitive processes associated with novel and useful ideas (Amabile, Conti, Coon, Lazenby, & Herron, 1996). It is the basis for generating originality in a range of endeavours including science, art, philosophy, technology and business. In the current volatile economic climate, businesses need creativity to attain competitive advantage and continued viability (Axtell, Holman, Unsworth, Wall, & Waterson, 2000). Creative personality studies associate it with brilliance and adaptive behaviour as well mental and affective disorders (Belli, 2009; Fisher, Heller, & Miller, 2013). Our study on how personality predicts divergent thinking, a key critical feature of creativity, contributes therefore to several applied fields and advances theoretical models of creativity.

Researchers commonly use divergent thinking tasks to measure creativity, as these tasks may best assess the construct (Plucker & Renzulli, 1999; Runco, 2007). In divergent thinking tasks, participants list creative uses for everyday objects. The two most common scoring methods are fluency and originality. Fluency is the raw number of creative items (Torrance, 2008). It assesses ability to spontaneously create a flow of ideas (Rubinstein, 2008). Fluency is consistent with Eysenck's (1996) definition of creativity as the ability to produce inventions, insights and ideas that experts assess as valuable in domains ranging from science, aesthetics, society and technology. Originality is the uniqueness of the item compared

to other items in the dataset (Wallach & Kogan, 1965). The statistical infrequency of an idea is an index of creativity because individuals must temporarily abandon conventional thinking and build new associations between stimuli that no other person has perceived (Rossman & Fink, 2010). Mednick's (1962) theory posits that differences in creativity are variations in cognitive association abilities. Eysenck (1993) suggests that increased originality arises from high levels of dopamine, which reduces latent inhibition. Individuals with fewer constraints and inhibitions in their thinking use a wider array of information with which to make associations (Chermahini & Hommel, 2010).

Divergent thinking tasks using the Five Factor Model (FFM: openness to experience, conscientiousness, extraversion, agreeableness, and neuroticism) have consistently identified that openness to experience predicted divergent thinking (e.g. Feist, 1998; King, Walker, & Broyles, 1996; McCrae, 1987; Silvia et al., 2008; Wuthrich & Bates, 2001). Openness to experience also predicted other aspects of creativity, such as self-assessed creative ability (Kaufman & Baer, 2004) and creative accomplishments (Feist, 1998, 2006). We predict:

H1. Openness to experience will positively predict fluency and originality in divergent thinking.

Researchers devised the FFM with a focus on producing a model with good psychometric design, yet some scholars are sceptical of the FFM because of its poor integration with theory and biology (e.g. Block, 2010). One attempt to develop a biopsychological personality theory is Gray's (1970) Reinforcement Sensitivity Theory (RST). This provides a biological basis for approach and

* Corresponding author. Tel.: +61 405679100.

E-mail address: b.walker@unsw.edu.au (B.R. Walker).

avoidance motivations. Response to reward is mediated by the Behavioural Approach System (BAS), which is associated with extraversion (Gray, 1987; Smillie, Pickering, & Jackson, 2006). Gray (1987) designated avoidance as the Behavioural Inhibition System (BIS). This is associated with punishment sensitivity and the personality trait of anxiety. BIS has some overlap with neuroticism. Research has supported the BAS and BIS biopsychological model of personality (e.g. Boksema, Topsa, Westera, Meijman, & Lorist, 2006; Clark & Loxton, 2012; Gray, 1987; Lang, 1995).

RST underwent a major revision that separates anxiety and fear into two systems (Gray & McNaughton, 2003). Animal data, psychology and neuroscience support this revision (De Pascalis, Strippoli, Riccardi, & Vergari, 2004; Dissabandara, Loxton, Dias, Daglish, & Stadlin, 2012). The new model is termed revised Reinforcement Sensitivity Theory (r-RST) and comprises three building blocks of personality: r-BAS, r-BIS and r-FFFS (Perkins, Kemp, & Corr, 2007).

