

Comparison of Creativity between Children with and without Attention Deficit Hyperactivity Disorder: A Case-Control Study

Banafsheh Aliabadi, MD^{1,2}
 Rozita Davari-Ashtiani, MD^{1,2}
 Mojgan Khademi, MD^{1,2}
 Fariba Arabgol, MD^{1,2}

1. Department of Psychiatry, Imam Hossein Hospital, Shahid Beheshti University of Medical Sciences, Tehran, Iran.

2. Behavioral Sciences Research Center, Shahid Beheshti University of Medical Sciences, Tehran, Iran.

Corresponding author:

Rozita Davari-Ashtiani, MD,
 Associate Professor of Child Psychiatry, Imam Hossein Hospital, Shahid Madani St, Tehran, Iran
 Tel: +98 21 77551023
 Fax: +98 21 77551023
 Email: rodavari@sbmu.ac.ir

Objective: The aim of this study was to compare creativity in children with and without attention deficit hyperactivity disorder.

Method: This was an analytic and descriptive study. Participants were 33 children aged 7-12 years selected from a child and adolescent psychiatric clinic at Imam Hossein hospital (Tehran, Iran), who were diagnosed with ADHD by a child and adolescent psychiatrist. They met the DSM-IV diagnostic criteria for ADHD and had no comorbidity according to K-SADS (Kiddi-Scadule for Affective disorders and Schizophrenia). They were requested not to take any medication. They took the Figural TTCT (Torrance Test of Creativity Thinking) and Raven Intelligence test after using medication. Thirty-three age and sex-matched children selected from the regional schools were recruited for the control group. They did not have any psychiatric disorders according to K-SADS. The Figural TTCT and Raven Intelligence test were conducted for the controls as well.

Results: No statistically significant difference was found in the intelligence score and the mean±SD of the total score of creativity between children with ADHD (125.2 ± 42.6) and the control group (130.6 ± 47.5) (P value = 0.49). Children with ADHD had worse function in fluency and flexibility items and were not different in originality and elaboration items.

Conclusion: The creativity of children with ADHD is not different from that of the control group.

Key words: Attention Deficit Hyperactivity Disorder (ADHD), Children, Creativity

Iran J Psychiatry 2016; 11:2: 99-103

Attention deficit hyperactivity disorder is one of the most prevalent childhood psychiatric disorders (1), and its diagnosis is growing among children and adolescences (2). Although ADHD may negatively affect academic achievement, employment performance and social relationships, there are some children with ADHD who are very creative and successful in adulthood. Gifts and ADHD may cover each other (3, 4). Some authors believe that studies of children with ADHD often focus on the problems, diagnosis, and treatment; but rarely consider the symptoms as characteristics similar to creativity (5). There are some similarities between creative individuals and those with ADHD: Distractibility and inattentiveness, which is associated with creativity (6); Oversensitivity; restlessness and hyperactivity; inability in time management; dangerous activities; impulsivity and impatience, especially in daily activities; uncontrollable behavior and acting on emotions; day dreaming; mixed laterality and anomalies in cerebral dominance; more spontaneous ideation; higher levels of sensation seeking behavior

(4, 7). There are some reports of superiority of children with ADHD in some domains of creativity. For instance, they were better problem-solvers and more creative with unusual ideas in response to stimulating video games (8). In cooperative tasks, the group with children with ADHD were more successful in problem solving (9). In one study, a group of 34 children with ADHD were tested for creativity, using the figural form of the Torrance Tests of Creative Thinking and found that although the group performed at about the mean on the TTCT, 32% of the children scored above the 90th percentile, and half above the 70th percentile (7). However, a significant limitation of this study was that the author had no control over whether the children with ADHD were medicated during testing or not. Since there is the possibility of inverse relationship between creativity and concentration, some believe that when people use stimulants to improve cognitive performance, their creative ability may decrease. One study investigated this topic and found no effect (10), while other researchers reported improving creativity (11, 12), and also another study showed decreasing divergent thinking (13). Another important limitation was that there were a large number of very intelligent children in the ADHD group; six of the 11 children

with ADHD who scored above the 90th percentile on TTCT had also been selected for a gifted scholars program.

