

**Comparisons and associations between personality, creative potential and achievement in creative, non-creative and early psychosis group participants**

Journal:	<i>Psychosis</i>
Manuscript ID	RPSY-2018-0069.R1
Manuscript Type:	Research Article
Keywords:	Creativity, Early psychosis, Personality, Schizotypy
Abstract:	<p>Epidemiological evidence supports common genetic determinants between psychosis spectrum populations and creative individuals. Aspects of personality may contribute to protecting the creative artist from psychosis vulnerability. This study examines the similarities and differences in personality within a sample of Early Psychosis (EP), Creative Control (CC) and Non-Creative Control (NCC) participants. Findings indicated that the CC group shared closer personality commonalities with the EP group than with NCC participants, on traits such as Neuroticism, Openness, and Impulsive Non-conformity as well as on variables such as Unusual Experiences, Cognitive Disorganisation and Paranoia/Suspiciousness. However, the CC group may better manage their emotional sensitivity and interpersonal suspiciousness than the EP participants. In separate analyses, CC and EP participants recorded higher creative cognition than NCC participants. Unsurprisingly the CC group reported significantly higher creative achievement than the EP and NCC samples. Of note, the findings indicate that, EP participants recorded significantly higher creative achievement than NCC, suggesting that EP patients demonstrate some capacity for creative cognition and creative achievement. These preliminary findings may encourage further research and promote avenues of treatment for at risk creative individuals and early psychosis individuals.</p>

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## 1 Introduction

2 Similarities between highly creative individuals and those with bipolar disorder and  
3 schizophrenia have been well documented (Andreasen, 1987; Brod, 1997; Jamison, 1995; Ma,  
4 2009; Rybakowski, Klonowska, Parrzala, & Jaracz, 2008), however there is ongoing debate over  
5 what aspects of these schizophrenia and bipolar disorder populations contribute to this  
6 association. Three large Swedish epidemiological studies provide support for the assertion that  
7 there are common genetic determinants between bipolar disorder and schizophrenia (Kyaga et  
8 al., 2011; Lichtenstein et al., 2009; MacCabe et al., 2018), and that creativity and creative  
9 professions are overly represented amongst those with bipolar disorder and among the family  
10 members of those with schizophrenia and bipolar disorder (Kyaga et al., 2011). Furthermore, a  
11 recent study also found common polygenetic risk scores between creativity and those with  
12 bipolar disorder and schizophrenia (Power et al., 2015) providing additional genetic evidence  
13 supporting the association between creativity and mental illness.

14  
15 In considering these associations, a unitary psychosis theory has been proposed (Carson, 2011;  
16 Claridge & Blakey, 2009; Sass, 2001) which argues that the apparently distinct clinical  
17 classifications with bipolar disorder and schizophrenia in fact have common underlying  
18 processes that differentially contribute to creativity. Specifically, Carson proposed a model of  
19 shared vulnerability between those with high creativity and individuals with psychopathology  
20 (Carson, 2011) based on existing research into molecular biology. The author suggested that  
21 hyper-connectivity, or the unusual neural linking of uncommon brain areas (often associated  
22 with psychosis), a preference for novelty, and attenuated latent inhibitions, are shared  
23 vulnerability factors operating below the level of consciousness between those with high  
24 creativity and those with psychopathology. High IQ, working memory skills and cognitive

1 flexibility are thought to help protect the high creativity population from developing psychosis  
2 by providing a meta-cognitive control over bizarre, unusual thoughts. In contrast, she suggests  
3 risk factors such as low IQ, perseveration, and poor working memory may render the creative  
4 individual vulnerable to developing psychopathology. Carson acknowledges that this is an  
5 incomplete list and suggests additional studies would extend this model. Further clarification is  
6 particularly apt as the factors proposed are generic and too broad to have specific clinical  
7 application. Since this model was proposed, vulnerability factors for those at risk for psychosis  
8 has been an area under increasing investigation (Fusar-Poli et al.), with risk factors such as  
9 childhood trauma, early adolescent low functioning and socio-demographic factors along with  
10 cognitive deficits such as verbal learning impairments (Carrión et al., 2018) also associated with  
11 transition to psychosis. However, these additional vulnerability factors have not, as yet, been  
12 considered in relation to a specific creative population.

