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Creative style and achievement in adults with attention-deficit/hyperactivity disorder

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ABSTRACT

Previous research has suggested that adults with ADHD perform better on some measures of creativity than non-ADHD adults (White & Shah, 2006). The present study replicated previous findings using a standardized measure of creativity (the Abbreviated Torrance Test for Adults, Goff & Torrance, 2002) and extended previous research by investigating real-world creative achievement among adults with ADHD. Results indicated that adults with ADHD showed higher levels of original creative thinking on the verbal task of the ATTA and higher levels of real-world creative achievement, compared to adults without ADHD. In addition, comparison of creative styles using the FourSight Thinking Profile (Puccio, 2002) found that preference for idea generation was higher among ADHD participants, whereas preference for problem clarification and idea development was greater among non-ADHD participants. These findings have implications for real-world application of the creative styles of adults with and without ADHD.

1. Introduction

Attention deficit hyperactivity disorder (ADHD) is a neuropsychological disorder, marked by inattentiveness, impulsivity, and hyperactivity, beginning in childhood and persisting into adulthood (e.g., Castellanos, Sonuga-Barke, Milham, & Tannock, 2006). ADHD may contribute to functional impairment in academic, vocational, and social situations (e.g., Kessler et al., 2006). On the flip side, one benefit of ADHD may be exceptional creativity (e.g., Weiss, 1997). Indeed, empirical studies suggest that individuals with ADHD have relatively high divergent thinking ability (White & Shah, 2006) and may be less influenced by contextual constraints during creative activities (Abraham, Windmann, Siefen, Daum, & Gunturkun, 2006). Collectively, these findings suggest that individuals with ADHD may excel at tasks or in situations that require divergent, unconstrained thinking. However, it is not clear whether or not the advantage observed on laboratory measures extends to creative achievement in real life. Thus, the present study measured creative achievement in ADHD and non-ADHD adults in several different domains, using the Creativity Achievement Questionnaire developed by Carson, Peterson, and Higgins (2005). To further characterize real-world creativity, we measured creative problem solving style preference using the FourSight Thinking Profile (Puccio, 2002). Together, these two measures allow us to go beyond previous studies that have focused on short, laboratory-based measures. Our second objective was to replicate previous findings (White & Shah, 2006) using a standardized measure of divergent thinking, the Abbreviated Torrance Test of Creativity for Adults (Goff & Torrance, 2002). In the sections that follow, we first review previous research in this area, and then discuss the rationale for the present study.

1.1. Uninhibited imaginations: why ADHD may enhance creativity

A key impairment in ADHD is deficient inhibitory control, which makes it difficult to focus attention on relevant aspects of the task at hand (e.g., Clark et al., 2007; Nigg, 2001). However, studies of non-ADHD individuals suggest that low inhibitory control is possibly advantageous for divergent thinking (e.g., Carson, Peterson, & Higgins, 2003; Fiore, Schooler, Linville, & Hasher, 2001). One explanation for the relationship between divergent thinking and poor inhibition is that low inhibition may actually facilitate divergent thinking because concepts and ideas are less likely to be inhibited in working memory. Conversely, convergent thinking tasks that require an individual to ignore competing ideas or partial solutions may benefit from greater inhibitory control (Fiore et al., 2001).

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Indeed, in previous research (White & Shah, 2006) adults with ADHD performed better on the Unusual Uses Task (a measure of divergent creative thinking), but scored lower on the Remote Associates Test (a measure of convergent creative thinking), compared to non-ADHD adults. Moreover, creative differences between adults with and without ADHD were partially mediated by differences in inhibitory control (White & Shah).

1.2. Creative achievement in adults with ADHD

To be useful in real-world contexts, creative ability must generalize outside the laboratory. In non-ADHD individuals, there is a positive correlation between divergent thinking and actual creative achievement (e.g., Carson et al., 2003; Guilford, 1957; Torrance, 1988). On the other hand, some models of creativity suggest that both the ability to diffuse attention and generate ideas *and* the ability to focus attention and work within certain constraints are necessary for achievement (Finke & Bettle, 1996; Finke, Ward, & Smith, 1992). In theory, adults with ADHD may show less real-world creative achievement than one might predict on the basis of divergent thinking measures; whether the ADHD-advantage generalizes to real-world creativity remains an empirical question.

