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Creative Minds: Altered Salience as a Bridge Between Creativity and Psychosis, a Case–Control Study

ABSTRACT

Prior studies suggest a multifaceted relationship between creativity and psychopathology, indicating that mild psychopathology might enhance creative behavior. Moreover, similar brain regions may be implicated in both creativity and psychosis. Although aberrant salience (AS) is often associated with psychotic disorders, it could also enhance creative capabilities. This study assesses salience alterations among healthy individuals, artists, and patients with psychosis to investigate its influence on creativity. Three groups were studied: 196 healthy controls, 50 artists from Florence Academy of Fine Arts, and 84 outpatients with a diagnosis of psychosis. They were assessed with the Aberrant Salience Inventory (ASI). We compared ASI scores among the groups using ANOVA, followed by post-hoc *t*-tests, and adjusted the scores for age, gender, and education through ANCOVA. The ANOVA revealed significant differences in ASI scores among the groups, with artists displaying notably higher ASI scores than both controls and patients. ANCOVA confirmed that group membership was a significant factor influencing ASI scores, while age, gender, and education were not. Additionally, antipsychotic treatment did not significantly impact ASI scores among patients. Rather than an unequivocal marker of pathology, AS might also be interpreted as an anthropological asset, enhancing creative faculties alongside unique perceptual experiences. Education may help individuals in channeling their AS mechanisms through art.

Keywords: aberrant salience, psychosis, psychopathology, creativity, art.

Creativity can be described as the ability to produce original, unusual, flexible, and valuable ideas or behaviors (Runco & Jaeger, 2012). This anthropologic disposition has been viewed as an evolutionary mechanism that allows both the individual and the species to adapt to the environment in real time (Carson, 2014).

An association between creativity and psychopathology has been proposed since Aristotle and Plato's time (Becker, 2001) and also Jaspers suggested a similar link (Jaspers, 1926). As a matter of fact, there is evidence suggesting that individuals with mild psychiatric conditions might be more likely to display creative behavior than either subjects with no psychiatric diagnosis or subjects with more severe forms of psychiatric disorders (Acar, Chen, & Cayirdag, 2018; Carson, 2014; Fink, Benedek, Unterrainer, Papousek, & Weiss, 2014; Parnas, Sandsten, Vestergaard, & Nordgaard, 2019). Some brain regions of the Salience Network have been shown to be involved both in artistic creativity (Shi, Cao, Chen, Zhuang, & Qiu, 2017) and

psychosis (Liloia et al., 2021; Martin, Clark, & Schubert, 2023), and higher rates of psychosis proneness have been found among creative artists compared to same age and gender subjects (Preti & Vellante, 2007). Moreover, a systematic review cautiously suggests an association between creativity and several conditions owing to the spectrum of psychosis, such as Bipolar Disorder and schizotypy (Thys, Sabbe, & De Hert, 2014); another study mentions how polygenic risk scores for Schizophrenia and Bipolar Disorder predict creativity (Power et al., 2015).

Salience could be described as the “relevance” that a perceived (internal or external) object acquires for the subject who perceives it, therefore leading to behavioral and ideative activation. We interpret salience as an inherent phenomenon of human existence which usually maintains an anthropological proportion (Blankenburg, 1972) between commonness (adaptive salience) and eccentricity (aberrant salience, AS), shaping the subjective way to experience the world. Within this interpretation, AS could be described as a starting point for several individual directions both in the clinical (anxious trajectory, psychotic trajectory, autistic trajectory, etc.) and nonclinical (artistic trajectory) spectrum, directed by one’s subjective characteristics and life experiences.

Thus, one prevalent model for the onset of psychosis suggests a reconfiguration of salience mechanisms, with the individual’s salience attribution being assigned to otherwise irrelevant stimuli, thus leading to thought and perception alterations such as delusions and hallucinations (Kapur, 2003). While hallucinations appear as a direct experience of the AS of internal representations, delusions are seen as an auto-hermeneutic attempt by which the subject tries to interpret and convey meaning to his senso-perceptual experiences. AS in fact has been said to disrupt normal attention and meaning-making processes, causing trivial stimuli to be perceived as highly significant.

