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THE RELATIONSHIP BETWEEN SCHIZOTYPY, CREATIVITY, & BEHAVIORAL
INHIBITION

A Thesis
Presented to
The Faculty of the Department of Psychology
Murray State University
Murray, Kentucky

In Partial Fulfillment
Of the Requirements for the Degree
Of Master of Science in Clinical Psychology

By
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Abstract

A creative individual is believed to possess many positive traits—such as openness to new experiences and intelligence (Jauk, Benedek, & Neubauer, 2014)—but also traits that are considered less desirable, such as the tendency to be hostile or impulsive (Burch, Hemsley, Corr, & Gwyer, 2006; Fink et al., 2013). These findings reveal a possible link between creativity and psychopathology (Simonton, 1999). A large focus in the research has been on schizotypal personality disorder (i.e., “schizotypy”) and creativity, which has led to a number of positive findings between these two variables (Fink et al., 2013; Furnham, 2015). Additionally, other studies indicate that individuals with schizotypy tend to show signs of behavioral impulsivity (Burch et al., 2006; Gooding, Kwapil, & Tallent, 1999; O’Driscoll, Lenzenweger, & Holzman, 1998; Smyrnis et al., 2003). The current study is a correlational/regression design investigating the relationship between schizotypy, impulsiveness, and creativity using a mediational model. The results indicate that, while individuals higher in schizotypal personality traits were more creative on a self-report of real-world creativity, and that individuals with schizotypal personality traits tended to be more impulsive, the results indicated that impulsivity was not strongly related to creativity and that impulsivity did not seem to mediate the relationship between schizotypy and creativity.

In order for humans to survive, we need to be able to adapt to an ever-changing environment. In order for us to be able to adapt to our environments, we need to be able to solve problems, create new ideas, and create new products and services (Baas, De Dreu, & Nijstad, 2008). In other words, essential to our survival is creativity—the production of novel ideas or problem solutions that are useful to a given situation. (Amabile, Barsade, Mueller, & Staw, 2005; Baas, et al., 2008; Davis, 2009; De Dreu, Baas, & Nijstad, 2008; Grawitch, Munz, Elliott, & Mathis, 2003).

Review of the Literature

Within the field of psychology, the relationship that creativity has with personality characteristics has been a longtime interest. A creative individual is believed to possess many positive traits—such as openness to new experiences and intelligence (Jauk et al., 2014)—but also traits that are considered less desirable, such as the tendency to be hostile or impulsive (Burch et al. 2006; Fink et al., 2013). The latter finding has certainly been an impactful finding in the literature, as it reveals a possible link between creativity and a certain degree of psychopathology (Simonton, 1999).

The idea that some aspects of the dark side of personality may be associated with creativity has received some support from Eysenck's measure of psychoticism (Eysenck, 1995), which has been observed to be strongly associated with creativity (Acar & Runco, 2012; Fink, Slamar-Halbedl, Unterrainer, & Weiss, 2012). These findings have encouraged the idea that creative individuals and the psychotic-prone (or those prone to schizophrenia) may share similar thought processes (Fink et al., 2012).

A large body of research suggests that certain subclinical aspects of schizophrenia are observable within the general population (Ettinger, Meyhöfer, Steffens, Wagner, & Koutsouleris, 2014). These schizophrenic-like personality traits that are observed within the general population have been termed schizotypal or “schizotypy”. According to Ettinger and colleagues (Ettinger et al., 2014), schizotypy refers to stable personality traits that resemble the symptoms and signs of schizophrenia that are observed in the general population. Schizotypy has been called “the less deviant bedfellow of ‘schizophrenia’” (Fink et al., 2013, p. 2) and is normally conceptualized as an increased susceptibility to developing psychotic- or schizophrenic-like symptoms.

Schizotypy traits lead to numerous cognitive, emotional, and social behaviors that are typically perceived as unusual by others (Fink et al., 2013). For example, individuals with schizotypal personality often report a high rate of unusual perceptual experiences and odd beliefs. Restricted affect and social isolation are also characteristics that are observed in individuals with schizotypy (Rosell, Futterman, McMaster, & Siever, 2014).

Conceptualization of Creativity

As stated above, creativity is usually defined as the production of novel ideas or problem solutions that are useful to a given situation (Amabile et al., 2005). In attempting to measure creativity, creativity has been operationalized in numerous ways across the literature. According to Fisher (2015), the reason for this is because creativity is likely comprised of numerous features. According to Abraham and Windmann (2008), in the Geneplore model of creativity, the ability to produce a novel response is believed to be triggered by many different cognitive processes including at least (1) generating possible ideas, (2) exploring the conceptual limitations of the idea, and (3) assessing the idea from

different perspectives. Examining these normal cognitive processes under various conditions will allow for a better understanding of the varied ways in which creative thought can emerge. This approach to creative thinking was used in the present study, where experimental tasks were used to tap into the following creative mental processes: (1) conceptual expansion, (2) creative imagery, and (3) the constraining effect of examples in an attempt to examine several different creative mental processes.

Conceptual expansion is defined as the ability to broaden the boundaries of established concepts (Abraham & Windmann, 2008). In other words, conceptual expansion refers to the ability to generate ideas about a particular concept that expand beyond the way most people would generate ideas about the concept. Furthermore, creative imagery is defined as the ability to generate novel and useful combinations from a set of simple geometric elements (as cited in Abraham & Windmann, 2008), and the constraining effects of examples is defined as the ability to surpass the restrictive effect of relevant examples during creative idea generation (Marsh, Landau, & Hicks, 1996).

In addition to assessing how creative people are during tasks implemented in the laboratory, it is also important to measure how creative people are in their everyday lives. For example, do they engage in the arts? Have they received rewards for their artistic achievements? When measuring creativity, Fisher (2015) suggests that multiple measures of creativity should be implemented in studies in order to determine how different facets of creativity are related to one another.

Schizotypy & Creativity

The investigation of the relationship between subclinical schizotypy and creativity has led to several positive findings between these two variables (Fink et al., 2013;

Furnham, 2015), suggesting that something about this particular population allows them to be more creative than the average person. Certain schizotypy traits (measured by self-report scales) – such as imaginativeness (Furnham, 2015) and odd beliefs (Fisher, Heller, & Miller, 2013) – have been shown to relate to higher creativity on divergent thinking tasks (Furnham, 2015), word association tasks, and self-report measures of creativity (Fisher et al., 2013). Additionally, a number of neuropsychological studies have used functional magnetic resonance imaging (fMRI) to examine patterns of brain waves during creative tasks. Fink et al. (2013) found that original idea generation and schizotypy were associated with similar brain activity patterns during an alternative-uses task. Further results have revealed that schizotypy traits relate to creative thinking on divergent thinking tasks (Fisher, et al., 2004), and on the Torrance Test of Creative Thinking (TTCT; Torrance, 1966) – a measure that assesses four components of creativity including fluency, flexibility, originality, and elaboration (Park, Kirk, & Waldie, 2015).

Abraham & Windmann (2008) conducted a study that examined differences between high and low schizotypy groups in creativity assessed via multiple measures including the previously-mentioned division of conceptual expansion, constraints of examples, and creative imagery. The results of this study found significant differences between the groups on the constraints of example task specifically, but no differences on the other two tasks.

Schizotypy & Poor Inhibition

The rationale most commonly used to explain the enhanced creative abilities in schizotypy is that this population has a tendency to exhibit signs of poorer inhibition (Breeze, Kirkham, & Marí-Beffa, 2011; Ettinger et al., 2015; Rosell et al., 2014).

Evidence for this tendency has been provided using cognitive inhibition tasks (Burch, Hemsley, & Joseph, 2004; Ettinger et al., 2014; Gray, Snowden, Peoples, Hemsley, & Gray, 2003) as well as behavioral inhibition tasks (Burch et al., 2006; Gooding et al., 1999).