1.3. Overview of the present study

To investigate creative achievement and creative style in adults with and without ADHD, we used the Creativity Achievement Questionnaire, (CAQ; Carson et al., 2005). The CAQ measures creative achievement in 10 domains: drama, humor, music, visual arts, creative writing, invention, scientific discovery, culinary arts, dance, and architecture. As such, it allows for assessing creativity within different domains, as well as in general. This is consistent with the literature suggesting that there are domain-specific and domain-general aspects of creativity (Ward, Smith, & Finke, 1999). For each domain, individuals report their level of achievement (e.g., no talent or training, some training, national recognition, etc.). This levels-approach takes into account the fact that training is a relatively low indication of accomplishment (Ludwig, 1995) and recognition by local and especially national experts is an indication of much greater expertise (Amabile, 1982). Finally, the CAQ is sensitive to individual differences in inhibitory control (Carson et al., 2003). We expected that adults with ADHD in the present study would score higher in overall level of creative achievement than adults without ADHD.

To further characterize real-world creativity in ADHD and non-ADHD adults, we used the FourSight Thinking Profile (Puccio, 2002), a self-report assessment of preferred creative style that is geared toward real-life creative problem solving (DeCusatis, 2008; Puccio, 2002). FourSight identifies four problem-solving styles: Clarifier, Ideator, Developer, and Implementer (Puccio). Clarifiers prefer to define and structure the problem space, Ideators prefer to generate ideas, Developers prefer to elaborate upon or refine ideas and solutions, and Implementers prefer to incorporate a refined idea into a final product or solution (Puccio). Research suggests that the clarification and development stages of problem solving require convergent thinking, while the ideation or "brainstorming" stage involves divergent thinking (Brophy, 2001). Thus, we expected that adults with ADHD in the current study would show greater Ideator preference on the FourSight, while adults without ADHD would demonstrate greater Clarifier and Developer preferences.

Finally, to further validate our previous findings of creative divergent thinking in adults with ADHD (White & Shah, 2006), we compared adults with and without ADHD on the Abbreviated Torrance Test for Adults (ATTA), a standardized and well-accepted measure of divergent creative thinking. We predicted that adults with ADHD would score higher on the ATTA relative to non-ADHD adults.

2. Method

2.1. Participants

Participants were 60 undergraduate students at the University of Memphis, selected from a large introductory psychology course over two semesters. ADHD participants ($N = 30$) were 17 males and 13 females, age $M = 20.1$, ACT $M = 22.3$, and non-ADHD participants ($N = 30$) were 14 males and 16 females, age $M = 19.9$, ACT $M = 21.9$. Of the 30 participants in the ADHD group, 15 were taking stimulant medication for the treatment of ADHD at the time of the study.

2.2. Participant recruitment and selection procedure

To recruit participants for the ADHD and non-ADHD groups, we first administered a questionnaire to approximately 600 students enrolled in introductory psychology as part of a large pre-screening session in which multiple researchers were screening/recruiting participants for various studies. In total, each student completed approximately five surveys/questionnaires in exchange for extra-credit. The questionnaire we administered contained items from Barkley and Murphy's (1998) Current Symptoms Scale and questions asking whether the individual had ever been clinically diagnosed with ADHD/ADD, and if so, whether ADHD/ADD status had been confirmed (either by initial diagnosis or follow-up care) by a clinician within the past six months. We also asked whether the individual had a parent and/or sibling diagnosed with ADHD/ADD. Lastly, we asked the student to provide contact info if s/he wished to participate in a future study. To minimize response bias, students were not to provide identifying info on surveys unless they wished to be contacted for future studies.

On the basis of this pre-screening, students were invited to participate in the study. Of the approximately 600 students, 37 (~6%) reported a diagnosis of ADHD/ADD and scored above the clinical threshold of the Current Symptoms Scale. Of these individuals, 34 participated in the experimental session, but four were excluded from the final sample due to comorbid learning disability (2), anxiety disorder (1), and bipolar disorder (1). To recruit participants for the non-ADHD/ADD control group, we randomly selected from the remaining surveys and contacted those individuals who scored below the clinical threshold on the Current Symptoms Scale and reported no personal or family history of ADHD/ADD. Of the 31 individuals in the original control group, one participant was excluded from the final sample due to history of major depression. To check reliability of self-reported ADHD/ADD symptoms, we administered a second, similar self-report measure, the *Conners Adult ADHD Rating Scales, Screening Version* (Conners, Erhardt, & Sparrow, 1999) during the experimental session. All participants qualified for inclusion based on the CAARS-S:SV (ADHD and non-ADHD participants scored in the clinical and non-clinical ranges, respectively).

