

## Comparing the Drawings of Children with Attention Deficit Hyperactivity Disorder with Normal Children

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**Objective:** Attention deficit hyperactivity disorder (ADHD) is the most common behavioral problem during childhood and in school-aged children. Various projection drawings have been designed for assessing children's personality and psychological disorders including the tests of draw a person (DAP) and draw a family (DAF). We aimed to compare the differences between typically developing children and children with ADHD using these tests.

**Methods:** In this case-control study, all the 9-10 year-old boy students studying at the third and fourth grades were enrolled from schools in the 2nd educational district of Shiraz, south of Iran. Eighty students were then selected and enrolled into the ADHD group and the control group. The Diagnostic and Statistical Manual of Mental Disorders, 4th edition- text Revised (DSM-IV-TR), and the Child Symptoms Inventory were used to diagnose the children with ADHD. We evaluated and analyzed impulsiveness, non-impulsiveness, emotional problems and incompatibility indices in the DAP and DAF tests in each group.

**Results:** A significant difference was found in the indices of incompatibility and emotional problems, impulsiveness, non-impulsiveness and DAF between typically developing children and those with ADHD. The mean ( $\pm$ SD) total scores of the above mentioned indices in the ADHD group were 19.79( $\pm$ 2.94), 12.31( $\pm$ 1.84), 5.26( $\pm$ 2.29) and 5.89( $\pm$ 2.13), respectively ( $P < 0.001$ ). The corresponding figures for these indices in the normal group were 12.11( $\pm$ 4.74), 5.63( $\pm$ 2), 10.36( $\pm$  2.33) and 2.88( $\pm$ 2.13), respectively ( $P < 0.001$ ).

**Conclusion:** Significant differences were obtained between the control group and children with ADHD using these two drawing tests. The rate of impulsivity and emotional problems indices in drawings of children with ADHD was markedly more common than those of the typically developing children. This suggests the need for further assessment to screen ADHD.

**Keywords:** Attention Deficit Hyperactivity Disorder, Draw a Person Test, Draw a Family Test, Child Symptom Inventory.

*Iran J Psychiatry 2014; 9:4: 222-227*

Children should be able to freely express what is in their minds and souls, and drawing is a way for open expression. Children's drawing may be the perfect reflection of their simple or complex problems and their relationship with family members (1).

Draw a person (DAP) and draw a family (DAF) tests are suitable for assessing the mental, emotional and familial aspects of all children (2). The DAP test has been widely used in various studies for cognitive, emotional and impulsivity evaluation (3-8). The DAP is used for evaluating indices such as impulsiveness, non-impulsiveness and incompatibility problems as well (2, 8).

Oas showed that impulsivity indices in the DAP test are higher in impulsive children than non-impulsive children. Moreover, non-impulsivity indices were at a lower level (7). The validity and reliability of the DAP test is satisfactory (9-11). The DAF test assesses 11 variables (12). This test was invented by Hulse in 1951 (13), and has been evaluated by various studies (14-15).

Moreover, Zaback (1994) and Rachel (1999) assessed the application of the DAP test in sexual disorders and sexual abuse (16-17). Furthermore, Rachel and coworkers (2000) used the DAP test for predicting aggressive behavior in prisoners (18). Wendy and colleagues (2004) studied the group differences between individuals with obsession,

hyperactivity and Tourette's syndrome and normal individuals using the DAP test (19).

Attention deficit hyperactivity disorder (ADHD) is the most common behavioral problem during childhood (20). Therefore, we decided to evaluate drawing test performances in children with ADHD. This study compared the drawing of ADHD children with that of the typically developing children.

## Material and Methods

In this case-control study, all the 9-10 year-old boy students studying at third and fourth grades in boy schools in the 2nd educational district of Shiraz, south of Iran, were enrolled. Among the 800 enrolled boys, 40 students were selected as the case group for they were diagnosed as having ADHD. They did not have any history of chronic diseases such as diabetes or hypothyroidism. Further, nothing abnormal was found in the participants' physical examinations. Moreover, the laboratory tests evaluation of the children with ADHD did not show any significant finding. We also selected 40 boys for the control group among the remaining children without ADHD. All children lived with their parents.

At first, all the students were evaluated using the Child Symptom Inventory-Teacher's form (CSI-4) developed by Gadow and Spafkin (21, 22) based on the DSM-IV ADHD criterion (21); its Farsi version has enough validity and reliability (23). The mothers of those children who were diagnosed as having ADHD were invited to complete the Parent's form of CSI-4 questionnaire (23).