In regards to the literature on cognitive inhibition, latent inhibition (LI) is the construct most commonly examined. LI is the brain's ability to screen out events that were experienced as irrelevant from conscious awareness (Fink et al., 2013). For example, LI would be implicated in being able to ignore background noise while studying. Through ignoring irrelevant stimuli, LI prevents a person from losing their concentration on a task, and therefore, allows a person to learn by focusing on more important stimuli. There are a number of studies that indicate that people who score high on measures of schizotypy show a reduction in LI (Ettinger et al., 2015; Gray, Fernandez, Williams, Ruddle, & Snowden, 2002) during visual tasks (Burch et al., 2004) and auditory tasks (Gray et al., 2003).

In the auditory LI task conducted by Gray and colleagues (Gray et al., 2003), participants were instructed to listen to recordings of syllables in addition to watching numbers appear on a board. They were told that the numbers on the board would appear with a sound (either a tone or white noise); and that their task was to determine as quickly as possible what the rule was relating number to sound. Participants were then scored based on the speed of which they learned the association between the noises and the numbers displayed. In this study, the results revealed that participants that were high in schizotypy were slower at making the associations between numbers and sounds,

suggesting that those high in schizotypy find it more difficult to ignore irrelevant stimuli (i.e., sounds and numbers that did not create a pattern or “rule”).

In addition to cognitive inhibition, several studies also indicate that individuals with schizotypy show deficits in tasks that require intentional behavioral inhibition, or the ability to voluntarily inhibit an action (Burch et al., 2006; Gooding et al., 1999; O’Driscoll et al., 1998; Smyrnis et al., 2003). According to Filevich, Kuhn, & Haggard (2012), intentional inhibition is believed to be a core process of self-control and shares some features with tasks that measure cognitive inhibition in the psychology literature. Intentional inhibition is required in tasks where participants are instructed to withhold responses when presented with particular stimuli, such as No-Go stimuli and the Stroop task. For instance, in the color-word Stroop task—a classic measure of cognitive inhibition—the word “blue” may be presented in red, and participants are required to name the color of words instead of the words themselves. This requires the participant to ignore task-irrelevant information (the word itself) in order to respond accurately with task-relevant information (the color of the word) (Benedek, Franz, Heene, & Neubauer, 2012). Results from a study conducted by Fisher et al. (2004) revealed that individuals high in schizotypy demonstrated a weakened ability to ignore the task-irrelevant information during a Stroop task. Other research evidence for this notion comes from a study conducted by Rawlings (1984), in which it was found that Eysenck’s Psychoticism (P) scale of the Eysenck Personality Questionnaire (EPQ) was correlated with two behavioral measures of impulsivity. The results of these studies suggest that those who are prone to psychosis, as are those with schizotypy traits, are prone to being impulsive.

More recent evidence for this notion is provided by a study conducted by Smyrnis et al. (2003). During an antisaccade task, participants were presented with a central visual target. After a few seconds, the central target disappeared and a peripheral target appeared randomly at a different spot, either to the right or left of the central target. The participants were instructed to move their eyes as quickly as possible to the opposite direction from the peripheral target and to hold that position until the central target reappeared. Success in this task requires people to override the natural urge to look towards that peripheral target instead of away from it. The results of this study found that those high in schizotypy made more errors during this task, suggesting that individuals with schizotypy find it difficult to voluntarily inhibit their actions.

Poor Inhibition & Creativity

There exists a view that “creative people are characterized by a lack of both cognitive and behavioral inhibition” (Benedek et al., 2012, p. 480). This notion likely stems from the observation that creative people usually exhibit signs of reduced latent inhibition (Carson, Higgins, & Peterson, 2003) and high behavioral impulsivity (Burch et al., 2006).

In regards to creative people showing more signs of behavioral impulsivity, Burch et al. (2006) demonstrated that the personality trait Impulsive Nonconformity (a characteristic commonly observed in schizotypy) was positively correlated with performance on a divergent thinking task and scores on The Creative Personality Scale, which are commonly used methods of measuring creativity. This suggests that people who are more creative tend to exhibit more impulsive behavior.

In addition to showing signs of a lack of behavioral inhibition, there also appears to be evidence that creative people show signs of a lack of cognitive inhibition. In other words, it has been found in several studies that more creative people respond slower in tasks that require one to inhibit interfering stimuli (Carson et al., 2003; Dorfman, Martindale, Gassimova, & Vartanian, 2008; Kéri, 2011). Carson et al. (2003) conducted a meta-analytic review on studies that examined creativity in teen samples who had high IQs. The results revealed that those who were high lifetime creative achievers scored lower on latent inhibition tasks than low creative achievers.

Schizotypy, Creativity, & Inhibition

Based on the above evidence, it has been shown that individuals high in schizotypy tend to perform more creatively. However, it is important to understand the underlying causes for enhanced creativity in this population. It has been proposed that an “overinclusive” style of thinking is a shared trait for both psychosis-prone (i.e., schizotypal) and creative people (Eysenck, 1995), suggesting that this style of thinking may be a valid explanation for enhanced creativity in the schizotypy population.

In an attempt to address this connection, Park et al. (2015) conducted a study using neuroimaging methods to examine the relationship between schizotypy and creative thinking. In this study, participant’s brain wave patterns were evaluated using fMRI during a creativity task in which they were asked to create an original drawing. The results revealed behavioral differences in creativity between high and low schizotypal individuals; specifically, that the high schizotypy group displayed greater creativity than the low schizotypy group. Furthermore, there was a significant, negative relationship between neural activations that are associated with creative thinking and three

schizotypal traits (unusual experiences, introverted anhedonia, and impulsive nonconformity). These results indicate that individuals who score highest in these traits displayed the least amount of activation during the creative task.

These results are also consistent with the fMRI results of Fink et al. (2013), who not only found an association between brain areas related to schizotypy and increased creativity, but who also suggests that a basic difference in the ability to inhibit or to include many more stimuli in mental processes may be an explanation for the behavioral relationship between schizotypy and increased creativity. In order for one to successfully complete a task that requires focused attention, deactivation of the right precuneus is essential as it assists in the ability to maintain attention on a task. Deactivation in this area of the brain results in a suppression of the brain's information gathering mechanisms. Fink and colleagues found that high-schizotypal individuals (compared to low-schizotypal) exhibited much weaker deactivation of this brain region (Fink et al., 2013). In other words, the high-schizotypy group was more likely to constantly gather external information during creative thought. This result provides evidence that those high in schizotypy exhibit poorer cognitive inhibition during tasks that involve creative thought.

Current Study

Research suggests that creative people are characterized by a lack of behavioral and cognitive inhibition and that individuals with schizotypy are also characterized by that same lack of inhibition. Therefore this study addressed the possibility that the relationship between schizotypy and creativity is mediated by inhibition.

As discussed earlier, Abraham & Windmann (2008) conducted a study that examined differences between high and low schizotypy groups in creativity as assessed via multiple measures including conceptual expansion, constraints of examples, and creative imagery. The results of this study only found significant differences between the groups on the constraints of example task. While the goal of the study to investigate the relationship between schizotypy and creativity using multiple measures was good, there were a few limitations to this study that may have led to non-significant findings. Most notably, the small sample size ($N = 31$) may have reduced the power to identify meaningful relationships. Additionally, the authors dichotomized the sample into extreme groups (either top or bottom 10% of the schizotypy scores distribution), instead of using schizotypy scores as a continuous measure.

The intention of the current study was to replicate and expand on Abraham & Windmann's (2008) study in an attempt to correct these limitations by obtaining a larger sample size and by assessing schizotypy on a continuum (instead of high vs. low schizotypy). Furthermore, in an attempt to expand upon the idea that the creativity schizotypal individuals demonstrate may be mediated by poorer inhibition (Fink et al., 2013; Park et al., 2015), behavioral impulsivity was measured in order to assess its relationship with schizotypy and creativity. Finally, measures of real-world creativity were obtained in addition to measures of laboratory creativity to see if similar relationships with schizotypy were seen across both types of measures.

Hypotheses

Based on the prior evidence, it was hypothesized that (1) individuals higher in schizotypy will score higher on measures of impulsivity, (2) both higher schizotypy and higher impulsiveness will predict higher scores on creativity tasks, and (3) the relationship between schizotypy and creativity will be mediated by impulsiveness.

