

# The Impact of Neurofeedback on Clinical Signs of Children That Have Attention Deficit Disorder and Hyperactivity

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## Abstract

This study was an attempt to examine the impact of Neurofeedback on clinical signs of Children that have attention deficit disorder and hyperactivity. The participants of this study 24 boys (6-11) that afflicted to ADHD. The participants of the study randomly divided into two groups and were selected to participate in the study. The experimental group received the Neurofeedback treatment (8 weeks, three sessions in a week). The control group, on the other hand was placed in a wait list. After treatment, CBCL, IVA, QEEG were administered between two groups. The analysis of data revealed that Neuro feedback has a significant impact on ADHD children. Moreover, Neurofeedback treatment leads to improve attention deficit disorder and decrease impulsivity in ADHD children.

**Keywords:** ADHD and attention deficit disorder, Neurofeedback

## 1. Introduction

Attention deficit and hyperactivity (ADHD) is a stable pattern of attention deficit and arousal that is more common and severe than normal children. There are some symptoms before the age of seven and lead to the clinical disorder in social, educational and professional functions of a person (American Psychiatric Association, 2000). ADHD is one of the most common psychiatric disorders between children and adolescents. Its prevalence is 3 to 7 and the proportion of boys to girls 4 to 1 (Cormirer, 2008). Most of the time, the parents of these children resort to some ways in order to control their behavior but it embitters their conditions (Fabiano et al., 2008). Nowadays, ADHD is a behavioral detection.

“Neurofeedback is a type of biofeedback that measures brain waves to produce a signal that can be used as feedback to teach self-regulation of brain function. Neurofeedback is commonly provided using video or sound, with positive feedback for desired brain activity and negative feedback for brain activity that is undesirable. Related technologies include hem encephalography biofeedback (HEG) and functional magnetic resonance imaging (fMRI) biofeedback” (Margo, 2016).

The researchers examined different treatments in order to cure this behavior including Quantitative Electro Encephalography (QEEG) (Lazzaro, Gordon, & Whitmont, 1998). Neurofeedback is also a safe, painless and non-invasive method in which an electrode called the sensor that is attached to the patient’s head (Kaiser & other, 2000). Frank H. Duffy, MD, a Professor and Pediatric Neurologist at Harvard Medical School, stated in an editorial in the January 2000 issue of the journal *Clinical Electroencephalography* that scholarly literature now suggests that Neurofeedback should play a major therapeutic role in many difficult areas (Duffy, 2002).

Hence the matter of this study is to examine the impact of Neurofeedback on clinical signs of Children that have attention deficit disorder and hyperactivity. One question is going to be addressed to what extent Neuro feedback can be effective on clinical signs of children (6-11) that have attention deficit disorder and hyperactivity. The purpose of this study is to examine Neuro feedback method and introduce advantage of it in improving and regulating brain waves. Moreover, it has long effects unlike medicine.

## 2. Methodology

The present study sets out to investigate the effect of Neurofeedback on clinical signs of children that have attention deficit disorder and hyperactivity.

### 2.1 Participant

The Participants of the study were male who were selected from among a total number of 24 boys that were treated at the ATEYEH comprehensive psychiatric center in Tehran, Iran. They suffered from attention deficit disorder and hyperactivity. Control and experimental groups are the same as each other in pre-test and post-test of research.

### 2.2 Instruments and Design

In order to examine this study, the researchers applied various procedures such as, diagnostic interview, quantitative Electro Encephalography, Achenbach system of Empirically Based Assessment simultaneous test of visual and Audio Qualitative Electro Encephalography. It is equipment to record brain activities through electrode and Achenbach system of Empirically Based Assessment.

It consists of sheets in order to assess competency, Adaptive functioning and Emotional and behavioral problems simultaneous test of visual and audio: this test lasts 22 minutes in order to standardize the results and controlled by computer. The test can be divided into 4 parts: 1) warm up, 2) practice, 3) main CPT, 4) Calm down.