Several studies support the distinction between fear and anxiety in r-RST. Perkins and colleagues (2007) found anxiety and fear separately predicted performance in a military training setting. Jackson (2009) found that r-Fight and r-Flight predicted delinquency and everyday psychopathy in students, whereas r-BIS results were non-significant. A study of workers (Clark & Loxton, 2012) found that r-FFFS rather than r-BIS predicted lower psychological acceptance and was correlated with lower work engagement when participants considered the job demanding. Another study found r-BIS predicted depression when r-BAS was low, and r-BAS, low r-BIS and low r-Freeze predicted psychological well-being (Harnett, Loxton, & Jackson, 2013). Jackson, Loxton, Harnett, Ciarrochi, and Gullo (2013) found that r-flight negatively predicted executive functioning. The authors advocated that fear restricts higher order cognitive functioning so cognitive resources can be channelled into a single minded flight response. Similarly, we think fear rather than anxiety will negatively impact divergent thinking, because divergent thinking consumes higher order cognitive resources and generates multiple cognitions which the fear response would usually restrict. This view adds depth to our current understanding that the role of r-BIS is to resolve conflicting demands, whereas the role of FFFS is to quickly respond to aversive stimuli (Morton & White, 2013). While the divergent thinking task includes time pressure, we do not believe this will trigger the approach-avoidance conflict detector role of the r-BIS, because the task does not associate producing ideas with reward or punishment. We predict:

H2. r-FFFS will negatively predict fluency and originality in divergent thinking.

This study compares FFM with r-RST in the prediction of divergent thinking. FFM and r-RST differ in many aspects but one principal way is the inclusion of r-FFFS and its separation from anxiety in r-RST, whereas the FFM more broadly measures emotionality in terms of neuroticism. Given our expectation that r-FFFS will predict divergent thinking, we expect r-FFFS to predict divergent thinking incrementally over and above significant predictors from the FFM:

H3. r-FFFS will incrementally negatively predict fluency and originality in divergent thinking with openness to experience controlled.

Dual systems theory by Elliot and Thrash (2010) and Jackson (2008) suggests r-BAS indirectly predicts functional outcomes through mastery. Elliot and Thrash (2010) suggest that observable behaviour arises from self-regulation as well as personality. Individuals use self-regulation such as mastery to gain momentum toward positive outcomes (Elliot & Sheldon, 1997). Individuals

high in mastery work hard to achieve goals. They accept mistakes and difficulties as learning experiences (Nicholls, 1992).

Several studies suggest r-BAS and mastery predict functional outcomes. Izadikhah, Jackson, and Loxton (2010) found r-BAS positively impacted supervisor ratings of work performance, mediated by mastery and moderated by psychological climate (Izadikhah et al., 2010). Jackson (2011) found sensation seeking (related to r-BAS) through mastery predicted work performance. Grant and Dweck (2003) found a goal-driven approach orientation to learning predicted educational achievement. We expect a similar impact for r-BAS on divergent thinking given that reward seeking concerns curiosity, exploration and novelty seeking, and r-BAS on divergent thinking through mastery given that mastery hones energizing drives (see Elliot & Thrash, 2010; Jackson, 2011). We predict:

H4. r-BAS will positively predict fluency and originality in divergent thinking.

H5. r-BAS will positively predict fluency and originality in divergent thinking through mastery, which is an indirect effects model.

2. Method

2.1. Participants

The sample consisted of 130 management students who participated in return for course credit (mean age = 19.29 years, SD age = 1.98 years, age range 17–30 years; female 60%, male 40%). An a priori power analysis suggested 107 participants would enable 95% power to detect a medium sized effect at the .05 level of significance (Faul, Erdfelder, Lang, & Buchner, 2007).

2.2. Measures

2.2.1. Five Factor Model (FFM; Costa & McCrae, 1992)

FFM is the primary personality assessment tool. We used the International Personality Item Pool (Goldberg et al., 2006). Openness to experience is associated with appreciation for art, curiosity and variety of experience. Conscientiousness is associated with self-discipline, duty and need for achievement. Extraversion is associated with positive emotions, energy and sociability. Agreeableness is associated with compassion and cooperativeness. Each measure included 10-items rated on a five-point scale.