Method

Participants

One hundred and eighty participants were recruited from the Murray State University online subject pool. Three of those participants were extreme outliers on the Creative Achievement Questionnaire and were excluded from all analyses. On average, the participants were 20.16 years old ($SD = 6.34$). Of the remaining 177 participants, 122 were females and 55 were males. In regards to year in school, 106 participants were freshmen, 33 were sophomores, 23 were juniors, and 15 were seniors. Finally, 143 participants were Caucasian, 16 were African American, 1 was Asian/Pacific Islander, 1 was Hispanic, 9 were bi-racial, and 8 identified as “Other”.

Design

The current study was a correlational/regression design investigating a mediational relationship between schizotypy, impulsiveness, and creativity. The predictor variable was schizotypy as assessed by the Schizotypal Personality Questionnaire (SPQ, Raine, 1991). The outcome variables were measures of creativity, assessed by conceptual expansion, constraints of examples, creative imagery, and real-world creative achievement. The mediating variable was impulsiveness as assessed by The Barratt Impulsiveness Scale (BIS-11; Patton, Standford, & Barratt, 1995).

Materials and Procedure

Conceptual expansion. Conceptual expansion was assessed by scores on the Ward (1994) animal task (see Appendix A). This task required participants to imagine and draw two different animals, each of a different species, that live on another planet that is very unlike Earth. Participants were allowed 5 minutes to complete this task. Each drawing was scored according to standardized procedures (Abraham, Windmann, Daum, & Güntürkün, 2005; Abraham, Windmann, Siefen, Daum, & Güntürkün, 2006; Ward, 1994) and with the help of two independent scorers. When scoring this task, the scorers were required to note whether the animal included: (a) an absence of limbs, (b) two-sided unevenness, (c) an absence of sense organs, (d) unusual sense organs, and (e) the presence of unusual limbs. Only a total lack of all normal limbs and sense organs were scored as lack of limbs or a lack of sense organs (Abraham & Windmann, 2008). The presence or absence of these certain features led to a score of 1 or 0, and the task's total score ranged from 0 to 5, with a 5 indicating more creativity. Because the coding was dichotomous, the degree of agreement between the two scorers was analyzed using percent agreement. In the current study, the raters agreed 90.9% of the time. Disagreements in scoring were resolved by a third coder.

Constraints of examples. During this task, individuals were asked to imagine that they were employed by a toy company that was in need of new ideas for toys (refer to Appendix B). Their task was to imagine and draw a new and different toy of his or her own creative design. The participants had 5 minutes to complete the task. Replication of toys that currently or have previously existed were not allowed (Abraham & Windmann, 2008). Before the participants drew the toys, they were exposed to three examples of toys (Smith, Ward, & Schumacher, 1993) that shared three central elements in common: (a)

the presence of a ball, (b) the presence of high physical activity, and (c) the presence of electronics. Two independent scorers were required to note if any of these three elements were present in the participant's final drawings. The total scores for this task ranged from 0 (none of the three elements of the toy examples were present in the drawing) to 3 (all three elements of the toy examples were present). Greater similarity of the created toy to that of the previously presented toy examples indicated a greater constraining effect of the examples and less creativity (Abraham & Windmann, 2008). Because the coding was dichotomous, the degree of agreement between the two scorers was analyzed using percent agreement. In the current study, the raters agreed 83.8% of the time. Disagreements in scoring were resolved by a third coder.

Creative imagery. During this task (Abraham & Windmann, 2008), the participants were asked to assemble an object that falls into a predetermined category using three pre-selected figures that were chosen from a variety of three-dimensional figures: a sphere, a half-sphere, a cube, a cone, a cylinder, wire, a tube, a flat square, a bracket, a rectangular block, a hook, wheels, a cross, a ring, and a handle (refer to Appendix C). The participants were allowed to change the figures given to them in any way with regard to size, orientation, position, texture, etc.; but were not allowed to alter the form of the figures. The participants were required to put the figures together in a useful way that formed an object from a particular category (furniture, tools and utensils, toys and games, transportation, and weapons). The figures and the category were randomly assigned for every participant, and each participant was given six trials (for a maximum of 6 inventions per person). The inventions were rated by two scorers on a five-point scale based on two areas: Originality (how unusual and unique the invention

is) and Practicality (how functional and usable the invention is). The average of these ratings were taken as the scores for this task; therefore each participant obtained an average score of practicality and originality. The higher total score was considered as higher creativity (Abraham & Windmann, 2008). The degree of agreement between the two scorers was analyzed using Pearson correlation. Any responses identified by a coder as not meeting the response criteria (e.g. including a description of purpose) were excluded from analyses. Of those items that were scored by both coders, scores on response originality were significantly correlated, $r(984) = .55, p < .001$. Scores on response practicality were also moderately correlated, $r(984) = .32, p < .001$. Final originality and practicality scores were computed by averaging the scores on each item across both scores and then summing the originality and practicality scores across all items.

Real world creative achievement measure. The Creative Achievement Questionnaire (CAQ) measures lifetime creative accomplishment in the fields of art and science (Carson, Peterson, & Higgins, 2005). Participants rated achievements in 10 domains of creative accomplishment. The 10 domains were: visual arts, music, dance, architectural design, creative writing, humor, inventions, scientific discovery, theater and film, and culinary arts. Scores were weighted according to the ranking of experts following the method of Carson et al. (2005). For example, in the dance domain the participants were asked to mark the statements that apply to them (e.g., “I have choreographed an original dance number”, “I have danced with a recognized dance company.”). The scores from the 10 domains were summed to obtain the total CAQ score, with higher scores indicating high real world creativity.

Schizotypy measure. The Schizotypal Personality Questionnaire (SPQ; Raine, 1991) is a 74-item self-report questionnaire which incorporates DSM-III-R (American Psychiatric Association, 1987) criteria for a diagnosis of schizotypal personality disorder. Participants responded either “yes” or “no” to the items; all items endorsed “yes” were scored 1 point and items endorsed “no” were scored 0 point. The questionnaire consists of nine subscales, which loaded onto three factors: cognitive-perceptual (including ideas of reference, odd beliefs/magical thinking, unusual perceptual experiences and suspiciousness/paranoid ideation subscales), interpersonal (social anxiety, no close friends, constricted affect and suspiciousness), and disorganized (eccentric/odd behavior and odd speech) factors (Raine, 1991). Higher scores indicated higher levels of schizotypal personality traits. Item examples are: “Have you had experiences with the supernatural?” (cognitive-perceptual), “I attach little importance to having close friends” (interpersonal), and “People sometimes stare at me because of my odd appearance” (disorganized) (Raine, 1991, p. 557-558).

The SPQ has been previously found to have high internal and test-retest reliability (Raine, 1991). In the present study, the SPQ was found to have a Cronbach’s alpha of .91. Raine (1991) also supported its validity, as 55% of participants scoring in the top 10 percent of SPQ scores had a clinical diagnosis of schizotypal personality disorder. Therefore, the SPQ is useful for screening schizotypal personality traits in the general population.

Impulsiveness measure. The Barratt Impulsiveness Scale (BIS-11; Patton et al., 1995) was used to assess the behavioral impulsiveness construct. This measure contains 30 items describing common impulsive and non-impulsive behaviors that load onto three

factors: attentional (including attention and cognitive instability), motor (including motor and perseverance), and nonplanning (including self-control and cognitive complexity). Participants responded to items using a Likert scale ranging from 1 (*Rarely/Never*) to 4 (*Almost Always/Always*). Higher scores indicated more impulsive behavior. Item examples are: “I concentrate easily” (attention), “I do things without thinking” (motor), and “I plan trips well ahead of time” (nonplanning) (Patton et al., 1995, p. 768-774).

Internal consistency was evaluated using Chronbach’s alpha. Internal consistency across the 30 items we moderate (.66). This is slightly lower than identified by Patton et al. (1995), who reported internal consistency coefficients for the BIS-11 that ranged from .79 to .83 for several different populations including undergraduates.

Results

Descriptive statistics for all predictor and outcome variables are presented in Table 1. Simple correlations between those variables are presented in Table 2.

