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

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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.

URL: http://mc.manuscriptcentral.com/rpsy
Introduction

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

In considering these associations, a unitary psychosis theory has been proposed (Carson, 2011; Claridge & Blakey, 2009; Sass, 2001) which argues that the apparently distinct clinical classifications with bipolar disorder and schizophrenia in fact have common underlying processes that differentially contribute to creativity. Specifically, Carson proposed a model of shared vulnerability between those with high creativity and individuals with psychopathology (Carson, 2011) based on existing research into molecular biology. The author suggested that hyper-connectivity, or the unusual neural linking of uncommon brain areas (often associated with psychosis), a preference for novelty, and attenuated latent inhibitions, are shared vulnerability factors operating below the level of consciousness between those with high creativity and those with psychopathology. High IQ, working memory skills and cognitive
flexibility are thought to help protect the high creativity population from developing psychosis by providing a meta-cognitive control over bizarre, unusual thoughts. In contrast, she suggests risk factors such as low IQ, perseveration, and poor working memory may render the creative individual vulnerable to developing psychopathology. Carson acknowledges that this is an incomplete list and suggests additional studies would extend this model. Further clarification is particularly apt as the factors proposed are generic and too broad to have specific clinical application. Since this model was proposed, vulnerability factors for those at risk for psychosis has been an area under increasing investigation (Fusar-Poli et al.), with risk factors such as childhood trauma, early adolescent low functioning and socio-demographic factors along with cognitive deficits such as verbal learning impairments (Carrión et al., 2018) also associated with transition to psychosis. However, these additional vulnerability factors have not, as yet, been considered in relation to a specific creative population.

Carson’s shared vulnerability model proposed novelty seeking as the only personality trait common to the creative individual and those with psychopathology. This study will examine if aspects of personality beyond the factor outlined by Carson, contribute to “protecting” the creative population from psychosis. Specifically, do aspects of personality and schizotypy differentiate the highly creative from those with expressed psychosis? Schizotypy is considered to be an aggregate of personality traits that lie along a continuum from normality to schizophrenia (Cochrane, Petch, & Pickering, 2012) (Siddi, Petretto, & Preti, 2017). Genetic, cognitive and brain fMRI studies provide supportive evidence for an overlap between schizophrenia and schizotypy (Wang et al., 2017). Aspects of positive schizotypy such as Impulsive Non-Conformity and Unusual Experiences, along with personality features such as
Openness and Neuroticism have consistently been associated with both the highly creative, bipolar and schizotypal populations (Batey & Furnham, 2008; Srivastava et al., 2010).

The authors, Nelson and Rawlings (2010) investigated psychopathology and personality indicators of creative experience in a study of 100 creative artists. Aspects of positive schizotypy (Unusual Experiences) were found to be the strongest predictor of creative experience, along with the ‘Big Five’ personality dimensions of Openness to Experience and Neuroticism, when compared to normative data. This is consistent with a number of other studies associating in particular Openness to Experience with creative cognition (Jung, Grazioplene, Caprihan, Chavez, & Haier, 2010; Jung, Mead, Carrasco, & Flores, 2013). As it has been postulated, Openness provides creative individuals with a deeper memory bank of experiences, thoughts and problem solving strategies for creative thinking (Ma, 2009).

Whilst the research discussed above has primarily investigated personality in non-clinical populations, a small number of studies have analysed personality and cognitive features in clinical and creative samples. In a comparison of personality similarities and differences between participants with a diagnosis of Bipolar 1 Disorder (BD), unipolar depression diagnosis (MDD), creative arts students (CC) and healthy controls (HC), Nowakowska and colleagues (Nowakowska, Strong, Santosa, Wang, & Ketter, 2005) reported the most prominent personality similarities were between BD and CC populations. In particular the authors found novelty seeking, self-transcendence (the experience of oneself as an integral part of the universe (Cloninger, 1994)) and the affective temperament factor, cyclothymia were similar across BP and CC populations. This finding of common personality traits between Bipolar (BD) and Creative (CC) populations has been supported in two similar studies (Srivastava et al., 2010;
Strong et al., 2007). Both these studies record similarly high scores on Neuroticism and Openness in BD and CC populations, which Strong suggests implicates an affective (e.g. Neuroticism) and cognitive/flexibility (e.g. Openness) component to creativity. Strong et al. (2007) hypothesised that these tendencies may assist creative expression through the ability to tolerate intense and often negative and varied shifts in emotion (Neuroticism), associated with driving innovation through dissatisfaction with the status quo (Strong et al., 2007). In contrast, she suggests Openness (which she associates with cognitive flexibility) may contribute to creative achievement and interpersonal relationships.