The neuroticism scale from FFM has some association with the r-BIS and r-FFFS. It appears to be a conflation of depression, anxiety and fear items. The scale includes five depression items, four anxiety items and one fear item. Because neuroticism includes four anxiety items, we expect neuroticism to associate with r-BIS more than r-FFFS.

2.2.2. Revised Reinforcement Sensitivity Theory (r-RST; Jackson, 2009)

The Jackson Five is the only published measure of r-RST. It is rated on a five-point scale and has three biological ‘building blocks’ of personality with r-BAS, r-BIS (anxiety) and r-FFFS (fear). Revised FFFS is an 18-item measure of fear spanning r-fight, r-flight and r-freeze. Because we theorise fear will predict creativity, we analyse our data at the r-FFFS level of analysis as opposed to the underlying sub-scales of r-FFFS.

2.2.3. Mastery (Jackson, 2008)

Mastery is a competence and learning subcategory of goal orientation associated with exerting effort into tasks. Participants rate the 15 items on a three-point scale. Several studies have validated this scale (Jackson, 2011; Jackson, Baguma, & Furnham, 2009; Jack-

son, Izadikah, & Oei, 2012). Theoretically, researchers propose mastery as a mediator that re-expresses undirected energy toward functional outcomes (Elliot & Thrash, 2010; Jackson, 2008).

2.2.4. Brick divergent thinking task (Guilford, 1967)

The 'brick' divergent thinking task is an established measure where participants list alternate uses for a brick. Three minutes was allocated as a standard time-frame that studies have shown to discern variance between participants (e.g. Furnham, Batey, Anand, & Manfield, 2008). We scored answers in terms of 'fluency' and 'originality'. For fluency, we calculated the raw number of ideas produced (Furnham & Nederstrom, 2010). For originality, we used the Wallach and Kogan (1965) method. We awarded one point for each response that occurred once only in the dataset. While researchers score originality using several methods, Silvia and colleagues (2008) suggest researchers most commonly use the Wallach and Kogan (1965) method.

2.3. Procedure

Participants used the YWeDo online cognitive laboratory (Jackson, 2010). YWeDo is available at www.ywedo.com/lab.asp. Fraser and Boag (2010) compared YWeDo to paper-and-pencil data collection methods and found few differences. The second author created YWeDo as a resource for the research community.

3. Results

As Table 1 suggests, the measures showed at least adequate reliability. We removed the item *I avoid work that makes me look bad* from r-BIS to improve reliability. Several correlations were significant. We found a significant positive correlation between r-BAS and both fluency and originality. There were no significant correlations between r-BIS and either fluency or originality. We found a significant negative correlation between r-FFFS and both fluency and originality. Openness to experience had a significant positive correlation with both fluency and originality. Mastery correlated with r-RST measures, FFM measures and fluency.

We performed a series of multiple regression analyses to examine the impact of FFM and r-RST on divergent thinking. In each analysis, we used all personality scales from FFM or r-RST to predict either fluency or originality. We found Openness to experience positively predicted both fluency and originality (see Table 2). Originality was positively predicted by r-BAS; fluency and originality were negatively predicted by r-FFFS (see Table 3). The proportion of variance accounted for was similar for both FFM ($R^2 = .09$) and r-RST ($R^2 = .08$) on fluency. For originality, the proportion of variance accounted for was substantially higher in r-RST ($R^2 = .13$) than FFM ($R^2 = .05$).

Table 1
Means, standard deviations, alphas, and correlations between variables.