As predicted, there was a significant correlation between scores on the SPQ and scores on the BIS, $r(178) = .264, p < .001$. Higher schizotypy was associated with more impulsiveness.

The only significant relationship between schizotypy and creativity was a significant positive correlation between scores on the SPQ and on the Creative Achievement Questionnaire, $r(178) = .18, p = .016$. Higher scores on the SPQ, indicating more schizotypal personality traits, were associated with reporting more real-world creative achievement.

The only significant relationship between impulsiveness and creativity was a significant negative correlation between the BIS and the originality scoring of the Creative Imagery Task, $r(178) = -.19, p = .009$. Higher scores on the inhibition score were associated with lower originality ratings.

To test whether inhibition mediated the relationship between schizotypy and creativity, follow-up mediational analyses using the resampling strategy (at 10,000 samples) proposed by Preacher and Hayes (2008) were planned for all creativity measures predicted by the SPQ. Therefore, only the CAQ outcome should be considered

as a planned analysis. However, the results of this mediational model are reported for all creativity outcomes, but these results should be considered as exploratory.

Conceptual Expansion Task

There were no significant correlations between the SPQ and conceptual expansion task. Additionally, there were no significant correlations between the BSI and the conceptual expansion task.

The full regression model predicting conceptual expansion was not significant, $R^2 = .004$, $MSE = 2.76$, $F(1, 175) = .31$, $p = .74$. The results of the full model are presented in Table 3. The full model was not significant and neither SPQ scores nor BIS score predicted performance on the conceptual expansion task. Similarly, the bootstrapping analysis found no significant indirect effect of schizotypy on conceptual expansion task performance based on impulsivity.

Constraining Effects of Examples Task

The results did not indicate a significant correlation between the SPQ and the constraining effect of examples task. Additionally, the BIS did not correlate with the constraining effect of examples task either.

The full regression model predicting conceptual expansion was not significant, $R^2 = .008$, $MSE = 2.77$, $F(1, 168) = .71$, $p = .49$. The results of the full regression model are presented in Table 4. The full model was not significant and neither SPQ scores nor BIS score predicted performance on the conceptual expansion task. Similarly, the bootstrapping analysis found no significant indirect effect of schizotypy on the constraining effect of examples, based on impulsivity.

Creative Imagery Task

The creative imagery task was scored along two dimensions: originality and practicality. Analyses for each dimension are presented separately. There was a significant correlation between the originality and practicality subscales of the creative imagery task, $r(173) = .64, p < .001$. These findings suggest that there is a relationship between participants producing highly original images and their producing highly practical images. Below, results for originality scores and practicality scores are discussed separately.

Originality. The full regression model predicting originality on the creative imagery task was marginally significant, $R^2 = .18, MSE = 21.83, F(1, 172) = 2.80, p = .06$. The results of that full model are presented in Table 5. Within this model, impulsivity was a significant predictor. The full model indicated that there was not a direct effect of schizotypy on originality scores. However, the bootstrapping analysis indicated an indirect effect of schizotypy on originality, through impulsiveness.

Practicality. The full regression model predicting practicality on the creative imagery task was not significant, $R^2 = .07, MSE = 13.14, F(1, 172) = .42, p = .66$. The full model is presented in Table 6. This model was not a significant predictor of practicality scores on the creative imagery task and neither impulsivity nor schizotypy were significant predictors in the model. Similarly, the bootstrapping analysis did not identify a significant indirect effect.

Creative Achievement Questionnaire

A regression model predicting CAQ using SPQ and BIS was significant, $R^2 = .03$, $MSE = 82.70$, $F(1, 176) = 5.96$, $p = .02$. The results of the regression model predicting CAQ score are presented in Table 7. Scores on the SPQ were a significant predictor of real-world creative achievement. The bootstrapping analysis indicated no indirect effect of schizotypy on CAQ scores through impulsiveness.

Discussion

This study initially hypothesized that (1) individuals higher in schizotypy would score higher on measures of impulsiveness, (2) higher schizotypy scores and higher impulsiveness would predict higher scores on creativity tasks, and (3) the relationship between schizotypy and creativity would be mediated by impulsiveness.

The first hypothesis was supported: there was a significant relationship between schizotypy and impulsiveness. This is consistent with prior research that has shown that creative individuals exhibit signs of reduced latent inhibition (Carson et al., 2003) and high impulsivity (Burch et al., 2006). Not only is this what was predicted, but the purpose of this research was to investigate whether this increased impulsivity (i.e., lack of inhibition) might explain the relationship between schizotypy and creativity as it may allow individuals to gather more external information during creative thought (Fink et al., 2013).

However, in regards to the second hypothesis, the current study's findings suggest that higher schizotypy scores only predicted higher scores on one measure of creativity: the Creative Achievement Questionnaire. Although this is *some* evidence that schizotypy predicts creativity, it is not a strong trend in the results. Additionally, this pattern did not replicate Abraham and Windmann's (2008) results. As mentioned previously, Abraham & Windmann (2008) only found significant differences between high and low schizotypy groups on the constraining effects of examples task. In comparison to those results, the

present study did not find that schizotypy predicted creativity as measured by the constraining effects of examples, the conceptual expansion task, or the creative imagery task. However, the results did suggest that that schizotypy predicted self-reported real-world creative achievement. A reason that this study's findings differ from Abraham and Windmann's (2008) findings may be because their sample size was small (31 participants). According to Gelman and Carlin (2014), using a small sample size may lead to misleading statistically significant results. This might suggest caution in judging the validity or potential replicability of the findings of Abraham and Windmann (2008). It was in fact one of the goals of this study to attempt to replicate Abraham and Windmann (2008), but using an appropriately large sample. Incidentally, Abraham and Windman (2008) did not report whether their creativity outcomes were correlated to one another. In the current data, there was no indication of performance on one laboratory creativity task predicting performance on another. While it might be expected that multiple measures of creativity should be correlated with one another, it should be noted that these tasks were specifically selected by Abraham and Windman (2008) to tap into different aspects of the creative process and so might not be expected to (and in fact did not) correlate with one another.

The finding that there was little evidence of a relationship between impulsivity and creativity was somewhat surprising. According to previous research, creative individuals tend to show increased levels of cognitive and behavioral impulsivity (Burch et al., 2006; Carson et al., 2003). One possible explanation for the failure to identify significant positive relationships between impulsivity and creativity study may have been due to the impulsivity measure used. The impulsivity measure was found to have

relatively low reliability (compared to prior studies), which may have led to the mostly insignificant findings in this study.

If anything, impulsivity was negatively related to originality on the creative imagery task. This suggests that higher impulsivity was related to lower originality on this task. Moreover, the result of the mediational analysis for this task is worth noting. The results indicated that there was no direct effect of schizotypy on creativity, but that there was a significant indirect effect through impulsiveness. This is because impulsiveness is negatively related to originality. This means that impulsivity may actually be counterproductive to a positive relationship between schizotypy and creativity on this particular outcome. A possible explanation for this is that the more impulsive you are, the more likely you may be to go with the first ideas that come to mind, even if they are less likely to be original. It may be the case that you need to consider and discard your first ideas before you get to truly original or creative ideas (Beaty & Silva, 2012).

The only creativity measure that schizotypy predicted was real-world creative productivity as measured by the CAQ. The combination of these results suggests that there may be an advantage to schizotypy in predicting real-world creativity that is not seen for laboratory measures of creativity. This may suggest that individuals with schizotypy may exhibit particular traits that are advantageous to real-world creativity. For example, it could be that their tendency to possess odd beliefs and exhibit odd behaviors may actually benefit them in the real world compared to a laboratory setting. This idea may be supported by the common notion that many artists are considered to be “eccentric”. However, it is also worthy to note that the CAQ was the only self-report measure of creativity in this study. Because of the nature of this measure, individuals may

have over-reported their level of creativity. However, because there is no reason to suspect that individuals higher in schizotypy are more likely to over-report their creativity than individuals lower in schizotypy, this possibility seems unlikely.