Taken together, these studies suggest that particular personality traits and certain positive schizotypal traits may differentially contribute to creative cognition. Mason’s review of the assessment of schizotypy (Mason, 2015), noted that research into schizotypal personality characteristics should include a measure of paranoia/suspiciousness. Paranoid ideation has also been associated with those at risk for psychosis (Masillo et al., 2017; Valmaggia et al., 2015) however most research has examined the relationship between positive schizotypy and creativity (eg (Nettle, 2006) rather than paranoia. 

Similarly, while many studies have researched creative inclination and creative potential with both bipolar and schizophrenia populations (Wang et al., 2017), few studies have investigated creative production or the ability to follow through with creative inclination to actually produce and deliver creative outputs (Andreasen, 1987). Further investigation is warranted into which aspects of personality and schizotypy (including paranoia/suspiciousness) are associated with creative production (or the lack of it) in populations with these clinical disorders, in the presence of creative cognition (Kyaga et al., 2011).
Therefore, the aim of the present study is to further investigate relationships between personality and creativity across clinical, creative and non-creative control samples. Based on previous research, we hypothesise:

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

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

3. The CC and early psychosis (EP) participants will demonstrate significantly higher creative thinking scores compared to NCC participants, but CC participants will record significantly higher levels of creative achievement when compared to both NCC and EP individuals.

Methods

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

Participants

*Early psychosis participants (EP) N=21*

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

*Creative control participants (CC) N=55*

Creative control participants were recruited following a brief presentation by the lead researcher (JC), to several Creative Art Colleges around Sydney, Australia. The recruitment sites included tertiary creative training institutions such as music colleges (contemporary, classical music,
composition, vocals), visual arts colleges, as well as advertising on relevant creative websites (e.g. livingwithacreativemind.com). Individuals were presented with an outline of the research and gave written consent to take part in the study. Creative controls were screened for past or present psychotic symptoms using a MINI (brief structured psychiatric questionnaire) (Lecrubier et al.). None were found to have past or present syndromal psychiatric disorders. Of those recruited 27 were primarily engaged with music; 15 were visual or graphic artists, 12 were actors or involved in the theatre and 1 was engaged in web development and design.

Non-creative control participants (NCC) N=24

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

Measures

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

Weschler Abbreviated Scale of Intelligence (WASI) (Wechsler & Zhou, 2011)
In order to screen for IQ, the two-scale version of the WASI was administered to all participants. The WASI has been found to be a brief but valid measure of intelligence in both healthy adult and clinical populations (Ryan et al., 2003). The two-scale version comprises a forty-two item test of vocabulary and a thirty-five item matrix reasoning test. The measure was administered and scored according to standard protocols.

Abbreviated Torrance Test for Adults (Goff & Torrance, 2002).

All participants were administered the Abbreviated Torrance Test for Adults (ATTA) (Goff & Torrance, 2002). This test comprises three tasks where participants are asked to respond to each challenge using imagination and problem-solving ability. The measure was selected as longitudinal studies support the consistent relationship between test behaviour and creative achievement and the Torrance test is the most widely used and well researched creativity measure (Torrance, 2000). Two scorers (JC and SG) evaluated each ATTA and where scores differed, the average was used.

Creative Achievement Questionnaire (Carson, 2005).

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

Participants were administered a self-report personality measure NEO-FFI-R (Costa & McCrae, 1985; McCrae & Costa, 2004) which rates five aspects of personality, namely Neuroticism, Extroversion, Openness, Agreeableness and Conscientiousness. The NEO-FFI-R is a 60-item, widely used measure of personality.