13  
14 Carson's shared vulnerability model proposed novelty seeking as the only personality trait  
15 common to the creative individual and those with psychopathology. This study will examine if  
16 aspects of personality beyond the factor outlined by Carson, contribute to "protecting" the  
17 creative population from psychosis. Specifically, do aspects of personality and schizotypy  
18 differentiate the highly creative from those with expressed psychosis? Schizotypy is considered  
19 to be an aggregate of personality traits that lie along a continuum from normality to  
20 schizophrenia (Cochrane, Petch, & Pickering, 2012) (Siddi, Petretto, & Preti, 2017). Genetic,  
21 cognitive and brain fMRI studies provide supportive evidence for an overlap between  
22 schizophrenia and schizotypy (Wang et al., 2017). Aspects of positive schizotypy such as  
23 Impulsive Non-Conformity and Unusual Experiences, along with personality features such as

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3 1 Openness and Neuroticism have consistently been associated with both the highly creative,  
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5 2 bipolar and schizotypal populations (Batey & Furnham, 2008; Srivastava et al., 2010).  
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10 4 The authors, Nelson and Rawlings (2010) investigated psychopathology and personality  
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12 5 indicators of creative experience in a study of 100 creative artists . Aspects of positive  
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14 6 schizotypy (Unusual Experiences) were found to be the strongest predictor of creative  
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16 7 experience, along with the ‘Big Five’ personality dimensions of Openness to Experience and  
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18 8 Neuroticism, when compared to normative data. This is consistent with a number of other studies  
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20 9 associating in particular Openness to Experience with creative cognition (Jung, Grazioplene,  
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22 10 Caprihan, Chavez, & Haier, 2010; Jung, Mead, Carrasco, & Flores, 2013). As it has been  
23  
24 11 postulated, Openness provides creative individuals with a deeper memory bank of experiences,  
25  
26 12 thoughts and problem solving strategies for creative thinking (Ma, 2009).  
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33 14 Whilst the research discussed above has primarily investigated personality in non-clinical  
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35 15 populations, a small number of studies have analysed personality and cognitive features in  
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37 16 clinical and creative samples. In a comparison of personality similarities and differences between  
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39 17 participants with a diagnosis of Bipolar 1 Disorder (BD), unipolar depression diagnosis (MDD),  
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41 18 creative arts students (CC) and healthy controls (HC), Nowakowska and colleagues  
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43 19 (Nowakowska, Strong, Santosa, Wang, & Ketter, 2005) reported the most prominent personality  
44  
45 20 similarities were between BD and CC populations. In particular the authors found novelty  
46  
47 21 seeking, self-transcendence (the experience of oneself as an integral part of the universe  
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49 22 (Cloninger, 1994)) and the affective temperament factor, cyclothymia were similar across BP  
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51 23 and CC populations. This finding of common personality traits between Bipolar (BD) and  
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53 24 Creative (CC) populations has been supported in two similar studies (Srivastava et al., 2010;  
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3 1 Strong et al., 2007). Both these studies record similarly high scores on Neuroticism and  
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5 2 Openness in BD and CC populations, which Strong suggests implicates an affective (e.g.  
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7 3 Neuroticism) and cognitive/flexibility (e.g. Openness) component to creativity. Strong et al.  
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9 4 (2007) hypothesised that these tendencies may assist creative expression through the ability to  
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11 5 tolerate intense and often negative and varied shifts in emotion (Neuroticism), associated with  
12  
13 6 driving innovation through dissatisfaction with the status quo (Strong et al., 2007). In contrast,  
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15 7 she suggests Openness (which she associates with cognitive flexibility) may contribute to  
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17 8 creative achievement and interpersonal relationships.  
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24 10 Taken together, these studies suggest that particular personality traits and certain positive  
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26 11 schizotypal traits may differentially contribute to creative cognition. Mason's review of the  
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28 12 assessment of schizotypy (Mason, 2015), noted that research into schizotypal personality  
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30 13 characteristics should include a measure of paranoia/suspiciousness. Paranoid ideation has also  
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32 14 been associated with those at risk for psychosis (Masillo et al., 2017; Valmaggia et al., 2015)  
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34 15 however most research has examined the relationship between positive schizotypy and creativity  
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36 16 (eg (Nettle, 2006) rather than paranoia. .  
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42 18 Similarly, while many studies have researched creative inclination and creative potential with  
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44 19 both bipolar and schizophrenia populations (Wang et al., 2017), few studies have investigated  
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46 20 creative production or the ability to follow through with creative inclination to actually produce  
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48 21 and deliver creative outputs (Andreasen, 1987). Further investigation is warranted into which  
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50 22 aspects of personality and schizotypy (including paranoia/suspiciousness) are associated with  
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52 23 creative production (or the lack of it) in populations with these clinical disorders, in the presence  
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54 24 of creative cognition (Kyaga et al., 2011).  
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5 2 Therefore, the aim of the present study is to further investigate relationships between personality  
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7 3 and creativity across clinical, creative and non-creative control samples. Based on previous  
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10 4 research, we hypothesise:

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12 5 (1) Non-significant differences in specific personality traits will be observed between highly  
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14 6 creative and clinical populations, such that individuals with early psychosis (EP) will  
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16 7 report similar levels of Neuroticism and Openness, Impulsive Nonconformity and  
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18 8 Unusual Experiences to individuals defined as highly creative; however both groups will  
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20 9 show significantly elevated levels of these traits compared to non-creative control  
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22 10 individuals.