In addressing the final hypothesis, that the creativity that schizotypal individuals demonstrate may be mediated by poorer inhibition (Fink et al., 2013; Park et al., 2015), behavioral impulsivity was measured in order to assess its relationship with schizotypy and creativity. On the basis of this research, there seemed to be almost no evidence to suggest the idea that impulsivity mediated the relationship between schizotypy and creativity. If anything, there was evidence to suggest that it might be slightly harmful to a positive relationship between those variables. This suggests that other abilities or constructs may be responsible for the relationship between schizotypy and creativity. Other constructs that may be worth exploring are personality characteristics, such as openness to new experiences. Symptoms specific to schizotypy, such as magical thinking and/or unusual perceptual experiences may also help explain the connection between these two variables.

The results of this study are important because they expand on previous work examining the relationship between schizotypy, impulsivity, and creativity in several ways. First, this study included a measure of real-world creativity by administering the Creative Achievement Questionnaire (CAQ) in addition to laboratory measures of creativity. This allowed for the assessment of similar relationships between schizotypy and both real-world and laboratory creativity measures. This was an important inclusion, as schizotypy predicted real-world creativity but not laboratory measures of creativity. Second, this study assessed schizotypy on a continuum, as opposed to prior research that

assessed high vs. low schizotypy (Abraham & Windmann, 2008). Using continuous variables to assess the relationship between schizotypy, impulsivity, and creativity should allow for a more accurate understanding of the relationship between those variables. Ultimately, these findings supported the prediction that impulsivity is associated with schizotypy, but did not indicate that impulsivity mediates the relationship between schizotypy and creativity.

The results of this study help us to better understand how the characteristics of individuals with schizotypy may affect their daily lives. The study brings to light the strengths that individuals with schizotypy may be able to utilize in order to increase positive coping skills and overall wellbeing. For example, these results support the idea that individuals with schizotypy may be more likely to have poor impulse control. Individuals with schizotypy may benefit from treatment aimed towards reducing impulsivity. Additionally, the study suggests that there may be an advantage in real-world creative productivity to having schizotypal symptoms. These individual may benefit from pursuing a career in the arts.

Limitations

The measure of impulsivity that was used in this study, the Barratt Impulsiveness Scale (BIS), was problematic for a few reasons. First, the BIS demonstrated relatively low internal consistency in this study. This may suggest that it is an unreliable measure of impulsivity. However, the BIS has shown higher internal consistency in other research (Patton et al., 1995). Second, the BIS is a self-report assessment. This could have enabled inaccurate or inconsistent reporting by the participants, and such behavior might explain the relatively low reliability of the measure. In the future, researchers may wish to use a

measure of inhibition or impulsivity that does not rely on self-report. Utilizing an objective measure of inhibition, such as the Stroop task or the Go/No-Go task would likely be more reliable measures of inhibition.

Future researchers may also want to continue studying whether conceptual expansion, creative imagery, and constraining effects of examples are reliable measures of creativity. Since none of these measures were found to correlate with one another or with performance on the Creative Achievement Questionnaire, it may be that these measures are not reliable or valid measurements of general creativity.

For example, the validity of the constraints of examples task may be influenced by the fact that the participant's exposure to the 3 examples of toys prior to beginning the task was not timed. The extent to which the participants examined the 3 examples and the length of time that they examined the examples was left to the individual participants. This may have led to unreliable results as the task was intended to see whether people, when making their own products, would appropriately avoid using ideas presented in the examples. If the participant ignored the examples and jumped straight to the task, then using or not using ideas present in the examples may not be an example of being constrained by or avoiding the ideas from the examples. Future studies may wish to structure this exposure more, potentially by timing the length of exposure to the toy examples. Additionally, the toy examples for this task were printed on paper for the participants. It may provide more structure for future research to display the examples on a projector to increase the likelihood that participants are actually examining and reading about the toy examples.

An additional possible explanation for a lack of positive findings between the predictor variables and the creativity tasks (and the creative imagery task), may have been its relatively low inter-rater reliability. Low inter-rater reliability in these tasks may suggest threats to validity arising from either the task or its coding. , there was relatively low interrater reliability for the creative imagery task was fairly low. This suggests that the results may not be completely accurate. Re-training of the coders and re-coding the responses may yield different results.

Researchers may also wish to replicate this study with a more diverse population. The current study's sample consisted mostly of white, female participants. Therefore, these results may not apply well to individuals of other ethnicities or genders. Additionally, future research should investigate a wider (and specifically older) age range. Real-world creative achievement is somewhat limited in the college population and these results may differ amongst individuals with more time and opportunity to engage in creative activities.

Conclusions

Overall, this study's findings are consistent with previous research that indicates that individuals with schizotypal personality traits tend to be more impulsive. However, the results suggest that impulsivity is not related to creativity and that impulsivity does not mediate the relationship between schizotypy and creativity. Schizotypy did not predict any of the laboratory measures of creativity, but did predict a measure of real-world creativity. Continued research on these constructs may help to confirm and explain why schizotypal characteristics relate to real-world creative achievement specifically. Assuming that poorer inhibition/impulsivity is not the explanation for the relationship

between schizotypy and creativity, then future research can also explore alternate causal pathways. Finally, continued research would be beneficial for the schizotypy population as it might aid in improving treatment of individuals with schizotypy and help to increase their overall wellbeing.

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Table 1.

Descriptive Statistics of Predictor and Outcome Variables

	M	SD	Range	Skew (SE)	Kurtosis (SE)
Schizotypy (SPQ)	27.30	12.05	1 – 68	.39 (.18)	.25 (.36)
Impulsivity (BIS)	65.37	10.75	43 – 106	.55 (.18)	.81 (.36)
Conceptual Expansion	1.58	1.66	0 – 8	.99 (.18)	.65 (.36)
Constraining Effects of Examples	1.58	.89	0 – 3	.12 (.19)	-.80 (.37)
Creative Imagery: Originality	13.13	4.72	1 – 25	-.01 (.18)	.10 (.37)
Creative Imagery: Practicality	12.69	3.61	1 – 21	-.56 (.18)	1.06 (.37)
Creative Achievement Questionnaire	9.49	9.22	0 – 43	1.54 (.18)	2.08 (.36)

Table 2.

Simple Correlations Between Predictor and Outcome Variables.

Variable	1	2	3	4	5	6	7
1. Schizotypy (SPQ)		.26**	.03	-.12	.01	-.01	.18*
2. Impulsivity (BIS)	178		-.04	.04	-.17*	-.07	-.004
3. Conceptual Expansion	178	178		-.09	.02	-.10	.06
4. Constraining Effects of Examples	171	171	171		-.03	.07	-.16*
5. Creative Imagery: Originality	175	175	175	168		.64**	.04
6. Creative Imagery: Practicality	175	175	175	168	175		.01
7. Creative Achievement Questionnaire	178	178	178	171	175	175	

Note. Correlation coefficients above diagonal; *N* of analysis below diagonal.

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

Table 3.

*Mediational Model of Schizotypy Predicting Conceptual Expansion Task with
Impulsiveness as Mediator*

Model	<i>B</i>	<i>SE</i>	<i>95% CI</i>	<i>t</i>
Constant	1.96	.77	.43, 3.48	2.52*
Impulsiveness	-.008	.01	-.03, .02	-.68
Schizotypy	.006	.01	-.02, .03	.56
Total Effect of Schizotypy	.004	.01	-.02, .02	.39
Indirect Effect of Schizotypy	-.002	.003	-.01, .003	.67

Table 4.

Mediational Model of Schizotypy Predicting Constraining Effects of Examples Task with Impulsiveness as Mediator

Model	<i>B</i>	<i>SE</i>	<i>95% CI</i>	<i>t</i>
Constant	1.44	.43	.60, 2.29	3.37**
Impulsiveness	.006	.007	-.007, .02	.95
Schizotypy	-.01	.006	-.02, .002	-1.72 [†]
Total Effect of Schizotypy	-.009	.006	-.02, .003	-1.52
Indirect Effect of Schizotypy	.002	.002	-.001, .006	1.00

Table 5.

