Trends in Cognitive Sciences

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Letter

Neurotic Individuals are not Creative Thinkers

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In the September 2015 issue of *Trends in Cognitive Sciences*, Perkins *et al.* [1] proposed that the personality trait of neuroticism stems from individual differences in neural processes that govern the nature of self-generated thought (SGT). They also asserted that higher levels of neuroticism are associated with higher levels of creativity, especially intellectual creativity and creative problem solving, and that this association can be explained in terms of SGT. In this letter, we highlight some serious problems with Perkins *et al.*'s proposal.

The first problem concerns the link they assert between neuroticism and creativity. This claim triggered extensive media attention, presumably because it reinforces the popular myth of the neurotic creative genius. However, it is contradicted by a rich empirical literature that was ignored by Perkins *et al.* Extensive evidence (see Table 1; for examples [2–6]) shows that there is no connection between high neuroticism and intellectual creativity, creative problem solving, high intelligence, or genius. By contrast, the (unrelated) personality trait of openness/intellect has been reliably linked with various measures of creativity (e.g., [4]). The only empirically supported link between creativity and neuroticism is a weak association between artistic creativity and risk for mood or psychotic disorders (e.g., [7]). Importantly, this is specific to artistic rather than intellectual creativity and appears to apply only to mental disorders and not to the general personality trait of neuroticism [4]. Therefore, a cornerstone of Perkins *et al.*'s proposal appears simply to be wrong.

Second, Perkins *et al.* propose that the negative ruminative thoughts of highly neurotic people arise from high levels of spontaneous activity within specific 'hubs' of the default mode network (DMN) of the brain. The DMN is a set of brain structures that are believed to control much of our SGT. Although there are some studies linking neuroticism to the structure (e.g., [8]) and function (e.g., [9]) of the parts of the DMN discussed by Perkins *et al.*, the findings from resting-state functional connectivity studies are not consistent (compare [10] with [11]). Moreover, there is a larger and more consistent literature showing that neuroticism is linked with other brain structures, including the amygdala and insula [8,12]. These structures are crucially involved in the generation of negative emotions, but are not part of the DMN. Although Perkins *et al.* downplayed the importance of these other structures, four pages into their article they nonetheless conceded, without further comment, that their theory cannot really explain neuroticism: 'Thus, it is not SGT per se that is the cause of neuroticism, but it is when this type of thought turns negative'. The processes determining when, and to what extent, SGT becomes emotionally negative appear to be driven by structures largely outside the DMN. Therefore, it is clear that the DMN cannot be the sole

Table 1. Studies Reveal a Lack of Significant Positive Associations between Multiple Measures of Creativity and Neuroticism

Creativity Measure	Strength of Relation with Neuroticism	Source and Sample Size
Divergent thinking: lab-assessed ability to generate multiple and/or varied solutions to problems without definitive answers	*r*s = –0.14 to +0.14[a]	[2]; *N* = 268
Insight problem solving: lab-assessed solution of problems that cannot be solved iteratively	*r*s = –0.18 to –0.10	[3]; *N* = 320
Intelligence: verbal reasoning, perceptual reasoning, mental rotation	Average *r* = –0.08	[4]; *N* = 1035, across four studies
Scientific versus nonscientific vocation: individuals who have worked, majored, or excelled in the sciences	Average *r* = –0.08[b]	[5]; *N* = 4852 (meta-analysis)[c]
Creative versus noncreative scientists: details not given in [5] for how the meta-analysis selected these studies	Average *r* = –0.02[b]	[5]; *N* = 3918 (meta-analysis)
Creative achievement (sciences): quantity of creative achievements (e.g., publications) in scientific endeavors (e.g., research)	Average *r* = –0.10	[4]; *N* = 1035, across four studies[d]
Everyday creative behavior: frequency of everyday creativity activities (e.g., 'Entered a project into a science contest')	*r* = +0.11	[6]; *N* = 189
Self-assessed creativity: self-assessed creativity across numerous real-world domains (e.g., 'How creative are you in the area of crafts?')	*r*s = –0.29 to –0.01	[6]; *N* = 189

[a]These nonsignificant relations were replicated by [3], [4], and [6].
[b]Weighted average Cohen's *d*, calculated and converted to *r* by the present authors.
[c]This author found modest relations between a variety of scales correlated with neuroticism and having an occupation in the arts.
[d]These authors additionally found no significant relation between neuroticism and creative achievement in the arts.

'engine of neuroticism' as claimed by the authors.

In light of these major concerns, what remains of Perkins *et al.*'s proposal? That negatively tinged SGT or 'rumination' is more prevalent in neurotic individuals is well established, although the neuroimaging signature(s) of this rumination remains to be established. However, a preponderance of negative SGT does not lead to creativity. This is not surprising because, as Perkins *et al.* themselves note (their Box 4), those with high levels of negatively focused SGT have problems both in steering the content of their experiences away from the aversive, and in limiting these thoughts to appropriate contexts. Thus, this style of SGT is not a recipe for creativity, but more likely leads to cognitive rigidity and dysfunctional rumination. Intellectually creative geniuses, such as Newton, who may have been highly neurotic, seem likely to have achieved their intellectual creativity despite their neurotic personalities rather than because of them. This is because the evidence clearly shows that neuroticism does not bolster creative thought.

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References

1. Perkins, A.M. *et al.* (2015) Thinking too much: self-generated thought as the engine of neuroticism. *Trends Cogn. Sci.* 19, 492–498
2. McCrae, R.R. (1987) Creativity, divergent thinking, and openness to experience. *J. Pers. Soc. Psychol.* 52, 1258–1263
3. Lin, W.L. *et al.* (2013) Different attentional traits, different creativities. *Thinking Skills Creativity* 9, 96–106
4. Kaufman, S.B. *et al.* (2014) Openness to experience and intellect differentially predict creative achievement in the arts and sciences. *J. Pers.* Published online December 8, 2014. http://dx.doi.org/10.1111/jopy.12156
5. Feist, G.J. (1998) A meta-analysis of personality in scientific and artistic creativity. *Pers. Soc. Psychol. Rev.* 2, 290–309
6. Silvia, P.J. *et al.* (2009) Openness to experience, plasticity, and creativity: exploring lower-order, higher-order, and interactive effects. *J. Res. Pers.* 43, 1087–1090
7. Power, R.A. *et al.* (2015) Polygenic risk scores for schizophrenia and bipolar disorder predict creativity. *Nat. Neurosci.* 18, 953–955
8. Holmes, A.J. *et al.* (2012) Individual differences in amygdala-medial prefrontal anatomy link negative affect, impaired social functioning, and polygenic depression risk. *J. Neurosci.* 32, 18087–18100
9. Lemogne, C. *et al.* (2011) Negative affectivity, self-referential processing and the cortical midline structures. *Soc. Cogn. Affect. Neurosci.* 6, 426–433
10. Adelstein, J.S. *et al.* (2011) Personality is reflected in the brain's intrinsic functional architecture. *PLoS ONE* 6, e27633
11. Sampaio, A. *et al.* (2013) The big five default brain: Functional evidence. *Brain Struct. Funct.* 219, 1913–1922
12. DeYoung, C.G. (2010) Personality neuroscience and the biology of traits. *Soc. Pers. Psychol. Compass* 4, 1165–1180