Oxford-Liverpool Inventory of Feelings and Experiences (O-LIFE) (Mason & Claridge, 2006)

The Oxford-Liverpool Inventory of Feelings and Experiences (Mason & Claridge, 2006) is a well used measure of schizotypal personality in schizophrenic patients and healthy controls ($\alpha$ = .87) (Ando, Claridge, & Clark, 2014; Burch, Pavelis, Hemsley, & Corr, 2006; Cochrane, Petch, & Pickering, 2010; Yaghoubi H & A., 2012). It comprises 104 items across four scales; Unusual Experiences (Un Ex), which describes perceptual aberrations and magical thinking and is linked to positive aspects of schizotypy; Impulsive Non-Conformity (ImpNon) describes eccentric forms of behaviour including impulsivity and a lack of self-control; Introverted Anhedonia (InAn) associated with avoidance of intimacy and discomfort in social and physical environments and is associated with negative schizotypy; and Cognitive Disorganisation (CogDis) which contains items describing thought disorder and poor decision making along with aspects of social anxiety.

Paranoid Suspiciousness Questionnaire (PSQ) (Rawlings & Freeman, 1996)

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

Procedures

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

Data analysis

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

Descriptive statistics

A total of 100 participants took part in the study (EP: 21; CC: 55; NCC: 24). Mantel-Haenszel chi-square tests of significance were used to test for differences in the bivariate associations between demographic variables (age, sex and IQ), and are presented in Table 1. There were no significant differences in age, gender or IQ between the three groups of participants. The sample was predominantly female (61.4%), the mean age of the participants was 23.71 (SD= 4.19; Median = 23), and 53.5% of all participants were in the younger age group (<23 years).

Hypothesis 1: Non-significant differences in specific personality traits will be observed between highly creative and clinical populations, such that individuals with EP will report similar levels of Neuroticism and Openness, Impulsive Nonconformity and Unusual Experiences to individuals defined as highly creative; however both groups will show significantly elevated levels of these traits compared to non-creative control individuals.

Group differences on NEO-FFI-R

Group means and standard deviations for NEO results are summarized in Table 2. To examine group differences, we conducted a series of ANOVAs with group (NCC; CC; EP) as the independent variable and the NEO-FFI-R subscales (Extraversion; Neuroticism; Openness; Agreeableness and Conscientiousness) as the dependent variables. The CC and EP groups both reported significantly higher scores on the Neuroticism and Openness subscales compared to
NCC ($p<.001$). The EP population also reported significantly higher scores on the Neuroticism subscale compared to the CC (and NCC groups). The non-creative control group was significantly more Conscientious than the early psychosis group ($p<.05$).

[Insert Table 2 near here]

Group Differences on the O-LIFE

Whereas the NEO-FFI-R is a measure of “normal” personality features, the O-LIFE measures schizotypal personality traits. Results of the one-way ANOVA comparing the three groups on the O-LIFE subscales are presented in Table 3. These show the EP and CC participants scored significantly higher on Unusual Experiences (UE), Impulsive Non-Conformity (Imp N), and Cognitive Disorganisation (Cog D) compared to the NCC participants (all $p < .001$), but were not significantly different from each other. In relation to Introverted Anhedonia (IA), although the ANOVA just met statistical significance, none of the post-hoc tests were significantly different from each other. This casts doubt on the reliability of the omnibus test; hence we have not included this variable among the group of significantly different group comparisons.

Considering NEO and O’LIFE together, Openness, Impulsive Non-Conformity, Unusual Experiences and Cognitive Disorganisation are similarly associated with EP and CC populations. Results on the Neuroticism personality factor in the NEO_FFI_R present a slightly different picture. Similar to the above factors, both clinical and creative participants recorded significantly higher scores on Neuroticism when compared to the NCC group, however the EP sample recorded significantly higher results again when compared to the CC group.

[Insert Table 3 near here]
Hypothesis 2: Negative personality features such as paranoia and suspiciousness will be more evident in EP participants, when compared to CC, NCC participants.