However, the boundary between the strictly pathological alterations of salience and an alternative but adaptive perception of the world which may lead to artistic creativity seems to be blurred. As a matter of fact, a peculiar experience of the lived world may lead not only to the onset of an explicit psychotic symptomatology but also to an increased artistic sensitivity. In fact, it has even been proposed that the persistence of the genetic bases of conditions such as Schizophrenia may be linked to an evolutionary advantage through enhanced creative ability (Thys, Sabbe, & De Hert, 2013), which may lead to a tendency to employ innovative approaches, or to apply well-known methods in unconventional ways (Carson, 2014).

Until today, AS has been thought to be a transdiagnostic trait-like feature of general vulnerability specific to psychosis (Li, Castro, & Martin, 2020). However, we would like to explore the intriguing proposal that the anthropological device (Stanghellini, 1997) of salience may also take part in shaping alternative psychological trajectories such as creativity, especially among young people. The difference between delusional and artistic creativity may therefore lie in the different ways of conveying meaning to AS experiences, leading to one trajectory rather than the other. In addition, it is worth noting that neurodivergent conditions like autism spectrum disorder (ASD) and attention deficit hyperactivity disorder might also be associated with altered salience network processing (Gerrans, 2021; Hayashibara, Savickaitė, & Simmons, 2023). In ASD, studies have found reduced functional connectivity within the salience network, along with reduced activation and gray matter volume in key salience network regions like the insula (Ebisch et al., 2011; Uddin, Supekar, & Menon, 2013). These alterations may underlie differences in how individuals with ASD perceive and assign salience to social cues, sensory stimuli, and internal experiences (Uddin, 2016). Similarly, in ADHD, meta-analyses have identified dysfunction within the salience network, particularly hypoactivation of the insula and anterior cingulate, which could contribute to problems with orienting attention and inhibiting responses to salient stimuli (Cortese et al., 2012).

For these reasons, we aimed to evaluate salience alterations among young, healthy controls, artists from the Florence Academy of Fine Arts, and subjects with a diagnosis within the psychosis spectrum from the Adult Psychiatry Unit of Florence University Hospital, testing the hypothesis of a progressively increasing level of aberrant salience experiences from healthy controls to artistic individuals to individuals with a diagnosis of psychosis.

METHODS

PARTICIPANTS

Individuals from the control group were recruited using convenience and snowball sampling methods, provided they met the following inclusion criteria: age between 18 and 40 years, Italian speakers, and collection of online written informed consent. Exclusion criteria were the following: illiteracy or inability to provide consent or to complete the survey online, lifetime diagnosis of a psychiatric disorder or substance use

disorder. On the basis of the methodology adopted, a set of 45 participants was initially selected to reduce selection bias associated with the non-probabilistic sampling method. The first subjects were selected by sharing the research protocol in the University of Florence's social spaces. Each participant was then asked to choose five individuals and to send them the questionnaire. This recruitment procedure was carried out until saturation of data. The Aberrant Salience Inventory (ASI, discussed in the section Measures) was administered to each of the participants through an online platform. The procedure was explained to respondents, and online written informed consent was collected before enrolment. The anonymity of participants was always ensured.

In total, 249 Italian adults were recruited after providing online informed consent. Of the 249 individuals who were contacted, 17 refused to participate. Of the 232 respondents, 9 participants were excluded because they reported a current or past psychiatric disorder, and 27 were excluded because they reported a current or past substance use. Therefore, the final sample consisted of 196 subjects.

Subjects from the Artist Group were recruited from Florence Academy of Fine Arts, provided they met the same inclusion and exclusion criteria of the control group. The same questionnaire used for the control group was administered to each of the participants through the same online platform in a similar fashion and with similar anonymity standards. Self report of the main artistic interest was also collected for descriptive purposes.