Mediational Model of Schizotypy Predicting Originality Scores on Creative Imagery Task with Impulsiveness as Mediator

Model	<i>B</i>	<i>SE</i>	<i>95% CI</i>	<i>t</i>
Constant	17.71	2.18	13.40, 22.02	8.11**
Impulsiveness	-.08	.03	-.15, -.01	-2.36*
Schizotypy	.03	.03	-.04, .09	.82
Total Effect of Schizotypy	.005	.03	-.05, .06	.16
Indirect Effect of Schizotypy	-.02	.01	-.05, -.005	-2.00*

Table 6.

*Mediational Model of Schizotypy Predicting Practicality Scores on Creative Imagery**Task with Impulsiveness as Mediator*

Model	<i>B</i>	<i>SE</i>	<i>95% CI</i>	<i>t</i>
Constant	14.20	1.69	10.86, 17.55	8.38**
Impulsiveness	-.02	.03	-.08, .03	-.90
Schizotypy	.002	.02	-.05, .05	.08
Total Effect of Schizotypy	-.004	.02	-.05, .04	-.17
Indirect Effect of Schizotypy	-.006	.008	-.02, .007	-.75

Table 7.

*Mediational Model of Schizotypy Predicting Score on Creative Achievement**Questionnaire with Impulsiveness as Mediator*

Model	<i>B</i>	<i>SE</i>	<i>95% CI</i>	<i>t</i>
Constant	8.54	4.24	.16, 16.91	2.01*
Impulsiveness	-.05	.07	-.18, .08	-.73
Schizotypy	.15	.06	.03, .27	2.54*
Total Effect of Schizotypy	.14	.06	.03, .25	2.44*
Indirect Effect of Schizotypy	-.01	.02	-.06, .02	-.50

Appendix A

Conceptual Expansion

(Ward, T. B., 1994)

Instructions: Imagine a planet somewhere else in the galaxy that is **very different** from Earth. Imagine 2 animals, **each of a different species**, that lives on that planet. Please draw these animals. Be sure to draw the animals in a way that another person might be able to recognize them based on your drawings. Feel free to use words to label major parts of the animals that you think would be unclear.

You have **5 minutes** to draw and label both animals.

Scoring Conceptual Expansion: Two scorers note the presence of fundamental features common to animals found on Earth and the presence of atypical features (see Figure 1). The features are as following (see figure below): bilateral symmetry of form, appendages (legs, arms, wings, tail), sense organs (eyes, mouth, nose, ears), atypical appendages, and atypical sense organs. The experimenter then extracts 5 elements from the coded data: (a) bilateral asymmetry, (b) lack of appendages, (c) lack of sense organs, (d) unusual appendages, and (e) unusual sense organs. In (b) and (c), if one or more of the four customary appendages or sense organs are present in the drawing, this qualifies as a presence of an appendage or sense organ. Only complete absence of all customary appendages and sense organs are scored as lack of appendages or a lack of sense organs. The presence or absence of an element receives a score of 1 or 0. The total score for a drawing ranges from 0-5. Scores on both drawings for each subject will be averaged to obtain the total score.

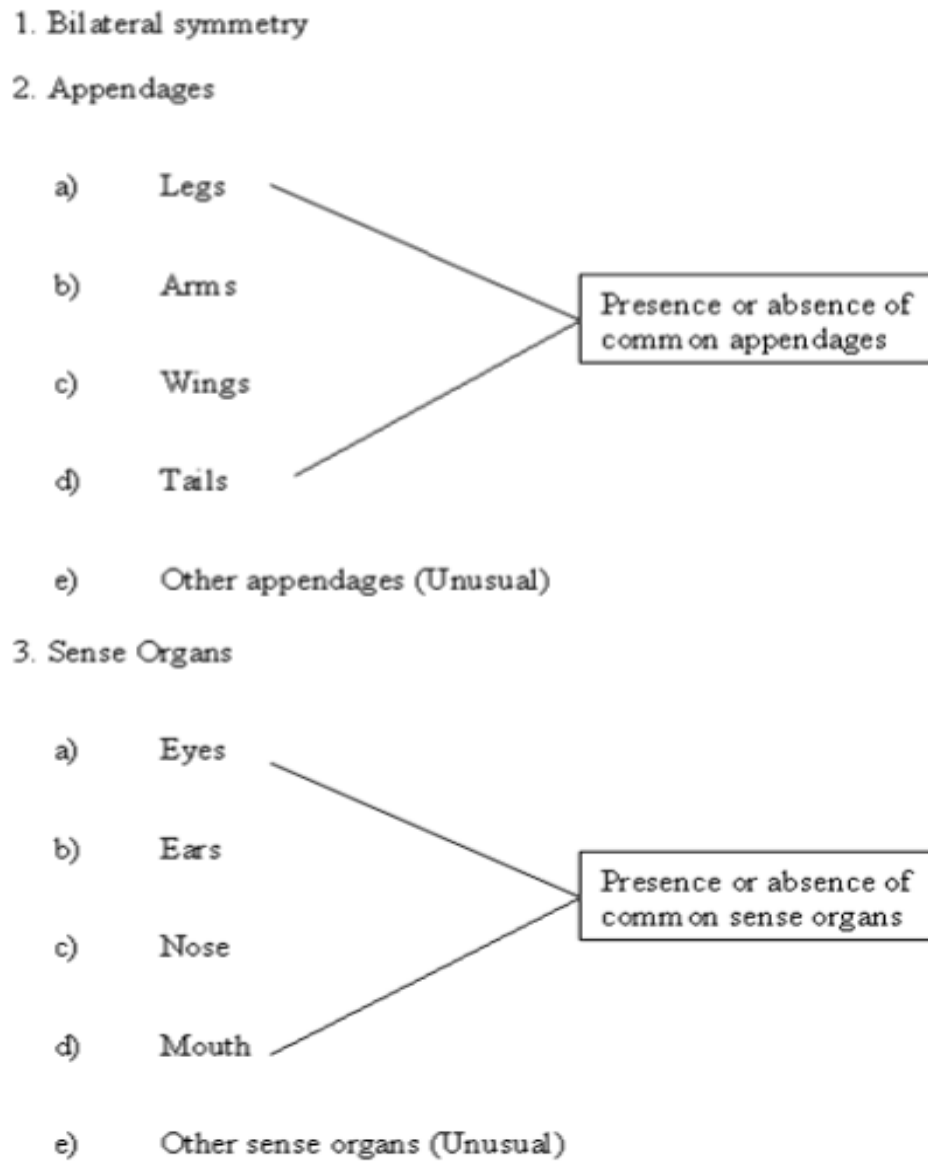


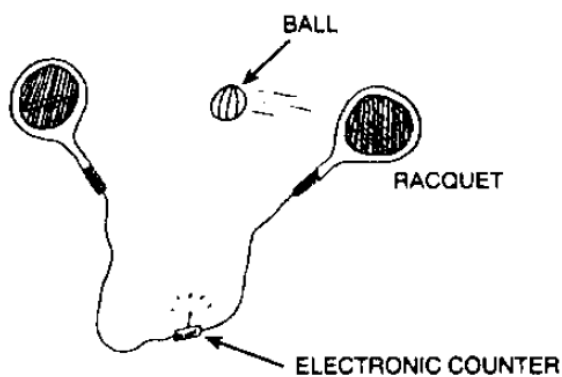
Fig 1. Properties that are coded from the Conceptual Expansion drawings (Abraham et al., 2005).