Group Differences on the P/SQ

The P/SQ measures negative personality feature such as general suspiciousness and hostility in interpersonal communication, alongside mistrustful and wary tendencies and resentment toward perceived hardship. To test the hypothesis that there would be a difference in positive and negative schizotypal features between EP, CC and NCC groups, a one-way ANOVA was conducted on P/SQ scores (see Table 4). The overall paranoia/suspiciousness mean score was significantly higher in the EP and CC groups compared to the NCC \( (p<.001) \), however a significant difference \( (p<.001) \) was also recorded between the EP and CC groups, supporting our hypothesis that negative schizotypal personality characteristics, measured by the PSQ, will be more prevalent in the EP population. Within the subscale comparisons, a comparative pattern of results was found for the Interpersonal Suspiciousness domain, with the NCC group reporting significantly lower scores than the other two groups \( (p<.001) \). The EP participants reported significantly greater negative personality features on Negative Mood and Anger Impulsiveness compared to the NCC participants \( (p<.001) \), however they were not significantly elevated compared to the CC group. Finally, scores on the Hardship/Resentment subscale were significantly higher among the EP group compared to both the CC and NCC groups.

[Insert Table 4 near here]
To summarize, this cluster of shared personality features indicates adaptive character traits typically associated with positive schizotypal features that were found with both EP and CC populations. However, the EP population is distinguished from the CC both by an increase in Neuroticism and Interpersonal Suspiciousness symptoms, and the presence of additional negative schizotypal features. The presence and intensity of these negative traits may either impede creativity or prevent this creative potential converting to creative achievement in the EP population.

Hypothesis 3: The CC and EP participants will record significantly higher divergent thinking (creative potential) scores compared to NCC participants, but CC participants will record significantly higher levels of creative achievement when compared to both NCC and EP individuals.

Group Differences of the Abbreviated Torrance Test for Adults (ATTA) (Goff, 2002) and Creative Achievement Questionnaire (CAQ) (Carson, 2005).

A series of one-way ANOVAs were conducted to determine if there were any group differences in creative potential as measured by the divergent thinking (ATTA measure) and in creative achievement as measured by the CAQ (see Table 5). Not surprisingly the CC individuals scored significantly higher on the divergent thinking and CAQ measures, compared to the NCC group. While there was no significant difference between the CC and EP population on the divergent thinking task, there was a significant difference between CC and EP on the CAQ. Of particular note however is the finding that the EP population scored significantly higher than the NCC on
the CAQ. These results suggest that while the EP population has similar creative potential (divergent thinking) to the creative population, they are less able to translate this into creative achievement. However, some creative achievement was still evident.

[Insert Table 5 near here]

Discussion

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

There are of course a range of biological, social and motivational inhibitors to the psychosis population not achieving the creative output that their creativity scores in this study would suggest they have the capacity for (Richards, 2001). However, one additional difference
between the two populations suggested by these data may lie in the ability to regulate heightened emotions for the purposes of maintaining social connectedness. On the one hand, emotional intensity is required for creative expression (Feist, 2006) while on the other hand self management of emotions are needed in collaborative social interactions necessary for creative achievement. Czikszentmihalyi (1999) hypothesised that an individual’s ability to achieve creatively involves not simply the ability to produce outstanding creative products, but implicates personality traits that enable access to a network of contacts and highly developed interpersonal skills that make it possible for the creative product to have influence. The high functioning creative individual may have the ability to sufficiently regulate their sensitivity in the social relationships necessary for creative influence. The model below (Figure 2) summarises these results.

Nevertheless, limited creative achievement is possible for psychosis patients, as evidenced by the early psychosis group’s significantly higher scores on creative achievement compared to non-creative controls. This suggests that those with early psychosis have a capacity for creative achievement. It may be in part that psychosis patients’ elevated emotional sensitivity, suspiciousness and defensiveness impedes their ability to effectively communicate and collaborate with others within their creative network. Elevated emotional sensitivity is of particular relevance in creative achievement as rejection (of creative work) is an associated aspect of a creative vocation (Van den Eynde, Fisher, & Sonn, 2015). Mature creative artists learn to manage this rejection (Czikszentmihalyi, 1999), however, this may be difficult for the equally talented but emotionally vulnerable early psychosis individual. Difficulties with
managing this type of rejection inherent in creative industries is likely to have a reciprocal
relationship with the characteristics of hypersensitivity, suspiciousness and defensiveness found
in this study.