Assessing the impairment in function for diagnosis of ADHD is very important as in a study about 40% of the highly creative children were diagnosed with ADHD according to rating scales but the diagnosis was not confirmed by semi-structured clinical interview as they were not significantly impaired by the symptoms they displayed (14).

On the other hand, some studies showed no difference in creative ability among the ADHD group and the control group (15-18) and even some studies reported worse creative function in ADHD group (10, 19 and 20).

The researchers have noted the importance of approaching education from a strength-based perspective rather than focusing on remediating weaknesses (21, 22). It is helpful to consider the abilities of these children and promote their achievement through enhancing organization with treatment and better implication of these strengths. A creative child, who can learn to organize his activities, complete his projects and pay attention to details, has a more chance for excellence.

Considering the methodological problems of the previous studies like a highly intelligent sample, uncontrolled medication and unconfirmed ADHD diagnosis, the higher creative ability of children with ADHD is still a question. In this study, we tried to compare creativity in children with and without ADHD considering the limitation of past studies.

Materials and Method

Participants: Thirty-three children aged 7-12 years, diagnosed with ADHD by a child and adolescent psychiatrist, were selected from a child and adolescent psychiatric clinic at Imam Hossein hospital (Tehran, Iran). They also met the DSM-IV TR diagnostic criteria for ADHD and had no comorbidity according to K-SADS (Kiddi-Scadule for Affective disorders and Schizophrenia). Thirty-three age and sex- matched children were selected from the regional schools for the control group. The controls did not have any psychiatric disorders according to K-SADS.

Instruments: The Figural TTCT (Torrance Test of Creativity Thinking) and Raven Intelligence test, whose reliability in Iran has been confirmed (23), were conducted for both groups. TTCT is the most widely used test of its kind since it only requires the examinee to reflect upon their life experiences (24). Thinking creatively with pictures is appropriate for all levels, kindergarten age through adulthood. The test- retest method for the TTCT test in Iran showed the reliability coefficient of 0.8 (25). The test takes 30 minutes and involves three tasks of drawing unusual and creative pictures. In first task, the child should use a yellow bean shaped paper to demonstrate the idea of a story in his or her mind and choose a title for it. The second task includes 10 incomplete pictures and the

child should make the most unusual picture from each. In the third task, which involves a number of circles, the child should make as many pictures as he or she can.

Creativity is assessed by four components including: Fluency, flexibility, originality and elaboration. Task 1 is scored for originality, which means how rare and creative is the idea, and for elaboration, which shows how the examinee could explain the idea with details. Task 2 and 3 are scored for fluency, which is the number of meaningful ideas of each task, and flexibility, which shows how the subjects of ideas are different.

Children with ADHD did the TTCT without receiving stimulants, but they received it before the IQ test. Children with IQ score of less than 90 were excluded from the study. Written consent was obtained from each participant.

Statistical Analysis: To compare the IQ of the two groups, t-test was used and the creativity items between the two groups were compared by Mann-Whitney test with 0.05 significance level, using SPSS 19.

Results

The mean age of children in both groups was 9 ± 2 and there were 9 girls and 24 boys in each group.

Results are presented in the table 1. Based on the results of the t-test, there was no statistically significant difference in the IQ of the two groups. Creativity was assessed in four items: Originality, fluency, flexibility and elaboration, using Mann-Whitney test. The difference of the total scores of creativity in children with and without ADHD was not statistically significant. The scores of the fluency and the flexibility items were significantly better in the group without ADHD (figure1). Moreover, no statistically significant difference was found between the two groups in terms of elaboration and originality items.