In total, 77 Italian adults were recruited after providing online informed consent. Of the 77 individuals who were contacted, 10 refused to participate. Of the 67 respondents, 5 participants were excluded because they reported a current or past psychiatric disorder, 12 were excluded because they reported a current or past substance use. Therefore, the final sample consisted of 50 subjects.

The psychiatric outpatient sample was recruited after a clinical interview held by medical specialists in Psychiatry at the Adult Psychiatry Unit of Florence University Hospital. All patients received an information leaflet explaining exhaustively the protocol and its implications. Further explanations were given by the research team as needed. The inclusion criteria were the following: age between 18 and 40 years, diagnosis of a psychiatric disorder with lifetime presence of psychotic symptoms (Major Depression with psychotic features, Bipolar Disorder with psychotic features, Schizophrenia Spectrum and other psychotic disorders) according to DSM-5, Italian speakers, high school degree or above scholarship, collection of written informed consent. The exclusion criteria were: illiteracy or inability to provide the consent or to complete the questionnaires, lifetime diagnosis of a substance use disorder, acute psychotic episode (according to clinical evaluation), cognitive impairment due to psychiatric or medical conditions, diagnosis of a neurological condition. Diagnosis and clinical status were assessed by expert psychiatrists (authors A. B. and V. R.). Only the main diagnosis was included in the database. The ASI was administered to each of the participants. The anonymity of participants was always ensured.

In total, 128 Italian outpatients were recruited after providing informed consent. Of the 128 individuals who were selected, 15 refused to participate. Of the 113 responders, 23 were excluded because they reported current or past substance use and 6 were excluded because they were having an acute psychotic episode at the moment of test administration. Therefore, the final sample consisted of 84 outpatients.

Overall, a total of 330 individuals participated in the study from January 2023 to July 2023. The procedure was approved by the Ethics Committee of the Local Institution (CEAVC, Comitato Etico Area Vasta Centro, approval code CEAVC_14709) and by the local University Ethical Committee (protocol number: 0077881).

MEASURES

Self-reported data were the following: socio-demographic information (age, gender, education), presence of a current or past psychiatric diagnosis, and use of psychopharmacological drugs.

Salience alterations were assessed by means of the ASI (Cicero, Kerns, & McCarthy, 2010), a 29-item self-reported scale with dichotomous answers ("Yes"/"No"); scores range from 0 to 29; higher scores identify a higher vulnerability to psychosis. A recent meta-analysis proposed a new factor structure into three subscales, namely sharpening of senses, unveiling experiences and enhanced interpretation and emotionality (Merola et al., 2023).

STATISTICAL ANALYSES

Demographic and clinical characteristics of the sample were summarized as descriptive statistics. This encompassed age, gender distribution, educational level, and distribution of diagnoses among the patient

group. A one-way ANOVA was employed to compare the means of ASI scores among the three groups (control, artists, and patients, with a significance threshold set to $p = 0.05$). Subsequently, Bonferroni post-hoc t -tests were conducted for pairwise comparisons between the groups. Finally, an analysis of covariance (ANCOVA) was executed to adjust for potential confounding variables, specifically age, gender, and educational attainment, when assessing ASI scores across the groups. All statistical analyses and graphs were carried out through the R packages “stats” and “ggplot2” (R Core Team, 2021; Wickham, 2009).