If the Parent and Teacher forms matched, then the student underwent the final screening stage which was a face-to-face interview with the parents. This interview was conducted to confirm the ADHD diagnosis according to DSM-IV-Text Revised diagnostic criteria. Forty children with ADHD were matched with 40 children without ADHD by age and gender.

Children in both groups performed the Draw-A-Person (DAP) and Draw-A-Family (DAF) tests in a silent environment. They were provided with a white A4 paper, a black pencil and an eraser and were asked to draw a person. The time taken to draw a person was recorded. Then they were asked about the gender of the drawn person. After finishing the test, the children were given another A4 paper and were told to imagine a family and then draw that family. If any of the emotional problems or the incompatibility variables such as deleting the important components of the body (such as hand or leg), simplifying the head or body, distortion and lack of proportion (such as inappropriate arm size) were shown, score of 1 was given, and if not, the score of 0 was given, except for score 1 to 9 for the weak quality of the drawing and sexual differentiation. If any of the DAF variables were presented, score of 1 was given, if not, the score of 0 was given.

Impulsivity and non-impulsivity indices have 13 variables separately; for example, if the signs which were suggestive of aggressiveness such as (knife, gun, blood), deleting important parts of the body for impulsivity index and shading, emphasis on the eyes and mouth for non-impulsivity index were detected, the score of 1 was given; for the existence of two components or more, the score of 2 was given, and if not, then the score of 0 was given.

### Statistical Analysis

Data were analyzed using SPSS software, version 11.5. The mean scores of impulsiveness, non-impulsiveness, indices in the DAP and DAF were compared between the two groups using the independent t-tests. P value less than 0.05 was considered as significant.

## Results

The maximum and minimum total scores of incompatibility and emotional problem indices in the ADHD group were 23 and 12, respectively, with a mean ( $\pm$ SD) of 19.79 ( $\pm$ 2.94). The corresponding figures for the normal group were 22 and 3, respectively, with a mean ( $\pm$ SD) of 12.11( $\pm$ 4.74) ( $P<0.001$ , Table 1).

The maximum and minimum total scores of impulsiveness in the ADHD group were 21 and 7, respectively, with a mean ( $\pm$ SD) of 12.31 ( $\pm$ 1.84). The corresponding figures for the normal group were 10 and 2, respectively, with a mean ( $\pm$ SD) of 5.63 ( $\pm$ 2) ( $P<0.001$ , Table 2). The maximum and minimum total scores of non-impulsiveness in the ADHD group were 11 and 1, respectively, with a mean ( $\pm$ SD) of 5.26 ( $\pm$ 2.29). The corresponding figures for the normal group were 16 and 6, respectively, with a mean ( $\pm$ SD) of 10.36 ( $\pm$ 2.33) ( $P<0.001$ , Table 3). The maximum and minimum total scores of DAF indices in the ADHD group were 10 and 0, respectively, with a mean ( $\pm$ SD) of 5.89 ( $\pm$ 2.13). The corresponding figures for the normal group were 7 and 60, respectively, with a mean ( $\pm$ SD) of 2.88 ( $\pm$ 2.13) ( $P<0.001$ , Table 4). Table 5 demonstrates the mean total scores of the four variables and their comparison between the two groups.

## Discussion

ADHD is the most common behavioral disorder in children. Therefore, the accurate diagnosis of children with ADHD in its primary stages is of prime importance. So far, various methods have been used to evaluate and diagnose this disorder such as related questionnaires, clinical interviews with parents and teachers and monitoring the child in different situations. Various projection drawings regarding child personality and mental disorders have been designed. We used the DAP test to evaluate and identify students with ADHD, and we also used the DAF test to assess the interpersonal relationship of the children with ADHD and their families.

Table 1: Mean scores of incompatibility and emotional problems in both groups

Incompatibility and emotional problem indices	Group	Minimum	Maximum	Mean	P value
1-Simplifying the head	ADHD	0	1	0.94	<0.001
	Normal	0	1	0.38	
2-Simplifying the body	ADHD	0	1	0.94	<0.001
	Normal	0	1	0.50	
3- Deleting the important components of the drawing	ADHD	0	1	0.76	<0.001
	Normal	0	1	0.22	
4- Distortion and lack of proportion	ADHD	1	1	1	<0.001
	Normal	0	1	0.83	
5-Weak quality of the drawing	ADHD	4	9	7.78	<0.001
	Normal	1	8	4.58	
6-Clarity of the drawing	ADHD	0	0	0	Not calculat
	Normal	0	0	0	
7-Sexual differentiation	ADHD	1	9	8.07	<0.001
	Normal	1	9	5.55	
8-Lack of balance in standing	ADHD	0	1	0.26	<0.001
	Normal	0	1	0.03	
9-Sexual details	ADHD	0	0	0	Not calculat
	Normal	0	0	0	