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26 11 (2) Personality traits such as paranoia and suspiciousness will be more evident in early  
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28 12 psychosis (EP) participants when compared to CC and NCC individuals.

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31 13 (3) The CC and early psychosis (EP) participants will demonstrate significantly higher  
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33 14 creative thinking scores compared to NCC participants, but CC participants will record  
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35 15 significantly higher levels of creative achievement when compared to both NCC and EP  
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37 16 individuals.

## 38 39 40 17 41 18 42 19 **Methods**

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45 22 Recruitment and study procedures were approved by the Human Research Ethics Committees of  
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47 23 the University of New South Wales (HREC UNSW Protocol No. 11279) and ratified by the  
48  
49 24 University of Technology (HREC UTS ETH16-0532). All participants provided written consent  
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51 25 prior to participation. Participants were aged 18-35 as we were interested in first episode  
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53 26 psychosis and epidemiological studies suggest the age of onset of psychosis ranges from 15 – 35  
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1 with the median age of initial presentation in the mid twenties (Kessler et al., 2007). All  
2 participants were given a \$AUD40 monetary reimbursement for travel costs.

### 3 4 5 **Participants**

#### 6 7 *Early psychosis participants (EP) N=21*

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10 Early psychosis participants were recruited from a previous study (Rowland et al., 2012), and  
11 had given consent to be approached for further studies. Twenty-five participants were  
12 approached for the study and twenty-one agreed to participate. Of the four who declined to  
13 participate, two reported active psychotic symptoms and two failed to respond to invitations to  
14 participate. All were recruited from either an inpatient or outpatient hospital clinic and had  
15 undergone a psychiatric assessment using a comprehensive Diagnostic Interview for Psychosis  
16 (DIP), administered by an experienced clinician. All early psychosis participants met criteria for  
17 psychotic disorder according to ICD -10 criteria and had recorded a first episode psychosis or  
18 hospitalisation. Active psychotic symptoms were an exclusion criteria for the study, hence a  
19 PANSS (Positive and Negative Syndrome Scale for Schizophrenia (Kay, Fiszbein, & Opler,  
20 1987) measure was given at the time of testing. No participants were excluded due to the  
21 presence of acute psychotic symptoms.

#### 22 23 24 *Creative control participants (CC) N=55*

25 Creative control participants were recruited following a brief presentation by the lead researcher  
26 (JC), to several Creative Art Colleges around Sydney, Australia. The recruitment sites included  
27 tertiary creative training institutions such as music colleges (contemporary, classical music,



1 composition, vocals), visual arts colleges, as well as advertising on relevant creative websites  
2 (e.g. *livingwithacreativemind.com*). Individuals were presented with an outline of the research  
3 and gave written consent to take part in the study. Creative controls were screened for past or  
4 present psychotic symptoms using a MINI (brief structured psychiatric questionnaire) (Lecrubier  
5 et al.). None were found to have past or present syndromal psychiatric disorders. Of those  
6 recruited 27 were primarily engaged with music; 15 were visual or graphic artists, 12 were actors  
7 or involved in the theatre and 1 was engaged in web development and design.

#### 9 *Non-creative control participants (NCC) N=24*

10 Healthy, non-creative controls were recruited via a university website. The online information  
11 asked for psychologically healthy volunteers to participate in research into creative cognition,  
12 and thirty-three individuals initially responded. Nine participants were excluded because they  
13 met either of the following three exclusion criteria: i) no personal or family history of mental  
14 illness; ii) an inability to communicate proficiently in spoken and written English and iii) receipt  
15 of more than rudimentary training in any field of creative arts. Using the MINI (Lecrubier et al.),  
16 the normal non-creative controls were also screened for any current mental illness and one  
17 participant was excluded (eating disorder). These participants were reimbursed for their time.

#### 19 ***Measures***

20 All participants completed a series of tests including self-report questionnaires, mood assessment  
21 and intellectual ability testing.

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23 *Weschler Abbreviated Scale of Intelligence (WASI) (Wechsler & Zhou, 2011)*

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3 1 In order to screen for IQ, the two-scale version of the WASI was administered to all participants.  
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5 2 The WASI has been found to be a brief but valid measure of intelligence in both healthy adult  
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7 3 and clinical populations (Ryan et al., 2003). The two-scale version comprises a forty-two item  
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9 4 test of vocabulary and a thirty-five item matrix reasoning test. The measure was administered  
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11 5 and scored according to standard protocols.  
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17 7 *Abbreviated Torrance Test for Adults (Goff & Torrance, 2002).*