RESULTS

DESCRIPTIVE STATISTICS

A total of 330 subjects were recruited, 196 within the control group, 50 in the artists group, and 84 in the patient group. Overall, 53% of the sample identified as female (57%, 33%, and 74% among controls, artists, and patients, respectively), while the remaining portion identified as male. No participants in any group identified as nonbinary, transgender, or chose to self-describe their gender. The average age was 27.42 ± 6.511 (controls 27.30 ± 5.591 ; artists 22.59 ± 4.183 , patients 30.52 ± 7.775). Years in school averaged 15.40 ± 3.662 (controls 16.80 ± 3.306 ; artists 14.76 ± 2.715 , patients 12.51 ± 3.130). In the artists group, participants' main interests were the following: sculpture (34%, $n = 17$), painting (30%, $n = 15$), music (14%, $n = 7$), illustration (8%, $n = 4$), graphic design (6%, $n = 3$), performance art (4%, $n = 2$), and others (4%, $n = 2$). The average ASI total score was 14.26 ± 6.896 (controls 11.98 ± 6.233 ; artists 20.56 ± 4.687 ; patients 15.82 ± 6.758). Sixty-four (76%) of the subjects in the psychotic group were under antipsychotic treatment. Among patients, 45 were diagnosed with Schizophrenia Spectrum Disorder, 32 with Bipolar Disorder with psychotic features and 7 with Major Depression with psychotic features. Cronbach's Alpha yielded values of 0.886 for healthy controls, 0.874 for patients, and 0.838 for artists, indicating good reliability across groups.

ANOVA results indicated significant differences in ASI scores among the groups, $F_{(2, 327)} = 42.098$, $p < 0.001$, with post-hoc tests revealing that artists scored significantly higher than both patients (Mean Difference = -4.739 , $p < 0.001$) and controls (Mean Difference = -8.575 , $p < 0.001$), even after Bonferroni correction (Table 1, Figure 1).

The result remained significant even after correction for age, gender, and educational attainment (see Table 2 for ANCOVA results).

The model accounted for approximately 21.2% of the variance in ASI scores (R Squared = 0.212, Adjusted R Squared = 0.199). The ASI scores were significantly influenced by group membership (controls, artists, patients), as evidenced by $F_{(2, 323)} = 34.448$, $p < 0.001$. In contrast, the covariates age, gender, and educational attainment did not significantly affect ASI scores with p -values of 0.786, 0.402, and 0.647, respectively.

TABLE 1. ANOVA (Analysis of Variance) with post-hoc t -tests, three groups: controls, patients with psychosis, artists

ANOVA					
	Sum of squares	df	Avg. square value	F	p-value
Between groups	3203.99	2	1601.99	42.098	<0.001
Within groups	—	327	38.054	—	—
Total	—	329	—	—	—
Post-hoc t -tests (with Bonferroni correction)					
	Mean difference	Std. error	p-value	Lower bound (95% CI)	Upper bound (95% CI)
Controls vs patients	-3.837^*	0.804	<0.001	-5.77	-1.90
Controls vs artists	-8.575^*	0.977	<0.001	-10.93	-6.22
Patients vs artists	-4.739^*	1.102	<0.001	-7.39	-2.09

* = p -value < 0.05.

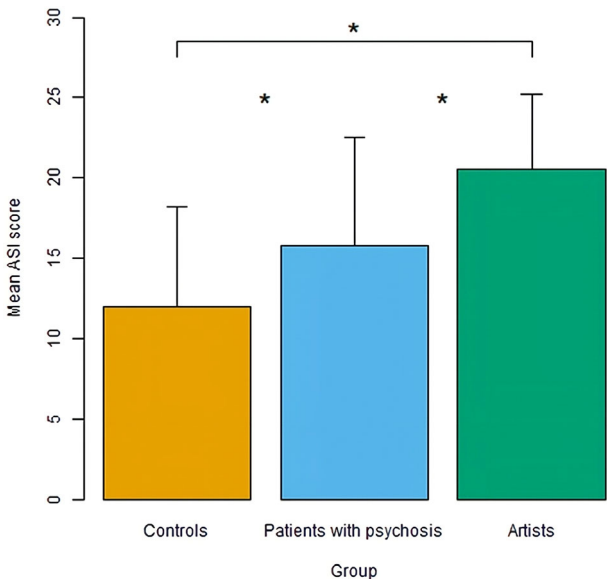


FIGURE 1. Bar plot displaying mean ASI scores among the three groups with standard deviations. Asterisks (*) underline a statistically significant difference in post-hoc tests.