Table 2: Mean scores of impulsiveness indices in both groups

Impulsiveness indices	Group	Minimum	Maximum	Mean	P value
1-Consumed time	ADHD	0	2	0.47	<0.001
	Normal	0	0	0	
2-Disconnected lines	ADHD	0	2	1.57	<0.001
	Normal	0	2	0.33	
3-Omitting specific features	ADHD	0	2	1.78	<0.001
	Normal	0	2	0.83	
4- Shoulders	ADHD	0	1	0.81	<0.001
	Normal	0	1	0.11	
5-Aggressiveness	ADHD	0	2	0.31	0.037
	Normal	0	2	0.16	
6-Deleting important parts of the image	ADHD	2	2	2	<0.001
	Normal	0	2	0.88	
7-General quality of the image	ADHD	0	2	1.21	<0.001
	Normal	0	2	0.22	
8-Tendency to the left	ADHD	0	1	0.52	<0.001
	Normal	0	1	0.30	
9-Increasing the drawing surface	ADHD	0	2	0.36	<0.001
	Normal	0	2	0.88	
10-Neck	ADHD	0	1	0.57	<0.001
	Normal	0	1	0.13	
11-Weak planning	ADHD	0	1	0.36	<0.001
	Normal	0	1	0.06	
12-Posture	ADHD	0	1	0.28	<0.001
	Normal	0	1	0.08	
13-Proportions	ADHD	2	2	2	<0.001
	Normal	0	2	1.61	

Table 3: Mean scores of non-impulsiveness indices in the groups

Non-impulsiveness indices	Group	Minimum	Maximum	Mean	P value
1-Symmetry	ADHD	0	1	0.26	0.0013
	Normal	0	1	0.38	
2-Consumed time	ADHD	0	2	1.36	<0.001
	Normal	2	2	2	
3-Emphasis on the eyes	ADHD	0	2	0.15	<0.001
	Normal	0	2	1.05	
4- Design	ADHD	0	0	0	<0.001
	Normal	0	2	1.05	
6-Paying attention to details	ADHD	0	0	0	<0.001
	Normal	0	2	0.61	
6-Erasing mistakes	ADHD	0	1	0.34	<0.001
	Normal	0	1	0.88	
7-Size	ADHD	0	1	0.55	<0.001
	Normal	0	1	0.41	
8-Place of drawing	ADHD	0	1	0.42	0.175
	Normal	0	1	0.36	
9- Sexual identity	ADHD	0	1	0.03	0.161
	Normal	0	1	0.08	
10- Features of the mouth	ADHD	0	2	0.47	<0.001
	Normal	0	2	1.11	
11- Scenery and landscapes	ADHD	0	1	0.03	0.345
	Normal	0	0	0	
12- Tendency to the right	ADHD	0	1	0.36	<0.001
	Normal	0	1	0.50	
13- Shading	ADHD	0	2	1.26	<0.001
	Normal	0	2	1.88	

Table 4: The mean scores of DAF variables in the groups

DAF indices	Group	Minimum	Maximum	Mean	P value
1-Very weak organization	ADHD	0	1	0.78	<0.001
	Normal	0	1	0.25	
2- Smallness of the total drawing space	ADHD	0	1	0.48	<0.001
	Normal	0	1	0.13	
3-Drawing oneself smaller than other	ADHD	0	1	0.59	<0.001
	Normal	0	1	0.44	
4-Very simple image without any details	ADHD	0	1	0.67	<0.001
	Normal	0	1	0.16	
5-Drawing oneself distant and separated from others	ADHD	0	1	0.51	<0.001
	Normal	0	1	0.38	
6-Weak sexual differentiation between the drawn members	ADHD	0	1	0.64	<0.001
	Normal	0	1	0.22	
7-Lots of empty spaces in the drawing	ADHD	0	1	0.54	<0.001
	Normal	0	1	0.27	
8-Omitting a member of the family from the drawing	ADHD	0	1	0.59	<0.001
	Normal	0	1	0.44	
9-Deleting important features of the drawing	ADHD	0	1	0.81	<0.001
	Normal	0	1	0.38	
10- Drawing the parents undesirably	ADHD	0	1	0.24	<0.001
	Normal	0	1	0.16	
11- Drawing the male sex undesirably	ADHD	0	0	0	Not calculate
	Normal	0	0	0	

Table 5: The mean total scores of the four variables and their comparison between the two groups

Variables	Group	Minimum	Maximum	Mean	SD	P value
Incompatibility and emotional problems	ADHD	12	23	19.79	2.94	0.001
	Normal	3	22	12.11	4.74	
Impulsiveness index	ADHD	7	21	12.31	1.84	0.001
	Normal	2	10	5.63	2.00	
Non-impulsiveness index	ADHD	1	11	5.26	2.29	0.001
	Normal	6	16	10.36	2.33	
DAF	ADHD	1	10	5.89	2.22	0.001
	Normal	0	7	2.88	2.13	

Many of these students were identified at school and were then evaluated and treated.