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19 8 All participants were administered the Abbreviated Torrance Test for Adults (ATTA)(Goff &  
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21 9 Torrance, 2002). This test comprises three tasks where participants are asked to respond to each  
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23 10 challenge using imagination and problem-solving ability. The measure was selected as  
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25 11 longitudinal studies support the consistent relationship between test behaviour and creative  
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27 12 achievement and the Torrance test is the most widely used and well researched creativity  
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29 13 measure (Torrance, 2000). Two scorers (JC and SG) evaluated each ATTA and where scores  
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31 14 differed, the average was used.  
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38 16 *Creative Achievement Questionnaire (Carson, 2005).*

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40 17 To evaluate creative output, the Creative Achievement Questionnaire (CAQ) (Carson, Peterson,  
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42 18 & Higgins, 2005); was administered to all participants. In the CAQ participants were asked to  
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44 19 indicate their creative accomplishments in ten separate domains: (visual arts; music including  
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46 20 both instrument and voice; dance; theatre, film and including acting and creative direction;  
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48 21 architecture including graphic design; creative writing; humour; inventions including computer  
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50 22 and web design). Weighted scores indicating the achievements within each domain were  
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52 23 calculated.  
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3 1 *Neuroticism Extraversion and Openness Scale Five Factor Inventory (NEO-FFI-R) (McCrae &*  
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5 2 *Costa, 2004).*

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8 3 Participants were administered a self-report personality measure NEO-FFI-R (Costa & McCrae,  
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10 4 1985; Mc Crae & Costa, 2004) which rates five aspects of personality, namely Neuroticism,  
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12 5 Extroversion, Openness, Agreeableness and Conscientiousness. The NEO-FFI-R is a 60-item,  
13  
14 6 widely used measure of personality.  
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19 8 *Oxford-Liverpool Inventory of Feelings and Experiences (O-LIFE ) (Mason & Claridge, 2006)*

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21 9 The Oxford-Liverpool Inventory of Feelings and Experiences (Mason & Claridge, 2006) is a  
22  
23 10 well used measure of schizotypal personality in schizophrenic patients and healthy controls ( $\alpha=$   
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25 11 .87) (Ando, Claridge, & Clark, 2014; Burch, Pavelis, Hemsley, & Corr, 2006; Cochrane, Petch,  
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27 12 & Pickering, 2010; Yaghoubi H & A., 2012). It comprises 104 items across four scales; Unusual  
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29 13 Experiences (Un Ex), which describes perceptual aberrations and magical thinking and is linked  
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31 14 to positive aspects of schizotypy; Impulsive Non-Conformity (ImpNon) describes eccentric  
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33 15 forms of behaviour including impulsivity and a lack of self-control; Introverted Anhedonia  
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35 16 (InAn) associated with avoidance of intimacy and discomfort in social and physical  
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37 17 environments and is associated with negative schizotypy; and Cognitive Disorganisation  
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39 18 (CogDis) which contains items describing thought disorder and poor decision making along with  
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41 19 aspects of social anxiety.  
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49 21 *Paranoid Suspiciousness Questionnaire (PSQ) (Rawlings & Freeman, 1996)*

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51 22 The 'Paranoia/Suspiciousness Questionnaire was designed to support the O-LIFE as a measure  
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53 23 of schizotypy in largely non-clinical populations. It is a 47-item questionnaire specifically  
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55 24 assessing cognitions involving paranoia and suspiciousness. It also includes seven subscales:  
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1 interpersonal suspiciousness/hostility (IS); negative affect/withdrawal (NA); anger/impulsiveness  
2 (AI); mistrust/wariness (MW) and perceived hardship (PH) (Rawlings & Freeman, 1997).

#### 3 4 ***Procedures***

5 All participants were tested individually, at a single session, in a dedicated confidential space  
6 either within a hospital environment (EP) or on student campus at a creative arts (CC) or a  
7 university setting (NCC). Participants presented themselves at the testing room and completed a  
8 written consent form prior to testing. The testing period ranged from 2-3 hours. Standardised test  
9 administration protocols were followed for all tests including the two-scale version WASI IQ  
10 (Wechsler & Zhou, 2011). Multiple test administrators were used and all were professionally  
11 trained in standardised intelligence testing.

#### 12 13 ***Data analysis***

14 Data were initially screened for missing values, and less than 5% of the dataset found to be  
15 missing which is within recommended limits for non-correction (Tabachnick, Fidell, &  
16 Osterlind, 2001). A series of data normality of distribution checks were then run (presence of  
17 outliers, skewness/kurtosis), as well as Levene's test for homogeneity of variance, and all  
18 variables found to meet criteria for parametric statistical analyses. A post-hoc power calculation  
19 was carried out using G\*Power (Erdfelder, Faul, & Buchner, 1996), which confirmed that  
20 assuming a small to medium effect size (0.4), and using an alpha rate of 0.05, the study was  
21 powered at 0.9 to detect a significant difference between groups with the present sample. A  
22 Bonferroni correction was applied to all comparative analyses, given the multiple tests conducted  
23 in this study. All statistical analyses were conducted using SPSS version 23.

