



# The Effect of Neuro-feedback on Indicators Obsessive-Compulsive Disorder and Anxiety

Sepideh Shahmoradi\*<sup>1</sup>, Mohamad Oraky<sup>2</sup>

## ABSTRACT

The aim of this study was to compare the effectiveness of neuro-feedback training on the reduction of indicators obsessive-compulsive, and anxiety.

The sample of this study was patients with obsessive-compulsive disorder and anxiety, which were selected through purposeful sampling and in the situations of entry and exit. They were randomly appointed in two groups of neuro-feedback and drug therapy. The Madesley and Beck Anxiety Inventory was used to collect the data from the subjects. In this study, only control group used drug. Finally, using SPSS software, data were analyzed by Covariance method.

The findings of this study indicate that neuro-feedback training lead to the significant reduction of checkpoints, rinsing, Kennedy and anxiety ( $P < 0.05$ ).

The results of this study show the effectiveness of this method as a complementary method to other treatments such as pharmacotherapy and psychotherapy in the treatment of obsessive-compulsive disorder and anxiety.

**Key Words:** neuro-feedback, obsessive-compulsive disorder, index, MOCI, anxiety

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## Introduction

Current cognitive theories posit that potentially harmful and immoral intrusive thoughts, images, or impulses elicit an inflated sense of personal responsibility, leading to compulsive behaviors, such as checking, ordering, or counting, to prevent unfavorable consequences (Salkovskis 1985; Salkovskis et al., 1998). Mancini and Gangemi (2004) proposed that OCD is dominated by a feeling of fear of guilt that would stem from behaving irresponsibly.

Patients with OCD often display dysfunctional appraisal about the power of their internal representations, believing that the mere appearance of an intrusive thought is morally the same as actions and behaviors driven by that thought (moral thought action fusion) (Rachman, 1997; Shafran and Rachman, 2004).

Recent progress in social neuroscience may provide a direct link between these theories and the neuronal mechanisms of OCD symptoms. Harrison et al. (2012) used functional magnetic resonance imaging (fMRI) in order to measure brain activation in OCD during the processing of moral dilemmas. Relative to controls, patients with OCD displayed increased activation of the medial orbitofrontal cortex, left dorsolateral prefrontal cortex, and middle temporal gyrus. Critically, the global severity of OCD symptoms predicted the extent of activation in the orbitofrontal striatal system during the processing of moral dilemmas, which is broadly consistent with the common pathophysiological and functional neuroanatomical models of the illness (Evans et al., 2004; Harrison et al., 2012; Menzies et al., 2008).

\*Corresponding author: Sepideh Shahmoradi

Address: <sup>1</sup>M.A in psychology, Payam Noor University, Iran; <sup>2</sup>Associate Professor in Psychology, Payam Noor University, Iran

e-mail ✉ shahmoradisepideh@gmail.com

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In recent decades, the cognitive research literature on obsessive-compulsive disorder has given a multi-dimensional and complex clinical picture of the disorder. Obsessive-compulsive is a heterogeneous disorder and in most of the people cognitive-behavioral procedures are used to treat symptoms of obsessive-compulsive disorder in the follow-up period. In DSM-IV, there was no separate disorder under obsessive-compulsive. Obsessive-compulsive disorder based on the DSM-V classification is divided into five categories of obsessive compulsive disorder, dys formic disorder, hoarseness disorder, hair disorder, skin impairment, and as a separate disorder of anxiety disorders.

The prevalence of this disorder is usually gradual and appears more in the early adolescence or adulthood, after a stressful event such as pregnancy, problems appeared in emotional and occupational relationships. About 2.5% of people experience OCD during their life. Also, children under the age of fourteen to fifteen face with this disorder. At least, the beginning age of the disorder is seven years old (Kaplan, 2010; Haljin, 2010).

Early onset prevalence is more common in men and obsessive-compulsive, and its late prevalence along with control practical obsession appeared in female. Obsession is accompanied with other anxiety, depression and personality disorders such as avoidance. There is a bidirectional relationship between depression and obsession.

Obsessive compulsive behaviors include: obsessive-rinsing, obsessive-checkout, suspicious, obsessive-compulsive, and Kennedy obsession so in this research Obsessive related to the pollution is the most common obsessive-compulsive disorder which often show as a practical obsessive rinse.

The biological point of view recognizes the cause of this disorder related to the genetic disorder and abnormalities exist in several regions of the brain. The affected areas include caudate nucleus, the forehead cortex, and belt cortex which together form the thalamic artery, and are concerned with the treatment of irrelevant and distorted information. The overlocking of this circuit causes OCD symptoms that a person is not able to clear the irrelevant information. Mc Dugal (1998) investigated the issue of attention deficit hyperactivity disorder of the singular area causes obsessive-compulsive behavior. Also, abnormalities exist in the serotogenic system (reduction of serotonin) and the brain waves of these people in the work.

One of the most widespread areas of research in recent decades has been anxiety and its related domains. There is still ambiguity about anxiety. All people experience this feeling and tension during periods of their life, which can be rehabilitating and in terms of the power of the strain. Powerful anxiety enables a person to act and think about it in line with his or her purpose.