2.3. Materials

2.3.1. Current and childhood ADHD symptoms rating scales

The current and childhood ADHD symptoms rating scales (Barkley & Murphy, 1998) are brief, self-report screening questionnaires for assessment of adult ADHD. Questionnaire items reflect diagnostic criteria for ADHD as per the DSM-IV (American Psychiatric Association, 1994). These scales have high reliability (coefficient alphas for inattention items and hyperactive-impulsive items are .92 and .91, respectively), and scale validity is indicated by significant correlations between self-report and spouse/parent ratings (Edwards, Barkley, Laneri, Fletcher, & Metevia, 2001).

2.3.2. Conners' adult ADHD rating scale (CAARS)

The CAARS is a self-report measure of adult ADHD based on current scientific understanding of ADHD symptoms in adulthood (Conners, Erhardt, & Sparrow, 1999). The CAARS measures four dimensions: Inattention/Executive Function, Hyperactivity/Restlessness, Impulsivity/Emotional Lability, and Problems with Self-concept. Coefficient alphas for the four factors range from .86 to .92, with median test–retest reliability $r = .89$ (Conners et al.).

2.3.3. Creative Achievement Questionnaire (CAQ)

The Creative Achievement Questionnaire, or CAQ (Carson et al., 2005) is a self-report assessment of creative achievement that measures creativity in 10 domains (drama, humor, music, visual arts, creative writing, invention, scientific discovery, culinary arts, architecture and dance). Items on the CAQ include, for example, "My work has won a prize at a juried art show". The CAQ is reliable and has high convergent, discriminant, and predictive validity (Carson et al., 2005).

2.3.4. FourSight Thinking Profile (FourSight)

FourSight (Puccio, 2002) is a self-report questionnaire that measures preference for each phase of creative problem solving (problem identification, idea generation, solution development, and solution implementation). Each item on FourSight corresponds to a phase of problem solving (e.g., "I enjoy taking the necessary steps to put my ideas into action" corresponds to implementation phase). Responses are weighted and summed to yield a score for each thinking type (Puccio, 2002).

2.3.5. Abbreviated Torrance Test for Adults (ATTA)

The ATTA is a short version of the Torrance Test for Creative Thinking, which evaluates creativity in terms of divergent thinking (Goff & Torrance, 2002). The ATTA includes three activities – one verbal, two figural – that yield scores for Fluency (ability to generate numerous unique responses), Originality (ability to generate unusual or infrequent responses), Elaboration (ability to add detail to creative responses), and Flexibility (ability to respond to the same object in multiple unique ways).

2.4. Procedure

Participants provided informed consent, and then completed the CAARS-S: SV and demographic information sheet. Participants then completed the ATTA, FourSight, and CAQ (task order was counter-balanced across participants). Tasks were administered and scored independently by trained research assistants who were blind to ADHD condition.

3. Results

3.1. Creative Achievement Questionnaire (CAQ)

Because scores on the CAQ were highly skewed, we first $\log_e$-transformed the total CAQ score (Silvia, Nusbaum, Berg, Martin, & O'Connor, 2009). An independent-samples *t*-test showed higher overall creative achievement in the ADHD group ($M = 2.82$, $SD = .780$) compared to the non-ADHD group ($M = 2.10$, $SD = .823$), $t(58) = 3.48$, $p = 001$. Creative achievement within each of the 10 domains by ADHD group is displayed in Table 1.