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3 1 NCC ( $p < .001$ ). The EP population also reported significantly higher scores on the Neuroticism  
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5 2 subscale compared to the CC (and NCC groups). The non-creative control group was  
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7 3 significantly more Conscientious than the early psychosis group ( $p < .05$ ).  
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12 5 [Insert Table 2 near here]  
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17 7 *Group Differences on the O-LIFE*  
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19 8 Whereas the NEO-FFI-R is a measure of “normal” personality features, the O-LIFE measures  
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21 9 schizotypal personality traits. Results of the one-way ANOVA comparing the three groups on the  
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23 10 O-LIFE subscales are presented in Table 3. These show the EP and CC participants scored  
24  
25 11 significantly higher on Unusual Experiences (UE), Impulsive Non-Conformity (Imp N), and  
26  
27 12 Cognitive Disorganisation (Cog D) compared to the NCC participants (all  $p < .001$ ), but were not  
28  
29 13 significantly different from each other. In relation to Introverted Anhedonia (IA), although the  
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31 14 ANOVA just met statistical significance, none of the post-hoc tests were significantly different  
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33 15 from each other. This casts doubt on the reliability of the omnibus test; hence we have not  
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35 16 included this variable among the group of significantly different group comparisons.  
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42 18 Considering NEO and O’LIFE together, Openness, Impulsive Non-Conformity, Unusual  
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44 19 Experiences and Cognitive Disorganisation are similarly associated with EP and CC populations.  
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46 20 Results on the Neuroticism personality factor in the NEO\_FFI\_R present a slightly different  
47  
48 21 picture. Similar to the above factors, both clinical and creative participants recorded  
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50 22 significantly higher scores on Neuroticism when compared to the NCC group, however the EP  
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52 23 sample recorded significantly higher results again when compared to the CC group.  
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56 24 [Insert Table 3 near here]  
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5 2 *Hypothesis 2: Negative personality features such as paranoia and suspiciousness will be*  
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8 3 *more evident in EP participants, when compared to CC, NCC participants.*  
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14 6 *Group Differences on the P/SQ*

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18 7 The P/SQ measures negative personality feature such as general suspiciousness and hostility in  
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20 8 interpersonal communication, alongside mistrustful and wary tendencies and resentment toward  
21  
22 9 perceived hardship. To test the hypothesis that there would be a difference in positive and  
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24  
25 10 negative schizotypal features between EP, CC and NCC groups, a one-way ANOVA was  
26  
27 11 conducted on P/SQ scores (see Table 4). The overall paranoia/suspiciousness mean score was  
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29 12 significantly higher in the EP and CC groups compared to the NCC ( $p<.001$ ), however a  
30  
31 13 significant difference ( $p<.001$ ) was also recorded between the EP and CC groups, supporting our  
32  
33 14 hypothesis that negative schizotypal personality characteristics, measured by the PSQ, will be  
34  
35 15 more prevalent in the EP population. Within the subscale comparisons, a comparative pattern of  
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37 16 results was found for the Interpersonal Suspiciousness domain, with the NCC group reporting  
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39 17 significantly lower scores than the other two groups ( $p<.001$ ). The EP participants reported  
40  
41 18 significantly greater negative personality features on Negative Mood and Anger Impulsiveness  
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43 19 compared to the NCC participants ( $p<.001$ ), however they were not significantly elevated  
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45 20 compared to the CC group. Finally, scores on the Hardship/Resentment subscale were  
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47 21 significantly higher among the EP group compared to both the CC and NCC groups.  
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53 22 [Insert Table 4 near here]

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3 1 To summarize, this cluster of shared personality features indicates adaptive character traits  
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5 2 typically associated with positive schizotypal features that were found with both EP and CC  
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7 3 populations. However, the EP population is distinguished from the CC both by an increase in  
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9 4 Neuroticism and Interpersonal Suspiciousness symptoms, and the presence of additional negative  
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11 5 schizotypal features. The presence and intensity of these negative traits may either impede  
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13 6 creativity or prevent this creative potential converting to creative achievement in the EP  
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15 7 population.  
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19 8 [Insert Figure 1 near here]  
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24 10 *Hypothesis 3: The CC and EP participants will record significantly higher divergent*  
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26 11 *thinking (creative potential) scores compared to NCC participants, but CC participants*  
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28 12 *will record significantly higher levels of creative achievement when compared to both NCC*  
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30 13 *and EP individuals.*  
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35 15 *Group Differences of the Abbreviated Torrance Test for Adults (ATTA) (Goff, 2002) and*  
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37 16 *Creative Achievement Questionnaire (CAQ) (Carson, 2005).*  
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42 18 A series of one-way ANOVAs were conducted to determine if there were any group differences  
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44 19 in creative potential as measured by the divergent thinking (ATTA measure) and in creative  
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46 20 achievement as measured by the CAQ (see Table 5). Not surprisingly the CC individuals scored  
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48 21 significantly higher on the divergent thinking and CAQ measures, compared to the NCC group.  
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50 22 While there was no significant difference between the CC and EP population on the divergent  
51  
52 23 thinking task, there was a significant difference between CC and EP on the CAQ. Of particular  
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54 24 note however is the finding that the EP population scored significantly higher than the NCC on  
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1 the CAQ. These results suggest that while the EP population has similar creative potential  
2 (divergent thinking) to the creative population, they are less able to translate this into creative  
3 achievement. However, some creative achievement was still evident.