TABLE 2. ANCOVA (Analysis of Covariance), three groups: controls, patients with psychosis, artists

	Sum of squares	df	Avg. square value	F	p-value
Corrected model	3310.769	5	662.154	17.344	<0.001
Intercept	2042.300	1	2042.300	53.493	<0.001
Age	2.831	1	2.831	0.074	0.786
Gender	26.849	1	26.849	0.703	0.402
Education	8.001	1	8.001	0.210	0.647
Group (controls, patients, artists)	2630.346	2	1315.173	34.448	<0.001
Error	12331.693	323	38.179	—	—

TABLE 3. Control analysis – *T*-test (95% CI, two-tails) regarding the role of antipsychotic treatment (APT) on ASI scores among patients.

	<i>t</i>	<i>df</i>	p-value	Mean difference	Std. error difference	95% Confidence interval of the difference	
						Lower	Upper
Patients in APT vs patients not in APT	−1.58	82	0.12	−2.72	1.72	−6.13	0.69

To exclude a role in antipsychotic treatment in influencing ASI scores, a two tailed, 95% CI *t*-test was performed among the patients sample. No significant effect was detected ($p = 0.117$) (detailed results are shown in Table 3).

DISCUSSION

Our research offers us interesting points of discussion.

Unexpectedly, as compared to our starting hypothesis, subjects from the Artists Group scored significantly higher than both patients with a diagnosis of psychosis and controls in AS, therefore disconfirming our hypothesis.

It can be argued that individuals with psychosis may present with reduced ASI scores as compared to artists due to their antipsychotic medications, which might attenuate altered novelty and aberrant salience (Kapur, Mizrahi, & Li, 2005). However, our analysis showed that antipsychotics did not significantly affect ASI scores (see Table 3) and therefore, the statistical differences among groups cannot be explained by iatrogenic dampened salience.

Higher scores among our Artists Group can be explained also by arguing that there may be a latent subset of undiagnosed individuals with psychosis within the aforementioned sample. However, psychosis is a rare event in the general population, with a prevalence of around 1% (Moreno-Küstner, Martín, & Pastor, 2018), so this counter-argument is unlikely to undermine the significance of the result.

A more convincing hypothesis appears to be the one according to which creative subjects share with the individuals affected by psychosis the same or even a stronger tendency towards aberrant salience experiences, which, however, shapes an artistic trajectory rather than a psychotic one.

Interestingly, our analysis showed that education did not significantly affect ASI scores, even though patients appeared to have lower years of education as compared to artists and controls (see Table 2). A possible explanation for lower years of education on average in patients is that such a population is known to display, on average, varying degrees of decline in social and occupational functioning and by that a reduced level of education. Vice versa, lower levels of education have been associated with the development of psychosis, whereas higher levels have been linked to both better initial conditions and outcomes after a first episode of psychosis (Ayesa-Arriola et al., 2023).

Altogether, our findings corroborate the intriguing idea that salience alterations may represent an anthropological device that can enhance not only the risk of psychosis but also creative and artistic sensitivity. Individual coping mechanisms, mentalization skills, subjective dispositions as well as environmental factors may help to maintain an anthropological proportion between commonness (adaptive salience) and eccentricity (AS) or to turn the eccentricity into original, unusual and valuable creations.

Following the questionnaire distribution, artists were occasionally engaged in qualitative, nonsystematic inquiries. These discussions revealed a noteworthy pattern: artists tend to experience heightened AS primarily during periods of active art-making processes. The artists' reflective insights on their experiences during creative peaks hint at an active mentalization process. As an example, a positive answer to item 1: "Do certain trivial things ever suddenly seem especially important or significant to you?" was often motivated by experiences of artistic-creative output. Moreover, a positive answer to item 6: "Do you have a feeling of inexpressible urgency, and you are not sure what to do?" was often supported by the description of the experience of artistic inspiration, whereas a positive answer to item 23: "Do you ever feel like a whole world is opening up to you?" often referred to the subjective feeling of being in front of a blank canvas or a white page. However, it's crucial to recognize that these insights were collected through informal, conversational exchanges post-survey rather than through rigorous, systematic investigation.