	M	SD	α	C	E	A	N	r-BAS	r-BIS	r-FFFS	Mastery	Fluency	Originality
O	34.10	5.48	.79	.25*	.33*	.30*	-.06	.39*	.11	-.21*	.46*	.27*	.18*
C	32.82	4.77	.68		.02	.09	-.09	.06	.07	-.17	.21*	.09	-.001
E	31.66	6.93	.86			.34*	-.14	.53*	.19*	-.24*	.51*	.15	.07
A	37.83	4.87	.76				-.12	.15	.03	-.13	.12	-.01	-.03
N	30.54	5.94	.80					-.01	.17	.39*	-.22*	.01	-.07
r-BAS	22.12	3.48	.78						.30*	-.19*	.52*	.19*	.21*
r-BIS	19.74	2.84	.71							.28*	.28*	-.01	-.11
r-FFFS	55.28	7.56	.70								-.25*	-.25*	-.31*
Mastery	20.49	5.65	.76									.20*	.09
Fluency	8.96	5.48											.55*
Originality	1.01	1.57											

Note: O = Openness to experience, C = Conscientiousness, E = Extraversion, A = Agreeableness, N = Neuroticism.

* $p < .05$.

Table 2
Multiple regression results of FFM predicting fluency and originality.

DV	IV	B	T	p	R^2
Fluency	Openness to experience	.26	2.71	.01	
	Conscientiousness	.03	.38	.71	
	Extraversion	.11	1.13	.26	
	Agreeableness	-.13	-1.35	.18	
	Neuroticism	.03	.28	.78	
Originality	Openness to experience	.21	2.08	.04	
	Conscientiousness	-.05	-.54	.59	
	Extraversion	-.03	.28	.78	
	Agreeableness	-.10	-1.05	.30	
	Neuroticism	-.07	-.80	.46	

Table 3
Multiple regression results of r-RST predicting fluency and originality.

DV	IV	B	T	p	R^2
Fluency	r-BAS	.14	1.52	.13	
	r-BIS	.01	.13	.90	
	r-FFFS	-.22	-2.38	.02	
Originality	r-BAS	.20	2.17	.03	
	r-BIS	-.10	-1.11	.27	
	r-FFFS	-.25	-2.73	.007	

Table 4
Multiple regression results of r-FFFS and openness to experience predicting fluency and originality.

DV	IV	B	T	p	R^2
Fluency	Openness to experience	.24	2.68	.008	
	r-FFFS	-.15	-1.72	.088	
Originality	Openness to experience	.13	1.45	.15	
	r-FFFS	-.23	-2.65	.009	

Results suggest r-FFFS is a unique construct separate from r-BIS regarding their intercorrelation ($r = .28$, $p < .05$) and that only r-FFFS predicted creativity. Our results support developing evidence that fear differs from anxiety (Jackson, 2009; White & Depue, 1999).

We completed further multiple regression analysis with r-FFFS and openness to experience to determine if r-FFFS uniquely predicted creativity incrementally beyond the FFM. As Table 4 suggests, r-FFFS negatively predicted originality, whereas openness to experience was non-significant. Openness to experience positively predicted fluency, whereas r-FFFS was non-significant.

In support of dual systems theory by Elliot and Thrash (2010), we tested an indirect effects model of the impact of r-BAS on fluency through mastery (see Fig. 1). The model had good fit of the

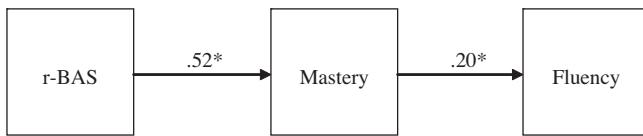


Fig. 1. Path model of an indirect effect of r-BAS on fluency through mastery.
* $p < .05$.

data ($\text{CMIN} = 1.244$, $p = .265$, $\text{CMIN}/\text{DF} = 1.244$, $\text{GFI} = .994$, $\text{AGFI} = .962$, $\text{NFI} = .974$, $\text{CFI} = .995$, $\text{RMSEA} = .043$). The significant pathways and the good model fit suggest an indirect effects model of r-BAS predicting fluency through mastery. We found no evidence that r-BAS predicted originality through mastery.