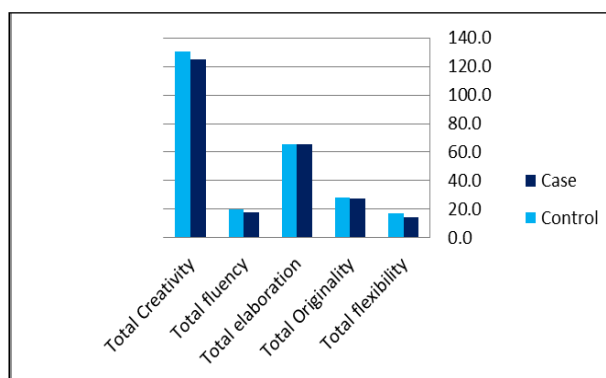


Figure1. Creativity results in children with and without ADHD

Table1. Comparison of IQ and Creativity Items between Children with and without ADHD

	Control Group(mean±SD)	Children with ADHD (mean±SD)	P-value
Intelligence quotient	110±10	106±11	0.205
Fluency	20.1±5.9	18.1±9	0.021
Flexibility	16.9±4.9	14.3±3.2	0.019
Originality	28.1±13.9	27.5±14.3	0.955
Elaboration	65.5±28.8	65.2±28.4	0.955
Total creativity	130.6±47.5	125.2±42.6	0.49

Discussion

In this study, the total score of creativity was not different between the two groups but children with ADHD had worse function in fluency and flexibility items. The same results were observed in other studies (10, 20). Some studies reported less creativity of children with ADHD during free play and performance of nonverbal, figural creativity tasks (10, 20) and in other studies they were not different or worse in object usage (ideational fluency), verbal fluency, and design fluency (5-Points Test) (19, 26).

A number of studies showed no difference in creativity in children with and without ADHD (15-18, 27). For instance, creativity and language, general science, and mathematics were compared between ADHD and control group and no difference was found. However, a serious methodological limitation of this study was that the ADHD diagnosis was done solely on the basis of teacher's ratings of hyperactivity on a DSM-IV evaluation form (18).

Considering the lower function of children with ADHD in other cognitive tasks such as naming speed, information processing speed and reaction time (14), lower function in creative task could have been predictable too. On the other hand, if they were more creative than the normal population, this ability should have had a positive effect in their life, but usually people with ADHD have many problems in their education and occupation. In fact, adults with ADHD are less likely to achieve educational (and occupational) level which is predicted based on their IQ (28-30). For example, although 84% of the ADHD-diagnosed adults were statistically expected to be college graduates, only 50% reached this level of education (28).

In a study on 32 children, children with ADHD showed better analysis for problem solving and more creative and unusual ideas (31), but ADHD diagnosis was only based on teacher's report and the continuum of the symptoms in other situations were not evaluated. Another limitation was that the IQ of the sample was all above 115, so they were not representative of community sample of children with ADHD.

A same result was found on thirty-seven 10-17 years old students. The ADHD group with equal IQ had better creative tasks but worse working memory.

However, the sample was selected from a gifted student camp and was not representative of usual students with ADHD, and the ADHD diagnosis was done by self-report test and not professionally confirmed (32).

In our study, the IQ of children with ADHD was not statistically different from the control group and this finding was similar to that of other studies (1, 33). The relationship between IQ and creativity was investigated in some studies, but the results were contradictory and inconclusive. Some suggest that creativity and IQ are correlated until an IQ of 120 (34). Furthermore, it has been stated in the literature that creativity does not need high IQ, and high intelligence does not bring creativity (35). In our study, IQ was assessed by Raven test and was only used for screening and not for examining the relationship of IQ and creativity. This study was carried on normal range of IQ to implicate the result on the usual population of children with ADHD, while the higher creativity in other studies could be the result of high intelligence and not the ADHD symptoms.

The similarities between ADHD and creative people cannot be a reason to expect creativity in people with ADHD. In fact, in some occasions, ADHD and creativity may overlap and this calls for caution against misdiagnosis (1). In some studies, the diagnosis of ADHD was not accurate and was based on the report of the teachers or students (19, 31); However, in our study, the diagnosis was done by a psychiatrist and was confirmed by KSADs.