Lastly, we cannot exclude that being part of a community of peers with common trait vulnerabilities and shared interests (in our case, the Academy of Fine Arts) may reduce not only self-stigma but also the risk of alienation since some specific contexts are known to be able to reduce psychotic symptomatology (Mosher, Vallone, & Menn, 1995).

Some limitations of the present study must be acknowledged. First, the use of self-reported instruments may be associated with a risk of under- or overreporting of subjective experiences: for example, the risk of underreporting may be particularly relevant in patients with poor insight. Second, our patient group is composed by individuals with lifetime presence of psychotic symptoms among different DSM-5 diagnosis (Major Depression with psychotic features, Bipolar Disorder with psychotic features, Schizophrenia Spectrum and other psychotic disorders): even if psychosis is reported to be a transdiagnostic feature, we cannot exclude that salience impairments may vary within each nosographic category. Third, our sample is limited mostly

to individuals of European descent from Italy, somewhat limiting the cross-cultural value of our data. Our sample is also limited in age range, as it was composed mostly of young subjects; this was addressed through ANCOVA correction. Additionally, categorical variables such as gender and antipsychotic treatment status were employed in the statistical analysis; even though such variables can be employed effectively in linear models (Lunt, 2015), such statistical tests are often more suited for dealing with continuous variables. Finally, the variance in temporal perspectives of the questionnaire items—some written in the present tense and others in a more general timeframe—could potentially influence the responses of patients undergoing treatment, who may not relate to the present tense items if their experiences have changed over time; recent studies, though, highlighted good reliability (Golay et al., 2020).

In conclusion, our study illuminates the complex interplay between aberrant salience, creativity, and psychosis, highlighting the potential of these intersections not just as pathological markers but also as unique contributors to artistic expression. Further research is warranted to unravel these intricate relationships and their implications for both mental health and creative domains.

AUTHOR CONTRIBUTIONS

Conceptualization: A.P. and G.P.M. Methodology: A.P. and G.P.M. Formal analysis: G.P.M. Investigation: G.P.M., D.B., B.B., G.P., V.P., G.A., G.M. Resources: A.B., V.R. Writing – Original Draft: A.P., G.P.M., D.B., V.P. Writing – Review & Editing: A.B. Supervision: A.B., V.R. Project administration: A.B., V.R.

CONFLICT OF INTEREST

The authors declare that they have no conflict of interest.

ETHICS APPROVAL STATEMENT

Methods of the analysis and inclusion criteria were specified in advance and documented in a protocol. This study protocol was approved by the Local Institution Ethics Committee (CEAVC, Comitato Etico Area Vasta Centro; approval code CEAVC_14709) and the University Ethical Committee (protocol number: 0077881). Written informed consent was collected before enrollment.

FUNDING STATEMENT

This research received no specific grant from any funding agency in the public, commercial, or not-for-profit sectors.

SCOPE STATEMENT

This manuscript delves deep into the complex relationship between aberrant salience experiences, artistic creativity, and psychopathology. Leveraging robust statistical methodologies (correction for multiple confounders and multiple comparisons), we have examined the salience alterations among three distinct groups: healthy controls, artists from the Academy of Fine Arts, and individuals with a diagnosis of psychosis.

Artists displayed statistically higher aberrant salience compared to both patients and controls, even after the aforementioned corrections. Our findings propose a transformative perspective on the often-stigmatized nature of psychopathology, suggesting the potential for aberrant salience experiences to be channeled into creative endeavors. Given the journal's commitment to research on creative behavior, we believe our manuscript offers both novel insights and raises further questions about the nature of creativity and the role of the environment and education in shaping individual trajectories. This work not only reinforces the interconnectedness of these domains but also paves the way for future interdisciplinary research.

DATA AVAILABILITY STATEMENT

The database of the studies, with the extracted data items, can be shared upon reasonable request to the corresponding author.

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