4. Discussion

The results support or partially support all five hypotheses. Concerning the first hypothesis, we found openness to experience positively predicted divergent thinking regarding both fluency and originality. This is consistent with established meta-analytic research (Feist, 1998). It suggests imagination, art appreciation, and desire for intellectual conversation impact idea generation and the ability to make unique associations between stimuli.

The second hypothesis was supported with fear but not anxiety predicting fluency and originality. This strengthens previous research suggesting fear and anxiety are different constructs. Fear appears to negatively predict several outcomes not impacted by anxiety (Clark & Loxton, 2012; Jackson et al., 2013). Personality appears to include three 'building blocks' of personality rather than just approach and avoidance (e.g. Elliot & Thrash, 2010). This research also supports the r-RST model of personality given the prominence of r-FFFS. We think fear may restrict cognitive capacity for higher order cognitions such as divergent thinking and channel them into primal responses such as flight, freeze and defensive fight, which are more specific fear responses oriented to survival behaviour.

The third hypothesis was partially supported as fear uniquely predicted originality after accounting for the variance explained by openness to experience. We also found that openness to experience predicted fluency rather than fear. We think fear might be more of a primal system depleting cognitive resources from divergent thinking, whereas openness to experience is likely to be more of a higher order cognitive system. From this perspective, we are not surprised they correlate ($r = -.21$, $p < .05$) and yet are potentially separate antagonistic systems influencing cognitions. Our research suggests that fear is more important than openness to experience in restricting cognitions associated with unique divergent thinking. Fear may restrict higher order cognitions and therefore the quality of the cognition. Our research also suggests that openness to experience is more important than fear in providing a broad range of divergent thinking cognitions. This view provides insight into openness to experience which is broadly defined and therefore more oriented towards fluency. Overall, we think openness to experience and fear both play a role in divergent thinking.

The fourth hypothesis was supported with r-BAS positively predicting originality. We did not find r-BAS predicted fluency. This suggests that r-BAS is an energiser that impacts the uniqueness of ideas, but not the number of ideas produced. We think this provides an interesting theoretical understanding of r-BAS, because it appears that reward-seeking is related to the pursuit of idea quality (i.e. novelty) more than quantity. The finding supports the idea that r-BAS concerns reward seeking activity, since originality is likely to provide more stimulation than fluency.

The fifth hypothesis was supported with an indirect effects model for the impact of r-BAS on fluency through mastery. Elliot

and Thrash (2010) suggest that r-BAS is a distal driver of reward oriented behaviour, and learning goals re-express this energy toward effort oriented outcomes. Our research supports this dual systems perspective, since fluency is likely to be an effort oriented outcome requiring the expenditure of much cognitive resources over a relatively long period of time, whereas originality may require less cognitive effort. Previous studies show mastery directs the drive toward functional outcomes (Clark & Loxton, 2012; Izadi-khah et al., 2010) and our research provides further evidence to give weight to the models of Elliot and Thrash (2010) and more broadly Jackson (2008). This study provides several important contributions to the literature. Our results sustain the view that anxiety and fear are separate systems which uniquely predict outcomes (Gray & McNaughton, 2003), as we found fear but not anxiety reduced divergent thinking. Elliot and Thrash (2010) advocate personality is best understood in terms of 'approach temperament' and 'avoidance temperament'. They noted that they were waiting for further evidence regarding r-RST and the distinction between anxiety and fear. This study reinforces a three domain approach to biological personality with two distinct avoidance motivations.

This study incorporated both the FFM and r-RST and found fear uniquely predicted originality in addition to openness to experience. Our research suggests that FFM does not adequately measure fear and that neuroticism does not properly capture r-FFFS. Our research suggests that biologically based models of personality have promise over the FFM (Block, 2010).

Our results add depth to applied research on divergent thinking. Gong, Cheung, Wang, and Jia-Chi (2012) found that proactive employees engaged in greater information exchange and this increased creativity in an environment of psychological safety. We think proactivity may derive from r-BAS and openness to experience. Information exchange may be similar to mastery goals. Increased psychological safety indicates an environment designed to reduce fear. Another study found abusive supervision reduced creativity (Liu, Liao, & Loi, 2012), which again suggests that negative effects of abusive supervision may derive from fear rather than anxiety. Many studies found positive mood enhances creativity (e.g. Forgeard, 2011) and positive mood is likely associated with high safety and low fear. Overall, our research suggests that individual differences plays an important role in lateral thinking and may partially explain some macro findings in the area.