4 [Insert Table 5 near here]

## 6 Discussion

7 This research aimed to delineate the similarities and differences in personality between highly  
8 creative and early psychosis populations, using a non-creative but similarly intellectually capable  
9 control group. Before discussing the results it is important to note that as our research was cross  
10 sectional rather than longitudinal and so our comments are preliminary in nature. These results  
11 support previous assertions that the personality and schizotypal traits of highly creative  
12 individuals are more closely aligned with clinical patients than the normal population (Claridge  
13 & Blakey, 2009; Strong et al., 2007). Furthermore, these results lend additional support to the  
14 widely held view that both affect (Neuroticism) and aspects of cognitive flexibility (Openness)  
15 contribute to creativity (Richards, 2001; Rybakowski et al., 2008; Srivastava et al., 2010; Strong  
16 et al., 2007). Both creative and clinical populations share personality traits that are exploratory,  
17 seek new experiences, are non-conformist, and prone to challenge social norms. Furthermore,  
18 both demonstrate a propensity for disorganised thinking, emotional sensitivity and general  
19 interpersonal suspiciousness.

20 There are of course a range of biological, social and motivational inhibitors to the psychosis  
21 population not achieving the creative output that their creativity scores in this study would  
22 suggest they have the capacity for (Richards, 2001). However, one additional difference

1 between the two populations suggested by these data may lie in the ability to regulate heightened  
2 emotions for the purposes of maintaining social connectedness. On the one hand, emotional  
3 intensity is required for creative expression (Feist, 2006) while on the other hand self  
4 management of emotions are needed in collaborative social interactions necessary for creative  
5 achievement. Csikszentmihalyi (1999) hypothesised that an individual's ability to achieve  
6 creatively involves not simply the ability to produce outstanding creative products, but  
7 implicates personality traits that enable access to a network of contacts and highly developed  
8 interpersonal skills that make it possible for the creative product to have influence. The high  
9 functioning creative individual may have the ability to sufficiently regulate their sensitivity in the  
10 social relationships necessary for creative influence. The model below (Figure 2) summarises  
11 these results.

12  
13 [Insert Figure 2 near here]

14  
15 Nevertheless, limited creative achievement is possible for psychosis patients, as evidenced by the  
16 early psychosis group's significantly higher scores on creative achievement compared to non-  
17 creative controls. This suggests that those with early psychosis have a capacity for creative  
18 achievement. It may be in part that psychosis patients' elevated emotional sensitivity,  
19 suspiciousness and defensiveness impedes their ability to effectively communicate and  
20 collaborate with others within their creative network. Elevated emotional sensitivity is of  
21 particular relevance in creative achievement as rejection (of creative work) is an associated  
22 aspect of a creative vocation (Van den Eynde, Fisher, & Sonn, 2015). Mature creative artists  
23 learn to manage this rejection (Csikszentmihalyi, 1999), however, this may be difficult for the  
24 equally talented but emotionally vulnerable early psychosis individual. Difficulties with

1 managing this type of rejection inherent in creative industries is likely to have a reciprocal  
2 relationship with the characteristics of hypersensitivity, suspiciousness and defensiveness found  
3 in this study.

4  
5 This may prove to be a new avenue for intervention for early psychosis patients; in that early  
6 psychosis patients with proven creative ability may benefit from interventions aimed at  
7 enhancing communication skills and building resilience in the face of rejection. This in turn may  
8 increase their ability to maintain creative networks and improve vocational outcome. Therefore  
9 through research, which focuses on creative outcomes for early psychosis populations, rather  
10 than cognitive deficits, it may lead to an associated reduction in stigma for this population  
11 (Serafini et al., 2011).

### 12 13 **Limitations**

14 Our findings are limited by the relatively small sample size and by the cross-sectional nature of  
15 the research. Moreover the challenge of defining a creative and early psychosis sample has been  
16 articulated by other researchers (Breitborde, Srihari, & Woods, 2009; Kaufman, 2009; MacCabe  
17 et al., 2018). While we have sought to address these issues, the ongoing discourse in determining  
18 operational definitions for these populations remains a concern for researchers in the field. The  
19 lack of clarification in defining these populations contributes to difficulty in comparing studies  
20 and therefore is a limiting factor for the current research. Further research to elucidate these  
21 differences will be important future area of investigation.