3.2. FourSight Thinking Profile

To assess differences in creative style as a function of ADHD, relative preference for each of the four styles (*Clarifier*, *Ideator*, *Developer*, and *Implementer*) was expressed as a proportion (e.g., "Ideator" preference was obtained by dividing the score for Ideator by the total score) and these were submitted to a multivariate analysis of variance with ADHD group as the independent variable. Between-subjects comparisons confirmed the predicted differences in preferred creative style between the ADHD and non-ADHD groups; specifically, the non-ADHD group showed greater preference for the Clarifier style ($F(1, 58) = 10.15$, $MSE = .001$, $\eta_p^2 = 149$, $p = .002$) and the Developer style ($F(1, 58) = 12.35$, $MSE = .001$, $\eta_p^2 = .176$, $p = .001$), while the ADHD group showed relatively higher preference for the Ideator style ($F(1, 58) = 12.90$, $MSE = .001$, $\eta_p^2 = .181$, $p = .001$). The groups did not differ for Implementer style ($p = .233$). Means and standard deviations are displayed in Table 2.

Table 1
Means (M), standard deviations (*SD*), minimum (Min) and maximum (Max) scores for ten domains of creative achievement measured by CAQ as a function of ADHD group.

	ADHD group				non-ADHD group			
	M	*SD*	Min	Max	*M*	*SD*	Min	Max
Visual arts	3.37	6.66	0	34	1.03	2.47	0	11
Music	4.27	7.42	0	28	1.73	2.85	0	11
Dance	2.50	5.11	0	21	1.07	3.90	0	21
Architecture	.83	2.17	0	10	.10	.31	0	1
Writing	2.53	3.86	0	21	2.23	3.18	0	15
Humor	2.07	2.52	0	10	1.33	1.49	0	7
Invention	1.43	2.22	0	10	.53	1.31	0	7
Science	2.60	7.43	0	41	.63	1.13	0	3
Theater	2.47	4.29	0	15	.50	1.31	0	7
Culinary Arts	1.20	2.83	0	15	.90	1.24	0	6

Table 2
Means (*M*) and standard deviations (*SD*) for creative style preferences as measured by FourSight as a function of ADHD group.

	ADHD Group		non-ADHD Group	
	M	*SD*	*M*	*SD*
Clarifier preference	.244	.024	.263	.022
Ideator preference	.275	.043	.241	.028
Developer preference	.219	.032	.243	.019
Implementer preference	.265	.026	.0256	.034

3.3. Abbreviated Torrance Test for Adults (ATTA)

The standardized scoring procedure for the ATTA yields scaled scores for fluency and originality that are based on combined performance on the three subtasks (one verbal, two figural), and scaled scores for elaboration and flexibility that are derived from the figural subtasks alone. Thus, we first conducted a MANOVA to examine differences in standardized scores as a function of ADHD and non-ADHD group. Tests of between-subjects effects yielded no reliable differences between ADHD and non-ADHD groups, for all tests, $p > .003$.[1]

However, because standardized scores for fluency and originality represent performance on all tasks combined, these scores make no distinction between verbal and figural divergent thinking. Thus, in order to examine fluency and originality by task type (verbal vs. figural), we *z*-transformed fluency and originality raw scores for each of the three tasks and computed variables for Verbal Fluency, Figural Fluency, Verbal Originality, and Figural Originality. These variables were then entered into a MANOVA as dependent variables with ADHD group as the independent variable. This analysis revealed higher Verbal Originality for the ADHD group ($M = .377$, $SD = 1.05$) than the non-ADHD group ($M = -.377$, $SD = .793$), $F(1, 58) = 8.542$, $MSE = .870$, $\eta_p^2 = .145$, $p = .003$. The ADHD and non-ADHD groups did not differ in level of Verbal Fluency, Figural Fluency, or Figural Originality, for all tests, $p > .003$.

[1] To control for experiment-wise error, we used Bonferroni correction (for all comparisons, $\alpha = .003$).

3.4. Comparisons between medicated and non-medicated adults with ADHD

Medication was not manipulated in the present study and no predictions were made regarding drug effects. But, because one-half of the ADHD group was taking medication to treat ADHD, we compared medicated and non-medicated ADHD participants on the divergent thinking task (ATTA) and creative achievement measure (CAQ). These comparisons yielded no reliable differences (for all tests, $p > .003$).

4. Discussion

The primary objective of our study was to establish that ADHD advantages in creative thinking occur not only on laboratory tasks, but also have an impact on real-life creativity. Indeed, we found that real-world creative achievement was higher for adults with ADHD relative to adults without ADHD. Creative style also differed as a function of ADHD, as predicted; preference for the Ideator style was greater among adults with ADHD, while preferences for the Clarifier and Developer styles were higher for adults without ADHD. Finally, adults with ADHD produced more original responses on the verbal component of the Abbreviated Torrance Test for Adults (ATTA), which confirmed our previous findings regarding divergent thinking among adults with ADHD (White & Shah, 2006).