### 2.3 Data Collection

The researchers collected data and analyzed them through differenced steps as follows:

- 24 boys (6-11) were interviewed.
- To be assessed by QEEG.
- The boys answered the test (IVA) and CBCL regarding to the age, severity of disorder, and IQ.
- They are treated through Nero feedback in 8 weeks, there sessions (24 sessions). The duration of each session was 1 hour.
- Connected one electrode to the  $C_3$  or  $C_4$  for (SMR) and  $C_2$ ,  $F_2$  for (B). Two electrodes to the ears. EEG was also recorded in four bands TETA (4-8 H2), SMR (12-15),  $\beta$  (15-18H2)  $\beta$  2(19-28 H2).

## 3. Data Analysis

In order to the answer the question to what extent Neurofeedback can be effective on clinical signs of children (6-11) that have attention deficit disorder and hyperactivity. The results of this study shows the moderated averages have decreased in experimental group. As a result ADHD problems have decreased in experimental group. The following table shows moderated average between control and experimental groups.

Table 1. Moderated average between two groups

Confidence interval		Standard deviation	Average	Groups	Variable
High	Low				
10.344	8.839	0.361	9.592	control	ADHD
6.827	5.329	0.361	6.075	experimental	
10.803	8.984	0.463	9.893	control	Attention
7.683	5.864	0.463	6.677	experimental	deficit

The results of multivariable tests show that the pre-test scores have a significant and meaningful effect on the group ( $P < 0.01$ ). The Table two shows the results of multivariable covariance.

Table 2. The results of multivariable tests

ETA separation	Meaningful	The degree of freedom deviation	The degree of freedom hypothesis	F	Rate	Tests	Agent
0.609	0.001	17	3.000	8.883	0.609	PYLA	
0.609	0.001	17	3.000	8.883	0.391	LAMBDI	
						VIIKEZ	group
0.609	0.001	17	3.000	8.883	1.559	Hetling	
0.609	0.001	17	3.000	8.883	1.599	The largest root	

As can be seen in the Table 3, there is no statistically significant meaningful difference between two groups ( $P > 0.05$ ). On the other hand, the other factors statistically significant meaningful difference between two groups ( $P < 0.05$ ).

Table 3. Covariance analysis between two groups

Square Of ETA separation	Meaningful	F	Square average	Freedom degree	Sum of squares	Problem	Variance source
0/018	0/565	0/343	6/101	1	6.101	hyperactivity	group
0/544	0/0001	22/671	27690/427	1	27690.427	attention	
0/487	0/0001	18/026	17579/545	1	17579.545	impulsivity	
			17/763	19	337.492	hyperactivity	deviation
			1221/421	19	23206.990	attention	
			975/220	19	18529.180	impulsivity	

According to the Table 4, moderated average of variables between two groups indicates that moderated average is between 277/576 and 321/208 in the experiment group except hyperactivity variable.

Table 4. Moderated average of variables between two groups

Confidence interval		Standard deviation	Average	Groups	Variable
High	Low				
111.135		1.257	108.505	control	hyperactivity
112.210		1.257	109.79	experimental	
248.841		10.423	227.025	control	attention
321.208		10.423	299.392	experimental	
317.830		9.314	298.336	control	impulsivity
375.491		9.314	355.997	experimental	

#### 4. Discussion

The study was an attempt to examine the effect of Neurofeedback on clinical signs of children that have attention deficit disorder and hyperactivity. The findings of this study strongly and positively are the same as the previous studies like HILARD (2012), Peyerand et al. (2015), Vangler et al. (2011) and Gonslin (2010). The previous study shows that can be pointed out theoretical and practical notes. Theoretical results can help to recognize the causes and continuing disruption. Moreover, practical results indicate the effect of Neuro feedback on the attention deficit, hyperactivity and impulsivity in the ADHD disorder according to the CBCL test.

## 5. Conclusion

This study attempts to investigate the effect of Nero feedback on attention deficit and hyperactivity. The findings of this study reveal that first, Neurofeedback can reduce 70% of variance ADHD disorders Neurofeedback have a significant effect on behavioral symptoms, lack of attention and impulsivity; conversely. It seems that it is not successful in reducing symptoms of hyperactivity. Secondly, this method can be used as a supplement or even replace medication for ADHD disorder the last one is Neurofeedback helps brain to regulate and eliminate the defect of function.

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