The DAP test has been widely used in many emotional-cognitive disorders. Some studies have shown a correlation between the indices of the DAP test and children's verbal intelligence score (4, 24). This test has been used as an initial screening tool for evaluating intelligence; however, it should not replace the standard intelligence tests (2).

Naglieri and colleagues used the DAP test for the initial screening and assessment of emotional disorders and found a significant difference between the drawings of exceptional and normal students (5).

A significant relationship existed between the conflict indices in the DAP test and mental pathologies (6). To assess a conflict in a child, Groth-Marnat has suggested to determine 9 indices in the DAP test (2). We found a significant difference between the case and control groups with respect to conflict indices in the DAP test, with a mean of 19.79(±2.94) in ADHD and 12.11 (±4.74) in normal children.

In two other studies, using the indices of the DAP test that assessed impulsivity, the researchers found that people with ADHD draw a part of the person out of the

border of the page (3, 4). Drawing items such as zipper, pocket, or belt shows a tendency to control impulses, and the lack of consistency and organization in the image and drawing, thin shoulders and wide arms depicts a tendency to be impulsive (3).

Currently, Oas's study (7) is considered as the most successful formulation for evaluating impulsivity (2). Oas showed that impulsivity indices in the DAP test are higher in impulsive children than non-impulsive children. Moreover, non-impulsivity indices were at a lower level. Consistently, in our study, the comparison of these indices between the two groups was highly significant. Impulsiveness scores were 12.31(±1.84), 5.63(±2) in ADHD and normal children, and non-impulsiveness scores were 5.26(±2.29), 10.36(±2.33) in ADHD and normal children.

Zaback and colleagues (1994) found that in normal individuals, 92% of men and 64% of women draw their same sex first in the DAP test (16). In a study of 1500 people, Leibowitz (1999) observed that 78% of normal people draw the image of the same sex while 81% of homosexuals draw the picture of their opposite sex first (3).

Rachel (1999) found that the DAP results differed significantly in the four general indices of the facial, eye, hand and arm and genital organs in adults who were sexually abused in childhood compared with those who were not (17). The results of Rachel's study were highly effective in discovering and identifying adults who had been sexually abused in childhood, and they suggested that the DAP test be used as a clinical tool. Moreover, Rachel and coworkers (2000) used the DAP test to predict aggressive behaviors in prisoners (18). The results showed that the eyebrows, shoulder, hair, mustache and eye indices significantly differed in aggressive prisoners compared to non-aggressive ones. These recent (16, 3, 17, 18) studies are other samples for DAP test usage in psychological problem detection. Human Figure Drawings were found to be a time/cost-effective, sensitive and culturally appropriate means for measuring emotional well-being in Debiase,s study (25).

There were significant differences between depressive patients and normal individuals in DAF test variables (14). Also, comparing the results of this test between children from divorced and non-divorced families revealed significant differences (15). In our study, the same result was obtained. DAF scores were  $5.89(\pm 2.13)$ ,  $2.88(\pm 2.13)$  in ADHD and normal children, respectively.

If children with ADHD are not recognized at the right time, their disorder might be left untreated and their performance will weaken. Moreover, it would lead to personality disorders, delinquency, drug addiction, alcohol use and depression in adulthood. Hyperactivity, immaturity in social behavior, impulsiveness and interference with teacher's educational strategies severely affect the learning of these children.

We aimed to introduce the DAP and DAF tests as primary screening tests. The simplicity and applicability of these tests are beneficial in the primary detection of high risk children at schools. These tests can be easily taught to the health teachers. Detected children can be referred to physicians, their parents can be interviewed and the rest of the diagnosis and treatment process can begin. Using a set of methods and techniques for diagnosis leads to better diagnosis of the disorder and therefore these tests can be added to the previous diagnostic tools.

## Conclusion

Significant differences were found between normal children and ADHD children using these two drawing tests. The rate of impulsivity and emotional problems indices in ADHD children's drawing was markedly more common than that of the typically developing children. This suggests the need for further assessment to screen ADHD.

## Contributors

1. Main concept, 2. design, 3. data gathering and Interview, 4. Data analysis, 5. Interpretation of the results, 6. preparing the first of the manuscript, 7. Revision of the manuscript.

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