Our cross-sectional methodology is an important limitation of our research, but the objective divergent thinking measure strengthens the research design as it likely reduces the influence of common method variance.

In conclusion, our research found evidence that openness to experience and fear predict divergent thinking. Moreover, the effect of r-BAS on divergent thinking may be through mastery such that the energizing effect of r-BAS is honed by mastery to achieve functional outcomes. Fear appears to be an additional variable to the FFM with the potential to better explain some applied findings of earlier research.

References

- Amabile, T. M., Conti, R., Coon, H., Lazenby, J., & Herron, M. (1996). Assessing the work environment for creativity. *Academy of Management Journal*, 39, 1154–1184.
- Axtell, C. M., Holman, D. J., Unsworth, K. L., Wall, T. D., & Waterson, P. E. (2000). Shopfloor innovation: Facilitating the suggestion and implementation of ideas. *Journal of Occupational & Organizational Psychology*, 73, 265–385.
- Belli, S. (2009). A psychobiographical analysis of Brian Douglas Wilson: Creativity, drugs, and models of schizophrenic and affective disorders. *Personality and Individual Differences*, 46, 809–819.
- Block, J. (2010). The five-factor framing of personality and beyond: Some ruminations. *Psychological Inquiry*, 21, 2–25.
- Boksema, M. A. S., Topsa, M., Westera, A. E., Meijman, T. F., & Lorist, M. M. (2006). Error-related ERP components and individual differences in punishment and reward sensitivity. *Brain Research*, 1101, 92–101.