Appendix B

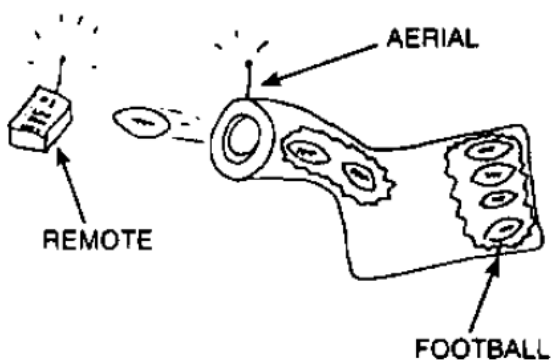
Constraining Effects of Examples

(Smith, Ward, & Schumacher, 1993)

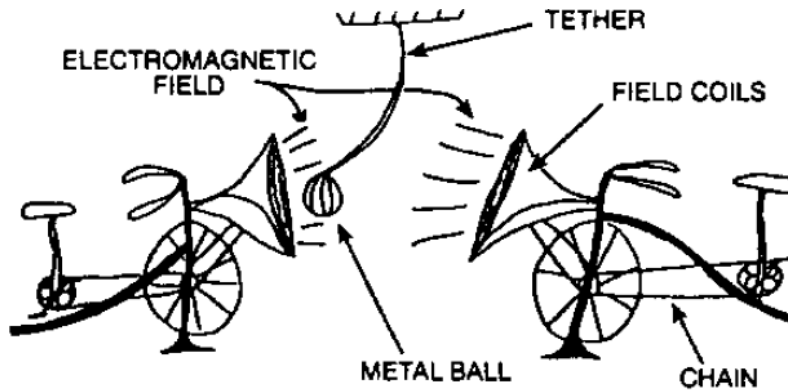
Instructions: Imagine that you are employed by a toy company that is in need of new ideas for toys. Your task is to design a new toy for the company. Within the allotted 5 minutes, draw a new and different toy of your own creative design. Below are 3 examples of toy inventions. Duplication of these toys or toys that currently exist or have previously existed is not permitted.



This toy combines exercise and fun for one person. The score counter electronically keeps track of the number of hits of the racquets.



This toy combines exercise with fun. Use the remote control to choose the action.



This toy combines exercise with fun. The fields build up as the bikes are pedaled. The goal is to push the ball toward the opponent.

Scoring Constraints of Examples: Two independent scorers note whether the drawings contain any of the 3 elements in the initial toy examples. Score of 0 is given if there are none of the three common elements of the toy examples present in the participant's drawings, 1 if one common element is present, 2 if two common elements are present, and 3 if all three elements are present. Greater similarity of the created toy to that of the previously presented toy examples indicates a greater constraining effect of the examples and less creativity.

Appendix C

Creative Imagery

(Abraham et al., 2005)

General Instructions: For this task, you will create a series of 6 objects. For each object, you will be provided with three figures and a category. Your task is to use those these figures to assemble an object that falls into the category that is provided. You can change the size, orientation, position, and texture of the figures, but you cannot alter the form of the figures. You must put the figures together in a meaningful way so as to form a useful object for the category, and then draw that object and write a brief description of the purpose of the object and how it works.

Per-Object Instructions: Consider the 3 figures below. Your task is to use those figures to assemble an object that falls into the following category:
















CATEGORY GOES HERE

You can change the size, orientation, position, and texture of the figures, but you cannot alter the form of the figures. You must put the figures together in a meaningful way so as to form a useful object for the category, and then draw that object and write a brief description of the purpose of the object and how it works.

You have **5 minutes** to draw and describe this object.

Example Figures & Categories:

Figures:

				
Sphere	Half-Sphere	Cube	Cone	Cylinder
				
Wire	Tube	Flat Square	Bracket	Rectangular Block
				
Hook	Wheel	Cross	Ring	Handle

Categories:

1. Furniture
2. Tools & Utensils
3. Toys & Games
4. Weapons
5. Transportation

Scoring Creative Imagery: Two scorers rate the inventions along two dimensions: Originality (how unusual and unique the invention is) and Practicality (how functional and usable the invention is) using a 5-point scale. For scores, the average of their ratings will be taken. Therefore each participant receives an average score of practicality and originality from the five inventions they created.

Appendix D

The Creative Achievement Questionnaire (CAQ; Carson et al., 2005)

I. *Place a check mark beside the areas in which you feel you have more talent, ability, or training than the average person.*

visual arts (painting, sculpture)

music

dance

individual sports (tennis, golf)

team sports

architectural design

entrepreneurial ventures

creative writing

humor

inventions

scientific inquiry

theater and film

culinary arts

II. *Place a check mark beside sentences that apply to you. Next to sentences with an asterisk (*), write the number of times this sentence applies to you.*

A. Visual Arts (painting, sculpture)

0. I have no training or recognized talent in this area. (Skip to Music).

1. I have taken lessons in this area.

2. People have commented on my talent in this area.

- 3. I have won a prize or prizes at a juried art show.
- 4. I have had a showing of my work in a gallery.
- 5. I have sold a piece of my work.
- 6. My work has been critiqued in local publications.
- * 7. My work has been critiqued in national publications.

B. Music

- 0. I have no training or recognized talent in this area (Skip to Dance).
- 1. I play one or more musical instruments proficiently.
- 2. I have played with a recognized orchestra or band.
- 3. I have composed an original piece of music.
- 4. My musical talent has been critiqued in a local publication.
- 5. My composition has been recorded.
- 6. Recordings of my composition have been sold publicly.
- * 7. My compositions have been critiqued in a national publication.

C. Dance

- 0. I have no training or recognized talent in this area (Skip to Architecture).
- 1. I have danced with a recognized dance company.
- 2. I have choreographed an original dance number.
- 3. My choreography has been performed publicly.
- 4. Dance abilities have been critiqued in a local publication.
- 5. I have choreographed dance professionally.
- 6. My choreography has been recognized by a local publication.
- * 7. My choreography has been recognized by a national publication.

D. Architectural Design

- __ 0. I have no training or recognized talent in this area (Skip to Writing).
- __ 1. I have designed an original structure.
- __ 2. A structure designed by me has been constructed.
- __ 3. I have sold an original architectural design.
- __ 4. A structure that I have designed and sold has been built professionally.
- __ 5. My architectural design has won an award or awards..
- __ 6. My architectural design has been recognized in a local publication.
- *__ 7. My architectural design has been recognized in a national publication.

E. Creative Writing

- __0. I do not have training or recognized talent in this area (Skip to Humor).
- __1. I have written an original short work (poem or short story).
- __2. My work has won an award or prize.
- __3. I have written an original long work (epic, novel, or play).
- __4. I have sold my work to a publisher.
- __5. My work has been printed and sold publicly.
- __6. My work has been reviewed in local publications.
- *__7. My work has been reviewed in national publications.

F. Humor

- __0. I do not have recognized talent in this area (Skip to Inventions).
- __1. People have often commented on my original sense of humor.
- __2. I have created jokes that are now regularly repeated by others.
- __3. I have written jokes for other people.

- __4. I have written a joke or cartoon that has been published.
- __5. I have worked as a professional comedian.
- __6. I have worked as a professional comedy writer.
- __7. My humor has been recognized in a national publication.

G. Inventions

- __0. I do not have recognized talent in this area.
- __1. I regularly find novel uses for household objects.
- __2. I have sketched out an invention and worked on its design flaws.
- __3. I have created original software for a computer.
- __4. I have built a prototype of one of my designed inventions.
- __5. I have sold one of my inventions to people I know.
- *__6. I have received a patent for one of my inventions.
- *__7. I have sold one of my inventions to a manufacturing firm.

H. Scientific Discovery

- __0. I do not have training or recognized ability in this field (Skip to Theater
- __1. I often think about ways that scientific problems could be solved.
- __2. I have won a prize at a science fair or other local competition.
- __3. I have received a scholarship based on my work in science or medicine.
- __4. I have been author or coauthor of a study published in a scientific journal.
- *__5. I have won a national prize in the field of science or medicine.
- *__6. I have received a grant to pursue my work in science or medicine.
- __7. My work has been cited by other scientists in national publications.

I. Theater and Film

- __0. I do not have training or recognized ability in this field.
- __1. I have performed in theater or film.
- __2. My acting abilities have been recognized in a local publication.
- __3. I have directed or produced a theater or film production.
- __4. I have won an award or prize for acting in theater or film.
- __5. I have been paid to act in theater or film.
- __6. I have been paid to direct a theater or film production.
- *__7. My theatrical work has been recognized in a national publication.

J. Culinary Arts

- __0. I do not have training or experience in this field.
- __1. I often experiment with recipes.
- __2. My recipes have been published in a local cookbook.
- __3. My recipes have been used in restaurants or other public venues.
- __4. I have been asked to prepare food for celebrities or dignitaries.
- __5. My recipes have won a prize or award.
- __6. I have received a degree in culinary arts.
- *__7. My recipes have been published nationally.