Limitations

One limitation in this study was that the sample was from the known cases of ADHD in the clinic. Clinic-referred samples of children with ADHD are more likely to have co-occurring disabilities and lower IQ (36). In particular, these students with co-occurring disabilities are three to seven times more likely than their typical peers to be retained, suspended/ expelled from school, or receive special education services (37). In addition, we did not define ADHD severity and subtypes, and the results might change in mild forms and in different subtypes of ADHD.

In our study, creativity was assessed without using medication, and this may have led to less attention

and motivation for task completion, but due to the unknown effect of the stimulants on creativity, the abstinence of medication was necessary to prevent their effect on the results.

Conclusion

Our results showed that creativity of children with ADHD was not different from that of the control group or was worse in some areas. Although some ADHD individuals are successful, their success may have not caused by ADHD.

Acknowledgement

This study was a part of Banafsheh Aliabadi's post graduate dissertation. The study was supported by a grant from Behavioral Sciences Research Center affiliated in Shahid Beheshti University of Medical Sciences, Tehran, Iran.

Conflict of interest

There is no conflict of interest in this study.

References

1. Dion M H JJR. The Relationship between ADHD and Creativity: The ADHD Report. *PriQuest Psychology journals* June 2008; 16: 1-5.
2. Low CB. Attention deficit hyperactivity disorder: dissociation and adaptation (a theoretical presentation and case study). *The Am J Clin Hypn* 1999; 41: 253-261.
3. Rately JJ, Hollowell EM, Lereroni CL. Pharmacotherapy for ADHD in Adults. Available in data base of Latin Psych, < Lat-Psy@ sjuvm. Stjohns. edu>. Owner: H. Biaggi< Biaggi@ CCFLIB. Fla. CCF. Org 1994.
4. Weiss L. ADD and creativity: tapping your inner muse. City: Taylor Trade Publications; 1997.
5. Leroux JA, Levitt-Perlman M. The gifted child with attention deficit disorder: An identification and intervention challenge. *Roeper Review* 2000; 22: 171-176.
6. Ansborg PI, Hill K. Creative and analytic thinkers differ in their use of attentional resources. *Personality and Individual Differences* 2003; 34: 1141-1152.
7. Cramond B. The Relationship between Attention-Deficit Hyperactivity Disorder and Creativity. 1994.
8. Lawrence V, Houghton S, Tannock R, Douglas G, Durkin K , Whiting K. ADHD outside the laboratory: boys' executive function performance on tasks in videogame play and on a visit to the zoo. *J Abnorm Child Psychol* 2002; 30: 447-462.
9. Zentall SS, Kuester DA, Craig BA. Social behavior in cooperative groups: Students at risk for ADHD and their peers. *The Journal of Educational Research* 2011; 104: 28-41.
10. Funk JB, Chessare JB, Weaver MT, Exley AR. Attention deficit hyperactivity disorder, creativity, and the effects of methylphenidate. *Pediatrics* 1993; 91: 816-819.
11. Solanto MV, Wender EH. Does methylphenidate constrict cognitive functioning? *J Am Acad Child Adolesc Psychiatry* 1989; 28: 897-902.
12. Douglas VI, Barr RG, Desilets J, Sherman E. Do high doses of stimulants impair flexible thinking in attention-deficit hyperactivity disorder? *J Am Acad Child Adolesc Psychiatry* 1995; 34: 877-885.
13. Swartwood MO, Swartwood JN, Farrell J. Stimulant treatment of ADHD: effects on creativity and flexibility in problem solving. *Creativity Research Journal* 2003; 15: 417-419.
14. Healey D , Rucklidge JJ. An investigation into the relationship among ADHD symptomatology, creativity, and neuropsychological functioning in children. *Child Neuropsychol* 2006; 12: 421-438.
15. Healey D, Rucklidge JJ. An exploration into the creative abilities of children with ADHD. *J Atten Disord* 2005; 8: 88-95.
16. Alt CA. The relationship among attention-deficit/hyperactivity disorder (ADHD), personality type and creativity in adults using the Myers-Briggs Type Indicator (MBTI) and the Torrance Tests of Creative Thinking (TTCT). City: ProQuest Information & Learning; 1999.
17. Barkley RA, Edwards G, Laneri M, Fletcher K, Metevia L. Executive functioning, temporal discounting, and sense of time in adolescents with attention deficit hyperactivity disorder (ADHD) and oppositional defiant disorder (ODD). *Journal of abnormal child psychology* 2001; 29: 541-556.
18. Biao S, Jia Y. A comparative study of the creative thinking and academic adaptativity of adhd and normal children *J Psychological science* 2002; 1: 010.
19. Barkley RA, Murphy KR, Fischer M. ADHD in adults: What the science says. City: Guilford Press; 2010.
20. Alessandri SM. Attention, play, and social behavior in ADHD preschoolers. *J Abnorm Child Psychol* 1992; 20: 289-302.
21. Nielsen ME. Gifted students with learning disabilities: Recommendations for identification and programming. *Exceptionality* 2002; 10: 93-111.
22. Nielsen ME, Higgins LD. The eye of the storm services and programs for twice-exceptional learners. *Teaching Exceptional Children* 2005; 38: 8-15.
23. Rahmani J, Abedi. M. standardizing the Raven colored test for children 5 to 10 years old in Isfahan, Iran, *J Educ R* 2004: 81-86.
24. Goff K. Abbreviated torrance test for adults. City: Scholastic Testing Service Bensenville, IL; 2002.