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

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

Conclusion and implications
Our findings support the need for further targeted longitudinal research into young, at risk, creative populations and early psychosis patients (McGorry, 2009). In particular our results underscore the need to research and develop programmes to foster and strengthen resilient, personality features in young, vulnerable, creative populations. These programmes would promote emotional self-management, along with interpersonal skills to challenge negative, suspicious patterns of thinking and behaviour.

Finally, the current results provide additional support for the development of preventative treatment protocols for creative populations, consistent with other recent studies that have identified the unique psychological vulnerability of creative populations (Gostoli, Cerini, Piolanti, & Rafanelli, 2017; Van den Eynde et al., 2015). The recent McCabe epidemiological study (MacCabe et al., 2018) provides additional compelling support for this assertion as they conclude that, artistic creativity is a risk factor for mental illness which is analogous to other well documented risk factors for psychosis.

Conflict of interest

The authors have no conflict of interest to declare.

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References


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Table 1.
Sample description

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<tr>
<td>N</td>
<td>21</td>
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<td>Age</td>
<td>25.4 ± 4.2</td>
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<td>22.8 ± 3.6</td>
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<td>Female (%)</td>
<td>57.1</td>
<td>63.6</td>
<td>62.5</td>
<td>(χ^2 = 0.201, p=.904)</td>
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<td>IQ</td>
<td>107.9 ± 15.2</td>
<td>109.4 ± 10.3</td>
<td>104.9 ± 13.4</td>
<td>(F_{2,97}=1.101, p=.337)</td>
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Table 2

Means and standard deviations for all groups on the NEO variables

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<td>N</td>
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<tr>
<td>Neuroticism</td>
<td>30.4 ± 8.6</td>
<td>24.6 ± 8.3</td>
<td>17.0 ± 6.9</td>
<td>F(_{2,99}) = 15.90, p&lt;.001(^a)</td>
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<td>Extraversion</td>
<td>29.3 ± 7.9</td>
<td>30.3 ± 6.4</td>
<td>29.2 ± 4.8</td>
<td>F(_{2,99}) = .346, p=.709</td>
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<td>Openness</td>
<td>33.9 ± 7.2</td>
<td>33.4 ± 6.8</td>
<td>24.2 ± 5.8</td>
<td>F(_{2,99}) = 17.90, p&lt;.001(^b)</td>
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<td>Agreeableness</td>
<td>28.1 ± 5.3</td>
<td>31.7 ± 7.1</td>
<td>31.0 ± 5.9</td>
<td>F(_{2,99}) = 2.45, p=.091</td>
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<td>Conscientiousness</td>
<td>26.8 ± 7.5</td>
<td>29.7 ± 6.9</td>
<td>32.4 ± 7.3</td>
<td>F(_{2,99}) = 3.45, p&lt;.05 (^c)</td>
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\(^a\) = EP > CC > NCC**
\(^b\) = EP, CC > NCC**
\(^c\) = NCC > EP*

** p<.01, * p<.05.

Table 3
Means and standard deviations for all groups on the O-LIFE variables

<table>
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<tr>
<td>Unusual Experiences</td>
<td>12.4 ± 7.6</td>
<td>13.3 ± 6.4</td>
<td>3.4 ± 4.0</td>
<td>$F_{2,98}=20.89$, p&lt;.001 $^a$</td>
</tr>
<tr>
<td>Cognitive Disorganisation</td>
<td>14.8 ± 5.1</td>
<td>12.3 ± 5.0</td>
<td>5.7 ± 5.1</td>
<td>$F_{2,98}=19.96$, p&lt;.001 $^a$</td>
</tr>
<tr>
<td>Introverted Anhedonia</td>
<td>8.2 ± 5.3</td>
<td>5.6 ± 3.9</td>
<td>7.6 ± 5.0</td>
<td>$F_{2,96}= 3.30$, p=.042</td>
</tr>
<tr>
<td>Impulsive Nonconformity</td>
<td>9.6 ± 4.9</td>
<td>9.4 ± 4.0</td>
<td>5.1 ± 3.3</td>
<td>$F_{2,98}=10.05$, p&lt;.001 $^a$</td>
</tr>
</tbody>
</table>