The specific association between ADHD and verbal originality on the ATTA may clarify existing discrepancies in the literature (see Healey & Rucklidge, 2008, for a review). For example, the majority of published studies that failed to detect a relationship between ADHD and creativity relied almost exclusively on nonverbal measures of creativity, such as the figural version of the Torrance Tests of Creative Thinking (e.g., Funk, Chessare, Weaver, & Exley, 1993; Healey & Rucklidge, 2005). A few studies included measures of verbal fluency, but did not consider originality of responses (e.g., Edwards et al., 2001; Murphy, Barkley, & Bush, 2001). The present results suggest that the creative advantage of ADHD is associated with higher levels of originality, but not fluency, on verbal measures of divergent thinking.

The present findings are consistent with current theoretical understanding of ADHD (e.g., Castellanos et al., 2006). Specifically, individuals with ADHD demonstrate poor inhibitory control, fluctuations in attention, and marked intra-individual variability in reaction time and resting state activation (Castellanos et al., 2008). Such variable disturbances and lapses in attention may lead to somewhat more random thoughts and ideas (Glazer, 2009). And, abnormal processing of irrelevant information, such as that which occurs in adult ADHD (King, Colla, Brass, Heuser, & von Cramon, 2007), may contribute to divergent thinking by increasing the likelihood of insight (Memmert, 2009). Another etiological possibility is that diminished prefrontal control in ADHD may engender unconventional thinking (Thompson-Schill, Ramscar, & Chrysikou, 2009). Indeed, adults with ADHD in the present study demonstrated high originality on the ATTA and a preference for the Ideator style; both of which are associated with unconventional thinking (Puccio, 2002).

On a practical note, ADHD-related differences on the FourSight may be particularly relevant in the context of a work environment (De Graaf et al., 2008). For example, the Ideator preference predicts entrepreneurship and an inclination toward expressive and flexible jobs (Brophy, 2001), and evidence suggests that creative style may be a determinant of intrinsic motivation (Collins & Amabile, 1999) and innovation in the workplace (Fagan, 2004; Schweizer, 2006). Vocational matching using creative style may be especially beneficial for adults with ADHD, given that attentional deficits pose significant risk to job success (Kessler et al., 2006).

The present research has exciting potential for application in real-life contexts. However, our findings may not generalize to children and non-college students with ADHD, or to individuals diagnosed with subtypes of ADHD other than ADHD-combined type. Another limitation is that the present study does not allow us to draw definitive conclusions regarding possible effects of stimulant medication on creativity in ADHD. Our comparisons of medicated and non-medicated ADHD groups were limited by sample size and lack of experimental manipulation. So, while consistent with previous research (e.g., Funk et al., 1993), the fact that we found no differences as a function of medication is not conclusive.

In summary, the current study establishes that ADHD individuals report greater lifetime creative achievement compared to non-ADHD adults as well as differences in creative style. Furthermore, this study replicates previous research regarding better performance on a different measure of divergent thinking, the ATTA. Future studies that include real-world creativity and innovation tasks, such as poetry writing, artistic creation, or invention, (e.g., Amabile, 1982; Cheng, Sanchez-Burks, & Lee, 2008) might provide a "middle-ground" between self-report measures and laboratory measures, each of which have limitations with respect to establishing actual differences in creativity between ADHD and non-ADHD participants. Moreover, future research is necessary to assess incremental validity of ADHD above other factors known to influence creativity, such as openness to experience (e.g., Silvia, Nusbaum, Berg, Martin, & O'Connor, 2009).

5. Conclusions

A better understanding of creative achievement and potential in ADHD individuals has important implications. It may be possible, for example, to identify careers that are particularly suited to the strengths and weaknesses of individuals with ADHD. Children with ADHD who are told of their possible creative strengths may benefit in terms of self-efficacy and perhaps even achievement. Similarly, an understanding of creative preference may guide adults with ADHD into endeavors that are intrinsically motivating and thus likely to be most fruitful (Collins & Amabile, 1999). Finally, adults with ADHD may be able to use creative advantages to strategically offset difficulties caused by ADHD symptoms in daily life.

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