- Chermahini, S. A., & Hommel, H. (2010). The (b)link between creativity and dopamine: Spontaneous eye blink rates predict and dissociate divergent and convergent thinking. *Cognition*, 115, 458–465.
- Clark, D. M. T., & Loxton, N. J. (2012). Fear, psychological acceptance, job demands and employee work engagement: An integrative moderated mediation model. *Personality and Individual Differences*, 52, 893–897.
- Costa, P. T., Jr., & McCrae, R. R. (1992). *Revised NEO Personality Inventory (NEO-PI-R) and NEO Five-Factor Inventory (NEO-FFI) manual*. Odessa, FL: Psychological Assessment Resources.
- De Pascalis, V., Strippoli, E., Riccardi, P., & Vergari, F. (2004). Personality, event-related potential (ERP) and heart rate (HR) in emotional work processing. *Personality and Individual Differences*, 36, 873–891.
- DiSabandara, L. O., Loxton, N. J., Dias, S. R., Daglish, M., & Stadlin, A. (2012). Testing the fear and anxiety distinction in the BIS/BAS scales in community and heroin-dependent samples. *Personality and Individual Differences*, 52, 888–892.
- Elliot, A. J., & Sheldon, K. M. (1997). Avoidance achievement motivation: A personal goals analysis. *Journal of Personality and Social Psychology*, 73, 171–185.
- Elliot, A. J., & Thrash, T. M. (2010). Approach and avoidance temperament as basic dimensions of personality. *Journal of Personality*, 78, 865–906.
- Eysenck, H. J. (1993). Creativity and personality: Suggestions for a theory. *Psychological Inquiry*, 4, 147–178.
- Eysenck, H. J. (1996). The measurement of creativity. In M. A. Boden (Ed.), *Dimensions of creativity* (pp. 199–242). Massachusetts: MIT Press.
- Faul, F., Erdfelder, E., Lang, A. G., & Buchner, A. (2007). G*Power 3: A flexible statistical power analysis program for the social, behavioral and biomedical sciences. *Behavior Research Methods*, 39, 175–191.
- Feist, G. J. (1998). A meta-analysis of personality in scientific and artistic creativity. *Personality and Social Psychology Review*, 2, 290–309.
- Feist, G. J. (2006). *The psychology of science and the origins of the scientific mind*. New Haven, CT: Yale University Press.
- Fisher, J. E., Heller, W., & Miller, G. A. (2013). Neuropsychological differentiation of adaptive creativity and schizotypal cognition. *Personality and Individual Differences*, 54, 70–75.
- Forgeard, M. J. C. (2011). Happy people thrive on adversity: Pre-existing mood moderates the effect of emotion inductions on creative thinking. *Personality and Individual Differences*, 51, 904–909.
- Fraser, M., & Boag, S. (2010). *Social facilitation and performance: Comparing online to face-to-face testing*. Paper presented at the 9th Australian Conference on Personality and Individual Differences, Wollongong, Australia.
- Furnham, A., Batey, M., Anand, K., & Manfield, J. (2008). Personality, hypomania, intelligence and creativity. *Personality and Individual Differences*, 44, 1060–1069.
- Furnham, A., & Nederstrom, M. (2010). Ability, demographic and personality predictors of creativity. *Personality and Individual Differences*, 48, 957–961.
- Goldberg, L. R., Johnson, J. A., Eber, H. W., Hogan, R., Ashton, M. C., Cloninger, C. R., et al. (2006). The international personality item pool and the future of public-domain personality measures. *Journal of Research in Personality*, 40, 84–96.
- Gong, Y., Cheung, S., Wang, M., & Jia-Chi, H. (2012). Unfolding the proactive process for creativity: Integration of the employee proactivity, information exchange, and psychological safety perspectives. *Journal of Management*, 38, 1611–1633.
- Grant, H., & Dweck, C. S. (2003). Clarifying achievement goals and their impact. *Journal of Personality and Social Psychology*, 85, 541–553.
- Gray, J. A. (1970). The psychological basis of introversion-extraversion. *Behaviour Research and Therapy*, 26, 67–70.
- Gray, J. A. (1987). *The psychology of fear and stress* (2nd ed.). New York: Cambridge University Press.
- Gray, J. A., & McNaughton, N. (2003). *The neuropsychology of anxiety: An enquiry into the functions of the septo-hippocampal system*. Oxford: Oxford University Press.
- Guilford, J. P. (1967). *The nature of human intelligence*. New York: McGraw-Hill.
- Harnett, P. H., Loxton, N. J., & Jackson, C. J. (2013). Revised Reinforcement Sensitivity Theory: Implications for psychopathology and psychological health. *Personality and Individual Differences*, 54, 432–437.
- Izadikhah, Z., Jackson, C. J., & Loxton, N. J. (2010). An integrative approach to personality: Behavioural Approach System, mastery approach orientation and environmental cues in the prediction of work performance. *Personality and Individual Differences*, 48, 590–595.