25. Pirkhaefi A. The relationship between creativity and intelligence among the students of second grade of high school in Tehran (Iran). Thesis: Allameh Tabatabaie University; 1994.
26. Murphy KR, Barkley RA, Bush T. Executive functioning and olfactory identification in young Adults with attention deficit-hyperactivity disorder. *Neuropsychology* 2001; 15: 211-220.
27. National Research Center on the Gifted and Talented Storrs, CT, Guenther A. What Educators and Parents need to know about-ADHD,Creativity,and gifted Students?Available from:<http://www.gifted.uconn.edu/nrcgt>, 1995.
28. Biederman J, Petty CR, Fried R, Kaiser R, Dolan CR, Schoenfeld S, et al. Educational and occupational underattainment in adults with attention-deficit/hyperactivity disorder: a controlled study. *J Clin Psychiatry* 2008; 69: 1217-1222.
29. Biederman J, Faraone SV, Spencer TJ, Mick E, Monuteaux MC, Aleari M. Functional impairments in adults with self-reports of diagnosed ADHD: A controlled study of 1001 adults in the community. *J Clin Psychiatry* 2006; 67: 524-540.
30. Mannuzza S, Klein RG, Bessler A, Malloy P , LaPadula M. Adult outcome of hyperactive boys. Educational achievement, occupational rank, and psychiatric status. *Arch Gen Psychiatry* 1993; 50: 565-576.
31. Shaw GA, Brown G. Laterality, implicit memory and attention disorder. *Educational Studies* 1991; 17: 15-23.
32. Fugate CM, Zentall SS, Gentry M. Creativity and Working Memory in Gifted Students With and Without Characteristics of Attention Deficit Hyperactive Disorder Lifting the Mask. *Gifted Child Quarterly* 2013; 57: 234-246.
33. Kaplan BJ, Crawford SG, Dewey DM , Fisher GC. The IQs of children with ADHD are normally distributed. *J Learn Disabil* 2000; 33: 425-432.
34. Albert RS, Elliott RC. Creative ability and the handling of personal and social conflict among bright sixth graders. *Social Behavior and Personality: an international journal* 1973; 1: 169-181.
35. Sternburg R, Salter W. Conceptions of intelligence. *Handbook of human intelligence*. Cambridge, MA: Cambridge University Press; 1984. pp.3-28
36. Zentall SS. ADHD and education: Foundations, characteristics, methods, and collaboration. City: Prentice Hall; 2006.
37. LeFever GB, Villers MS, Morrow AL, Vaughn ES. Parental perceptions of adverse educational outcomes among children diagnosed and treated for ADHD: A call for improved school/provider collaboration. *Psychology in the Schools* 2002; 39: 63-71.