### 22 23 **Conclusion and implications**

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3 1 Our findings support the need for further targeted longitudinal research into young, at risk,  
4  
5 2 creative populations and early psychosis patients (McGorry, 2009). In particular our results  
6  
7 3 underscore the need to research and develop programmes to foster and strengthen resilient,  
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9 4 personality features in young, vulnerable, creative populations. These programmes would  
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11 5 promote emotional self-management, along with interpersonal skills to challenge negative,  
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13 6 suspicious patterns of thinking and behaviour.  
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19 8 Finally, the current results provide additional support for the development of preventative  
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21 9 treatment protocols for creative populations, consistent with other recent studies that have  
22  
23 10 identified the unique psychological vulnerability of creative populations (Gostoli, Cerini,  
24  
25 11 Piolanti, & Rafanelli, 2017; Van den Eynde et al., 2015). The recent McCabe epidemiological  
26  
27 12 study (MacCabe et al., 2018) provides additional compelling support for this assertion as they  
28  
29 13 conclude that, artistic creativity is a risk factor for mental illness which is analogous to other  
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31 14 well documented risk factors for psychosis.  
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### 35 15 36 16 **Conflict of interest**

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39 17 The authors have no conflict of interest to declare.  
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### 47 20 **Acknowledgements**

48 21 The authors would like to acknowledge Shannon Gostelow and Nicole O'Reilly who were  
49  
50 22 research assistants for the project and Rob Brockman for his contribution to the research. The  
51  
52 23 authors would also like to acknowledge the National Health and Medical Research Council  
53  
54 24 (NHMRC) Project grant (APP630471), and the Australian Research Council (ARC) Future  
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1 Fellowship (FT0991511) both grants held by Melissa J Green (UNSW). Melissa J Green was  
2 responsible for this project as executed at UNSW and is affiliated with UNSW, Neuroscience  
3 Research Australia (NeuRA), the Black Dog Institute, and the Macquarie Centre for Excellence  
4 in Cognition and its Disorders.

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For Peer Review Only

**Table 1.**

Sample description

	<b>EP</b>	<b>CC</b>	<b>NCC</b>	<b>Statistical Value for main effect</b>
<i>N</i>	21	55	24	
Age	25.4 ± 4.2	23.4 ± 4.3	22.8 ± 3.6	( $F_{2,101}=2.433$ , $p=.093$ )
Female (%)	57.1	63.6	62.5	( $\chi^2 = 0.201$ , $p=.904$ )
IQ	107.9 ± 15.2	109.4 ± 10.3	104.9 ± 13.4	( $F_{2,97}=1.101$ , $p=.337$ )

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**Table 2**

Means and standard deviations for all groups on the NEO variables

	EP	CC	NCC	Statistical values for main effects
<i>N</i>	21	55	24	
Neuroticism	30.4 ± 8.6	24.6 ± 8.3	17.0 ± 6.9	F <sub>2,99</sub> =15.90, p<.001 <sup>a</sup>
Extraversion	29.3 ± 7.9	30.3 ± 6.4	29.2 ± 4.8	F <sub>2,99</sub> =.346, p=.709
Openness	33.9 ± 7.2	33.4 ± 6.8	24.2 ± 5.8	F <sub>2,99</sub> =17.90, p<.001 <sup>b</sup>
Agreeableness	28.1 ± 5.3	31.7 ± 7.1	31.0 ± 5.9	F <sub>2,99</sub> =2.45, p=.091
Conscientiousness	26.8 ± 7.5	29.7 ± 6.9	32.4 ± 7.3	F <sub>2,99</sub> =3.45, p<.05 <sup>c</sup>

a = EP &gt; CC &gt; NCC\*\*

b = EP, CC &gt; NCC\*\*

c = NCC &gt; EP\*

\*\* p&lt;.01, \* p&lt;.05.

**Table 3**

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Means and standard deviations for all groups on the O-LIFE variables

	EP	CC	NCC	Statistical values for main effects
<i>N</i>	21	55	23	
Unusual Experiences	12.4 ± 7.6	13.3 ± 6.4	3.4 ± 4.0	$F_{2,98}=20.89, p<.001^a$
Cognitive Disorganisation	14.8 ± 5.1	12.3 ± 5.0	5.7 ± 5.1	$F_{2,98}=19.96, p<.001^a$
Introverted Anhedonia	8.2 ± 5.3	5.6 ± 3.9	7.6 ± 5.0	$F_{2,96}= 3.30, p=.042$
Impulsive Nonconformity	9.6 ± 4.9	9.4 ± 4.0	5.1 ± 3.3	$F_{2,98}=10.05, p<.001^a$

