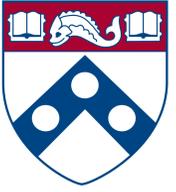


# Creative Differences:

## How is creativity differentially related to autism spectrum and schizotypy?

Julia Brooks Masters



### Introduction

There are often associations made between mental illness and creativity. In order to address this question, we chose to test healthy individuals and look directly at the expression of spectrum traits present in every person's personality. Not as much research has delved into this non-clinical population, and the implications of the research are much more widespread due to their potentially universal application to the general public. The stereotypes of the schizophrenic or bipolar creative genius and the autistic math savant drove me to do more research on these disorders and their non-clinical spectrum traits. These two personality dimensions are both heavily associated with opposing creative domains (Kaufman & Paul, 2014) and their relationship to each other is also of interest. There are numerous theories about the connection between schizotypy and autism spectrum traits and whether they exist on opposite ends of a spectrum, overlap in some traits, or are actually part of the same disorder (Barnveld et al., 2011; Crespi, Stead & Elliot, 2010).

By testing for schizotypy and autism spectrum traits, we aimed to not only see the connection these traits have with each other, but how they interact with creativity. In order to properly test the creativity of our participants, we had to break down this vague term into its testable and significant portions: everyday creative behaviors, creative identity, and creative achievement. Within some of these umbrella groups are domains relevant to artistic and scientific creativity, and under those even further sub-domains about engagement in specific, creative activities.

Our hypothesis, based on literature reviews and past research, surmised that creativity would be split into its scientific/mathematical and artistic subdivisions with schizotypal traits being positively correlated with artistic creativity and autism spectrum traits positively correlated with scientific and mathematical creativity (Acar & Sen, 2013; Barnveld et al., 2011; Kaufman & Paul, 2014; Zabelina, Condon & Beeman, 2014).

### Methods

#### Participants

204 participants over the age of 18 completed the study. 117 females and 86 males took part in the experiment. 1 participant chose to not specify gender. Participants were recruited online using Amazon's MechanicalTurk platform for test administration. We chose to recruit from the general population to gather a more representative sample. For proper completion of the study, participants were compensated with \$5.00.

#### Administered Tests

Participants completed 12 measures online. These questionnaires cover the testing of working creativity, creative achievement, everyday creativity, creative identity, humor, personality, schizotypal personality traits, autism spectrum traits, and intelligence. The measures were inputted to a Qualtrics survey whose link was imbedded in the MechanicalTurk test page. The measures on average took about one hour to complete. All participants received the same test — no reversed order tests were included in the study. In order of administration, the tests relevant to our analysis included demographic information inquiring about education level, gender, age, profession, mental health history, Creative Achievements Questionnaire (CAQ), Short Scale of Creative Self, Everyday Activities Questionnaire (EAQ), Big Five Aspect Scales (BFAS), Schizotypal Personality Questionnaire (SPQ), Autistic-Spectrum Quotient (ASQ).

#### Statistical Analysis

We first performed a factor analysis of the SPQ and ASQ using principal components analysis with a varimax rotation. We found that a two factor solution best explained the data. All correlations against these factors were run with Pearson correlations except for the CAQ which we ran with a Spearman's correlation because the results of the test were not normalized.

### Results

Factors	ASD/Negative Schizotypy	Positive Schizotypy
Low Social Skill	.844	-.068
Constricted Affect	.811	.266
No Close Friends	.779	.236
Low Communication	.736	.228
Low Attention Switching	.712	-.072
Excessive Social Anxiety	.708	.278
Low Imagination	.596	-.081
Odd Speech	.576	.580
Suspiciousness	.537	.572
Odd or Eccentric Behavior	.454	.477
Attention to Detail	-.055	.490
Odd Beliefs or Magical Thinking	-.091	.728
Ideas of Reference	.256	.811
Unusual Perceptual Experiences	.140	.842

For the factor analysis, low social skill, low attention switching, poor communication, excessive social anxiety, no close friends, and constricted affect all had heavy loadings on the first factor. Ideas of reference, odd beliefs or magical thinking, and unusual perceptual experiences loaded onto the second factor. Odd or eccentric behavior, odd speech, and suspiciousness were equally weighted on both factors. Based on the traits included in each factor, we named the first factor Autism Spectrum Disorder (ASD)/negative schizotypy, as this encapsulated the behaviors of these disorder. The second factor was named positive schizotypy, as the three main loadings are indicative of positive schizotypal traits (Kaufman & Paul, 2014).

As seen by the two factors' correlations with personality as tested by the BFAS, there are some personality traits with which the factors converge and others that diverge. Specifically, both factors have significant positive correlations with neuroticism and its sub-factors. The ASD/negative schizotypy factor has significant negative correlations with each of the big 5 personality factors. The positive schizotypy factor also shows a significant positive correlation with openness/intellect.