$a = EP, CC > NCC**$

** p<.01

Table 4

Means and standard deviations for all groups on the PSQ variable
<table>
<thead>
<tr>
<th></th>
<th>EP</th>
<th>CC</th>
<th>NCC</th>
<th>Statistical values for main effects</th>
</tr>
</thead>
<tbody>
<tr>
<td>N</td>
<td>21</td>
<td>56</td>
<td>23</td>
<td></td>
</tr>
<tr>
<td>Total paranoia/suspicious</td>
<td>24.9 ± 9.2</td>
<td>19.1 ± 7.9</td>
<td>14.2 ± 7.2</td>
<td>F(_{2,99}) = 9.83, p&lt;.001(^a)</td>
</tr>
<tr>
<td>Interpersonal suspicious</td>
<td>6.6 ± 3.4</td>
<td>5.5 ± 2.7</td>
<td>3.1 ± 2.6</td>
<td>F(_{2,99}) = 9.18, p&lt;.001(^{b,c})</td>
</tr>
<tr>
<td>Negative mood</td>
<td>4.5 ± 1.7</td>
<td>3.7 ± 1.6</td>
<td>2.8 ± 1.2</td>
<td>F(_{2,99}) = 6.33, p&lt;.05 (^d)</td>
</tr>
<tr>
<td>Anger impulsiveness</td>
<td>4.3 ± 3.2</td>
<td>3.3 ± 1.7</td>
<td>2.3 ± 1.2</td>
<td>F(_{2,99}) = 5.36, p&lt;.05 (^d)</td>
</tr>
<tr>
<td>Mistrust Wariness</td>
<td>3.6 ± 2.0</td>
<td>2.8 ± 1.9</td>
<td>2.6 ± 1.9</td>
<td>F(_{2,99}) = 1.76, p=.176</td>
</tr>
<tr>
<td>Hardship</td>
<td>3.5 ± 2.2 (^e)</td>
<td>2.1 ± 2.1</td>
<td>1.7 ± 1.5</td>
<td>F(_{2,99}) = 5.36, p&lt;.05 (^e)</td>
</tr>
</tbody>
</table>

\(^{a} = \text{EP} > \text{CC} > \text{NCC}^{**}\)
\(^{b} = \text{EP} > \text{NCC}^{**}\)
\(^{c} = \text{CC} > \text{NCC}^{*}\)
\(^{d} = \text{EP} > \text{NCC}^{*}\)
\(^{e} = \text{EP} > \text{CC, NCC}^{*}\)

** p<.01, *p<.05

Table 5

Means and standard deviation for all groups on creative achievement (CAQ) and creative thinking (ATTA)
<table>
<thead>
<tr>
<th></th>
<th>EP</th>
<th>CC</th>
<th>NCC</th>
<th>Statistical values for main effects</th>
</tr>
</thead>
<tbody>
<tr>
<td>N</td>
<td>21</td>
<td>54</td>
<td>23</td>
<td></td>
</tr>
<tr>
<td>Creative Achievement</td>
<td>25.1 ± 25.6</td>
<td>48.2 ± 29.4</td>
<td>3.4 ± 4.7</td>
<td>$F_{(2,97)} = 27.11. \ p&lt;0.001^{a,b}$</td>
</tr>
<tr>
<td>Creative Thinking</td>
<td>76.5 ± 12.5</td>
<td>79.7 ± 8.8</td>
<td>67.5 ± 9.2</td>
<td>$F_{(2,97)} = 12.68, \ p&lt;0.001^{b,c}$</td>
</tr>
</tbody>
</table>

a = CC > EP, NCC**  
 b = EP > NCC*  
 c = CC > NCC**  
** p<.01, * p<.05.
**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
Figure 2.

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

- Shared Traits
  * Openness
  * Impulsive
  * Non-conformity
  * Unusual Experiences
  * Cognitive Disorganisation
  * Interpersonal Suspiciousness

- Shared but EP Amplified
  * Neuroticism
  * Total Paranoid/suspiciousness

- EP Difference
  * Negative mood
  * Anger
  * Perceived Hardship

Creative Control   Early Psychosis group