- Jackson, C. J. (2009). Jackson-5 Scales of revised Reinforcement Sensitivity Theory (r-RST) and their applications to dysfunctional real world outcomes. *Journal of Research in Personality*, 43, 556–569.
- Jackson, C. J. (2011). How sensation seeking provides a common basis for functional and dysfunctional outcomes. *Journal of Research in Personality*, 45, 29–36.
- Jackson, C. J., Baguma, P., & Furnham, A. (2009). Predicting grade point average from the hybrid model of learning in personality: Consistent findings from Ugandan and Australian students. *Educational Psychology*, 29, 747–759.
- Jackson, C. J. (2010). Introducing the YWeDo online cognitive laboratory. In S. Boag & N. Tilipopoulos (Eds.), *Personality and individual differences: Theory, assessment, and application* (pp. 283–293). New York: Nova.
- Jackson, C. J. (2008). Proposing a hybrid model of functional and dysfunctional learning in personality. In G. Boyle, G. Matthews, & D. Saklofske (Eds.), *Handbook of personality testing* (pp. 73–93). London: Sage Publishers.
- Jackson, C. J., Loxton, N. J., Harnett, P. H., Ciarrochi, J., & Gullo, M. J. (2013). Original and revised reinforcement sensitivity theory in the prediction of executive functioning: A test of relationships between dual systems. *Personality and Individual Differences*, 56, 83–88.
- Jackson, C. J., Izadikhah, Z., & Oei, T. P. S. (2012). Mechanisms underlying REBT in mood disordered patients: Predicting depression from the hybrid model of learning. *Journal of Affective Disorders*, 139, 30–39.
- Kaufman, J. C., & Baer, J. (2004). Sure, I'm creative – But not in mathematics! Self-reported creativity in diverse domains. *Empirical Studies of the Arts*, 22, 143–155.
- King, L. A., Walker, L. M., & Broyles, S. J. (1996). Creativity and the five-factor model. *Journal of Research in Personality*, 30, 189–203.
- Lang, P. J. (1995). The emotion probe: Studies of motivation and attention. *American Psychologist*, 52, 372–385.
- Liu, D., Liao, H., & Loi, R. (2012). The dark side of leadership: A three-level investigation of the cascading effect of abusive supervision on employee creativity. *Academy of Management Journal*, 55, 1187–1212.
- McCrae, R. R. (1987). Creativity, divergent thinking, and openness to experience. *Journal of Personality and Social Psychology*, 52, 1258–1265.
- Mednick, S. A. (1962). The associative basis of the creative process. *Psychological Review*, 69, 220–232.
- Morton, R. D., & White, M. J. (2013). Revised reinforcement sensitivity theory: The impact of FFFS and stress on driving. *Personality and Individual Differences*, 54, 57–63.
- Nicholls, J. G. (1992). Students as educational theorists. In D. H. Schunk & J. L. Meece (Eds.), *Student perceptions in the classroom* (pp. 267–286). Hillsdale, NJ: Lawrence Erlbaum Associates, Inc.
- Perkins, A. M., Kemp, S. E., & Corr, P. J. (2007). Fear and anxiety as separable emotions: An investigation on the Revised Reinforcement Sensitivity Theory of personality. *Emotion*, 7, 252–261.
- Plucker, J. A., & Renzulli, J. S. (1999). Psychometric approaches to the study of human creativity. In R. J. Sternberg (Ed.), *Handbook of creativity* (pp. 35–61). New York: Cambridge University Press.
- Rossman, E., & Fink, A. (2010). Do creative people use shorter associative pathways? *Personality and Individual Differences*, 49, 891–895.
- Rubinstein, G. (2008). Are schizophrenic patients necessarily creative? A comparative study between three groups of psychiatric inpatients. *Personality and Individual Differences*, 45, 806–810.
- Runco, M. A. (2007). *Creativity*. Amsterdam: Elsevier.
- Silvia, P. J., Winterstein, J. T., Willse, J. T., Barona, C. M., Cram, J. T., Hess, K. I., et al. (2008). Assessing creativity with divergent thinking tasks: Exploring the reliability and validity of new subjective scoring methods. *Psychology of Aesthetic Creativity*, 2, 68–85.
- Smillie, L. D., Pickering, A. D., & Jackson, C. J. (2006). The new reinforcement sensitivity theory: Implications for personality measurement. *Personality and Social Psychology Review*, 10, 320–335.
- Torrance, E. P. (2008). *Torrance tests of creative thinking: Norms technical manual, verbal forms A an B*. Bensenville, IL: Scholastic Testing Service.
- Wallach, M. A., & Kogan, N. (1965). *Modes of thinking in young children: A study of the creativity-intelligence distinction*. New York: Holt, Rinehart, & Wilson.
- White, T. L., & Depue, R. A. (1999). Differential association of traits of fear and anxiety with noradrenergic- and dark-induced pupil reactivity. *Journal of Personality and Social Psychology*, 77, 863–877.
- Wuthrich, V., & Bates, T. C. (2001). Schizotypy and latent inhibition: Non-linear linkage between psychometric and cognitive markers. *Personality and Individual Differences*, 30, 783–798.