The domains of the CAQ that were significantly positively correlated with the positive schizotypy factor were music performance, dance, architecture, creative writing, humor, and total achievement. The only domain that showed a statistically significant correlation with the ASD/negative schizotypy factor was humor in the negative direction. Creative identity showed the strongest correlations of all of the domains tested especially with the ASD/negative schizotypy factor showing a strong negative correlation, and positive schizotypy a small but significant positive correlation. Everyday creativity's artistic measures showed higher correlations with both the ASD/negative schizotypy factor and the positive schizotypy factor than the intellectual achievement sub-measures.

Personality	ASD/Negative Schizotypy	Positive Schizotypy
Neuroticism	.600**	.208**
Withdrawal	.624**	.178*
Volatility	.479**	.209**
Agreeableness	-.367**	.001
Compassion	-.432**	.128
Politeness	-.158*	-.172*
Conscientiousness	-.350**	-.073
Industriousness	-.510**	-.117
Orderliness	-.074	-.003
Extraversion	-.728**	.115
Enthusiasm	-.685**	.085
Assertiveness	-.612**	.118
Openness/Intellect	-.412**	.203**
Intellect	-.401**	.022
Openness	-.295**	.313**

Creative Achievement	ASD/Negative Schizotypy	Positive Schizotypy
Visual Arts	-.007	.117
Music Performance	-.050	.242**
Music Composition	-.113	.078
Dance	-.117	.178*
Architecture	-.017	.196**
Creative Writing	-.088	.207**
Humor	-.160*	.154*
Inventions	.040	.130
Scientific Discovery	.054	.011
Culinary Arts	-.087	.104
Total CAQ	-.110	.211**

Creative Identity	ASD/Negative Schizotypy	Positive Schizotypy
Creative Self Efficacy	-.454**	.169*
Creative Personal Identity	-.373**	.186**
Creative Self-Concept	-.443**	.187**

Everyday Creativity	ASD/Negative Schizotypy	Positive Schizotypy
Everyday Creativity	-.302**	.280**
Artistic Total	-.162*	.237**
Visual Arts	-.042	.236**
Music	-.187**	.217**
Dance	-.113	.115
Theatre	-.194**	.108
Writing	-.130	.071
Intellectual Achievement Total	-.121	.049
Science	-.163*	.041
Academic Orientation	-.004	.066
Technology	-.007	.028

\*\* Correlation is significant at the 0.01 level (2-tailed)  
\* Correlation is significant at the 0.05 level (2-tailed)

### Discussion and Conclusions

Beginning with the factor analysis loadings, the individual tests of the ASQ and SPQ were analyzed and condensed to two main factors. This was a necessary step in our analysis due to the two distinct sub-categories of schizotypy: the negative and positive symptoms. This pattern is seen in clinical schizophrenia, and schizotypy also displays this duality, with negative schizotypal traits representing a deficit in normal behaviors, and positive traits representing the addition of an abnormal trait (Kaufman & Paul, 2014). The literature shows that the positive schizotypal traits are most significant in regards to creativity (Lindell, 2014). We found that these positive traits are unique to and characteristic of schizotypy apart from ASD. By performing the factor analysis, we saw that the deficits seen in negative schizotypy align well with those traits associated with the autism spectrum. Because of this alignment and overlap between the ASQ and SPQ, any individual's score on either the ASQ or SPQ was not significant.

To start with creative identity, the ASD/negative schizotypy factor was significantly negatively correlated. This indicates that individuals scoring high on this factor did not self-identify as being creative or having significant creative ability. The positive schizotypal factor, however, showed significant positive correlates with creative identity, showing that individuals self-identify as being creatively able and disposed. These self ratings of creativity are meaningful because of how well they align with our other measures of creativity.

The overall trend of the ASD/negative schizotypy factor showing negative correlations with creativity and the positive schizotypal factor having positive correlations confirms one aspect of my hypothesis — that schizotypy, defined by the positive traits, is positively correlated with creativity in the domains of creative identity, achievement, and everyday activity. What I had not expected, though, was for the ASD/negative schizotypy factor to be so negatively correlated with these creative measures. I had expected that the correlations would most certainly not be positive, but I thought they would simply be not significant. These results are surprising, as the extreme lack of creativity is statistically significant.

My hypothesis' second part — that autism spectrum traits would be positively correlated with scientific creativity — was not supported. The one statistically significant measure of science in everyday creativity was negatively correlated with the ASD/negative schizotypy factor.

There are several potential confounds with my experiment that could account for these findings. The test measures of creativity that I used were all primarily focused on artistic creativity and not scientific creativity. This led to much less data on the scientific spectrum, and thus we do not have as much data to compare these results. In addition, the sample population was not chosen based upon their scientific or artistic prowess, and thus it is possible that there was an under-representation of scientifically inclined individuals included in the study. The population may have also been lacking a good representation of high creative achievers. Another possibility is that in these subclinical populations, the typical increased scientific and mathematical ability associated with clinical autism spectrum disorder is not present.

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