a = EP, CC > NCC\*\*

\*\* p<.01

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**Table 4**

Means and standard deviations for all groups on the PSQ variable

	EP	CC	NCC	Statistical values for main effects
<i>N</i>	21	56	23	
Total paranoia/suspicious	24.9 ± 9.2	19.1 ± 7.9	14.2 ± 7.2	F <sub>2,99</sub> = 9.83, p<.001 <sup>a</sup>
Interpersonal suspicious	6.6 ± 3.4	5.5 ± 2.7	3.1 ± 2.6	F <sub>2,99</sub> =9.18, p<.001 <sup>b,c</sup>
Negative mood	4.5 ± 1.7	3.7 ± 1.6	2.8 ± 1.2	F <sub>2,99</sub> =6.33, p<.05 <sup>d</sup>
Anger impulsiveness	4.3 ± 3.2	3.3 ± 1.7	2.3 ± 1.2	F <sub>2,99</sub> =5.36, p<.05 <sup>d</sup>
Mistrust Wariness	3.6 ± 2.0	2.8 ± 1.9	2.6 ± 1.9	F <sub>2,99</sub> =1.76, p=.176
Hardship	3.5 ± 2.2 <sup>e</sup>	2.1 ± 2.1	1.7 ± 1.5	F <sub>2,99</sub> =5.36, p<.05 <sup>e</sup>

a = EP > CC > NCC\*\*

b = EP > NCC\*\*

c = CC > NCC\*

d = EP > NCC\*

e = EP > CC, NCC\*

\*\* p<.01. \*p<.05

**Table 5**

Means and standard deviation for all groups on creative achievement (CAQ) and creative thinking (ATTA)

	EP	CC	NCC	Statistical values for main effects
<i>N</i>	21	54	23	
Creative Achievement	25.1 ± 25.6	48.2 ± 29.4	3.4 ± 4.7	$F_{(2,97)} = 27.11, p < .001^{a,b}$
Creative Thinking	76.5 ± 12.5	79.7 ± 8.8	67.5 ± 9.2	$F_{(2,97)} = 12.68, p < .001^{b,c}$

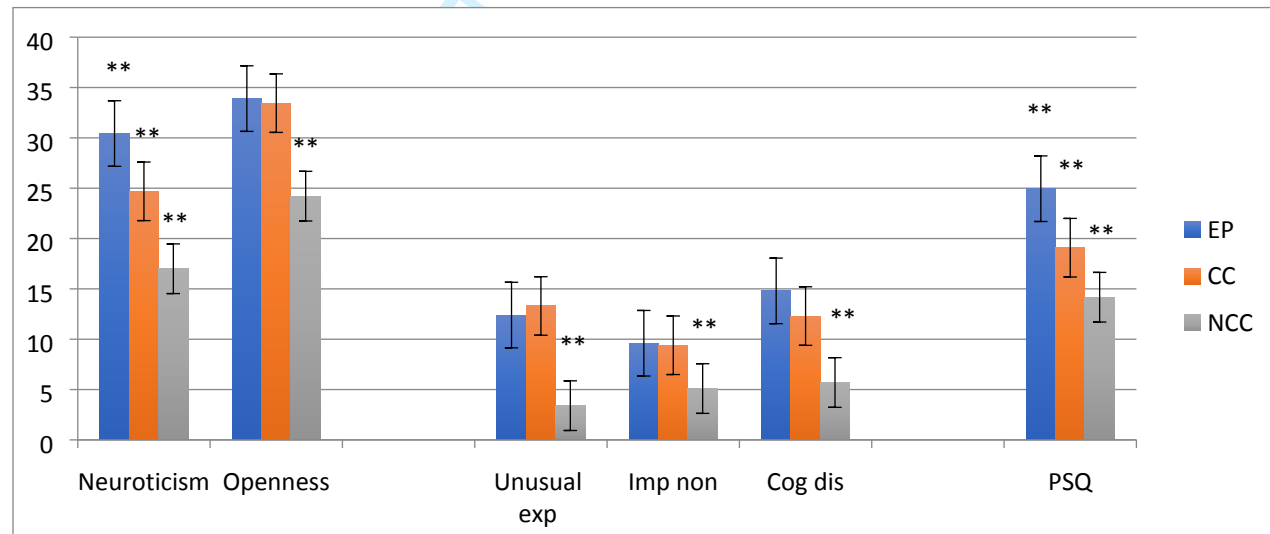
a = CC > EP, NCC\*\*  
 b = EP > NCC\*  
 c = CC > NCC\*\*  
 \*\* p < .01, \* p < .05.

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**Figure 1.**

Graph of means for NEO-FFI-R (Neuroticism, Openness), O-LIFE (Unusual Experiences, Impulsive Non-Conformity, Cognitive Disorganization) and Paranoid Suspiciousness Questionnaire (Total score).



\*\*  $p < .01$

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**Figure 2.**

A model of shared and distinct personality and schizotypal traits mapped to CC and EP populations