K. Please list other creative achievements not mentioned above.

III. *Place a check mark beside sentences that apply to you.*

One of the first things people mention about me when introducing me to others is my creative ability in the above areas.

People regularly accuse me of having an “artistic” temperament.

People regularly accuse me of being an “absent-minded professor” type.

Scoring of the Creative Achievement Questionnaire

1. Each check marked item receives the number of points represented by the question number adjacent to the checkmark.
2. If an item is marked by an asterisk, multiply the number of times the item has been achieved by the number of the question to determine points for that item.
3. Sum the total number of points within each domain to determine the domain score.
4. Sum all ten domain scores to determine the total CAQ score.

Appendix E

SPQ

(Raine, 1991)

- 1.) Do you sometimes feel that things you see on TV or read in the newspaper have a special meaning for you? Y N
- 2.) I sometimes avoid going to places where there will be many people because I will get anxious. Y N
- 3.) Have you had experiences with the supernatural? Y N
- 4.) Have you often mistaken objects or shadows for people, or noises for voices? Y N
- 5.) Other people see me as slightly eccentric (odd). Y N
- 6.) I have little interest in getting to know other people. Y N
- 7.) People sometimes find it hard to understand what I am saying. Y N
- 8.) People sometimes find me aloof and distant. Y N
- 9.) I am sure I am being talked about behind my back. Y N
- 10.) I am aware that people notice me when I go out for a meal or to see a film. Y N
- 11.) I get very nervous when I have to make polite conversation. Y N
- 12.) Do you believe in telepathy (mind-reading)? Y N
- 13.) Have you ever had the sense that some person or force is around you, even though you cannot see anyone? Y N
- 14.) People sometimes comment on my unusual mannerisms and habits. Y N
- 15.) I prefer to keep myself to myself. Y N
- 16.) I sometimes jump quickly from one topic to another when speaking. Y N

- 17.) I am not good at expressing my true feelings by the way I talk and look. Y N
- 18.) Do you often feel that other people have it in for you? Y N
- 19.) Do some people drop hints about you or say things with a double meaning? Y N
- 20.) Do you ever get nervous when someone is walking behind you? Y N
- 21.) Are you sometimes sure that other people can tell what you are thinking? Y N
- 22.) When you look at a person, or yourself in the mirror, have you ever seen the face
change right before your eyes? Y N
- 23.) Sometimes other people think that I am a little strange. Y N
- 24.) I am mostly quiet when with other people. Y N
- 25.) I sometimes forget what I am trying to say. Y N
- 26.) I rarely laugh and smile. Y N
- 27.) Do you sometimes get concerned that friends or co-workers are not really loyal or
trustworthy? Y N
- 28.) Have you ever noticed a common event or object that seemed to be a special sign for
you? Y N
- 29.) I get anxious when meeting people for the first time. Y N
- 30.) Do you believe in clairvoyancy (psychic forces, fortune telling)? Y N
- 31.) I often hear a voice speaking my thoughts aloud. Y N
- 32.) Some people think that I am a very bizarre person. Y N
- 33.) I find it hard to be emotionally close to other people. Y N
- 34.) I often ramble on too much when speaking. Y N
- 35.) My “nonverbal” communication (smiling and nodding during a conversation) is not
very good. Y N

- 36.) I feel I have to be on my guard even with friends. Y N
- 37.) Do you sometimes see special meanings in advertisements, shop windows, or in the way things are arranged around you? Y N
- 38.) Do you often feel nervous when you are in a group of unfamiliar people? Y N
- 39.) Can other people feel your feelings when they are not there? Y N
- 40.) Have you ever seen things invisible to other people? Y N
- 41.) Do you feel that there is no one you are really close to outside of your immediate family, or people you can confide in or talk to about personal problems? Y N
- 42.) Some people find me a bit vague and elusive during a conversation. Y N
- 43.) I am poor at returning social courtesies and gestures. Y N
- 44.) Do you often pick up hidden threats or put-downs from what people say or do? Y
N
- 45.) When shopping do you get the feeling that other people are taking notice of you? Y N
- 46.) I feel very uncomfortable in social situations involving unfamiliar people. Y N
- 47.) Have you had experiences with astrology, seeing the future, UFOs, ESP, or a sixth sense? Y N
- 48.) Do everyday things seem unusually large or small? Y N
- 49.) Writing letters to friends is more trouble than it is worth. Y N
- 50.) I sometimes use words in unusual ways. Y N
- 51.) I tend to avoid eye contact when conversing with others. Y N
- 52.) Have you found that it is best not to let other people know too much about you? Y
N

- 53.) When you see people talking to each other, do you often wonder if they are talking about you? Y N
- 54.) I would feel very anxious if I had to give a speech in front of a large group of people. Y N
- 55.) Have you ever felt that you are communicating with another person telepathically (by mind-reading)? Y N
- 56.) Does your sense of smell sometimes become unusually strong? Y N
- 57.) I tend to keep in the background on social occasions. Y N
- 58.) Do you tend to wander off the topic when having a conversation? Y N
- 59.) I often feel that others have it in for me. Y N
- 60.) Do you sometimes feel that other people are watching you? Y N
- 61.) Do you ever suddenly feel distracted by distant sounds that you are not normally aware of? Y N
- 62.) I attach little importance to having close friends. Y N
- 63.) Do you sometimes feel that people are talking about you? Y N
- 64.) Are your thoughts sometimes so strong that you can almost hear them? Y N
- 65.) Do you often have to keep an eye out to stop people from taking advantage of you? Y N
- 66.) Do you feel that you cannot get “close” to people? Y N
- 67.) I am an odd, unusual person. Y N
- 68.) I do not have an expressive and lively way of speaking. Y N
- 69.) I find it hard to communicate clearly what I want to say to people. Y N
- 70.) I have some eccentric (odd) habits. Y N

71.) I feel very uneasy talking to people I do not know well. Y N

72.) People occasionally comment that my conversation is confusing. Y N

73.) I tend to keep my feelings to myself. Y N

74.) People sometimes stare at me because of my odd appearance. Y N

Appendix F

Barratt Impulsiveness Scale (BIS-11; Patton et al., 1995)

DIRECTIONS: People differ in the ways they act and think in different situations.			
This is a test to measure some of the ways in which you act and think. Read each statement and put an X on the appropriate circle on the right side of this page. Do not spend too much time on any statement. Answer quickly and honestly.			
1	2	3	4
Rarely/Never	Occasionally	Often	Almost Always/Always
1. I plan tasks carefully.		1 2 3 4	
2. I do things without thinking.		1 2 3 4	
3. I make-up my mind quickly.		1 2 3 4	
4. I am happy-go-lucky.		1 2 3 4	
5. I don't "pay attention."		1 2 3 4	
6. I have "racing" thoughts.		1 2 3 4	
7. I plan trips well ahead of time.		1 2 3 4	
8. I am self controlled.		1 2 3 4	
9. I concentrate easily.		1 2 3 4	
10. I save regularly.		1 2 3 4	
11. I "squirm" at plays or lectures.		1 2 3 4	
12. I am a careful thinker.		1 2 3 4	
13. I plan for job security.		1 2 3 4	
14. I say things without thinking.		1 2 3 4	

15. I like to think about complex problems.	1	2	3	4
16. I change jobs.	1	2	3	4
17. I act "on impulse."	1	2	3	4
18. I get easily bored when solving thought problems.	1	2	3	4
19. I act on the spur of the moment.	1	2	3	4
20. I am a steady thinker.	1	2	3	4
21. I change residences.	1	2	3	4
22. I buy things on impulse.	1	2	3	4
23. I can only think about one thing at a time.	1	2	3	4
24. I change hobbies.	1	2	3	4
25. I spend or charge more than I earn.	1	2	3	4
26. I often have extraneous thoughts when thinking.	1	2	3	4
27. I am more interested in the present than the future.	1	2	3	4
28. I am restless at the theater or lectures.	1	2	3	4
29. I like puzzles.	1	2	3	4
30. I am future oriented.	1	2	3	4