Anxiety can lead to defeat and inconsistency in the individual and deprive him of a large part of his or her capabilities and abilities. Increasing of anxiety in individual reduced efficacy. Test anxiety is a situation when a person become upset about his or her performance or disability and doubts about his capability. Anxiety can be associated with an increased risk of medical illness and also has been considered as a risk factor in the broad etiology of psychiatric disorders, especially depression and alcohol abuse. Therefore, psychological intervention in anxiety disorder has a special place.

Effective treatments for this obsessive-compulsive disorder are drug therapies that play the first role in the treatment. Also, physiological and psychometric treatments are the most successful procedures in exposing and preventing response, cognitive-behavioral therapy and physiological treatments are divided into invasive and non-invasive categories include neuro-feedback and non-invasive TDCS, and TMS, which is an invasive technique. Be In this study, the brain-control and synchronization techniques, the neuro-feedback, are considered here. Here we explain the neuro-feedback treatment.

In the field of psychological disorders, neurophysiologic studies have investigated the relationship between brain electrical waveguide, the mechanisms of brain thalamic and psychological states, that the creation of optimal oscillations and changes in the rhythm and frequency of brain waves, using neural methods Therapy can make optimal changes in psychological states (Serman, 1996). Neuro-feedback is one of these nerve therapies that began with Serman (1996), and by many people Continued (Cabot, Michel, Pritchup and John, 2001; McCarthy and Silkowitz, 2001; Heywood & Beal, 2003). The neuro-feedback is a comprehensive therapeutic system that works directly on the brain.

The neuro-feedback causes changes, enhancement, modulation, and increase the efficiency of the brain cells. In fact, knowledge is a kind of technology that helps patients who are



mentally and cognitively capable of mental health and those who are mentally motivated. The brain will learn with simple reinforcement how to continue to prolong normal brain wave patterns. Over the course of several sessions, most of the users get a lot of deliberate and self-conscious awareness and gradually learn to focus on the long-term (even during tedious assignments in the classroom or at work). The reason for the interest of neuro-feedback for psychologists is that the brain is the center of emotion, thoughts and thoughts that define many problems for psychologists. Types of problems such as anxiety, depression, attention deficit hyperactivity disorder, learning disabilities, brain damage, obsessive-compulsive disorder, epilepsy, panic attacks, and sleep disorders can be improved or treated through a neuro-feedback.

Research conducted in several decades ago showed that neuro-feedback education in the treatment of obsessive-compulsive disorder (Moore, 2000; Hammond, 2003; 2004), anxiety (Vanathy et al., 1998, Hammond, 2005), attention deficit disorder (Kierser and Othmer, 2000; Bakhshayesh et al., 2007); depression (Hammond, 2005; Rosenfeld, 1997), and even applies to the optimal functions of healthy people.

Researches has been done on obsessive-compulsive therapy using neuro-feedback, which indicates the high efficacy of this method in the treatment of obsessive-compulsive disorder. Nevertheless, further research on the efficacy of neuro-feedback seems necessary because of its approximate emergence (quoted by Hammond, 2006). However, there is no research about effectiveness of neuro-feedback on obsessive compulsive scales and its comparison with anxiety. Obviously, such studies will be helpful in deciding which therapists to choose for the treatment of obsessive-compulsive patients.

Does neuro-feedback training reduce the amount of review, hesitation, Kennedy and rinsing in people with obsessive-compulsive disorder?

Does neuro-feedback training in obsessive-compulsive disorder reduce the symptoms of anxiety?

## Methodology

The present research is part of a semi-experimental design, pre-test-post-test with control group that the neuro-feedback program was performed on the first

group and then compared with the control group, which was the only drug treatment.

The statistical population of the present study included all individuals aged between 20 and 45 years old with obsessive-compulsive disorder and anxiety, who referred to the center of counseling and psychology of Payame Noor University in Tehran and the Tehran Health Private Centers. Among people, 10 individuals were randomly selected and assigned to two groups of four neuro-feedback and pharmacotherapy. In this research, each position (neuro-feedback, medication) included 4 men and women from the community with obsessive-compulsive disorder and anxiety. At the beginning of the study, 2 subjects refused to continue treatment, and 2 others were replaced. All three positions were matched based on the age, gender & education. Meantime, all subjects received necessary information in advance and the consent form was signed by the subjects.

1. Adults are between 20 and 45 years of age.
- 2- Non-dependence or substance abuse.
3. Have a low level of diploma qualification.
4. There is no learning disorder that is considered as the main problem.
5. Having a normal IQ.
6. Do not suffer from personality disorder.

In order to evaluate and measure the indices studied in the present study, the following methods and tools were used. Diagnostic interview was performed based on the diagnostic criterion for anxiety disorder based on DSM by the psychiatrist.

MOCI was developed by Rachman& Hodgson (1977) to investigate the type and scope of obsessive compulsive disorder. The questionnaire consisted of 30 items, half of them were the correct key, next half with the wrong key, and in the initial validation at the Madesly Hospital, 50 obsessive patients from 50 Roand Nehand treatments were well separated. Using a simple scoring method, an obsessive scoring can be made. Total and four sub grade points. The four components are: Checkout, Cleanness, Kennedy, and Hesitation. The Grading Score is scored with zero and one. The validity and reliability have been approved. For example, Sanavio obtained a correlation between the total score of the Madesley



test and the PADOA test was 70%. The calculated reliability was high between the test and the retest ( $r = 0.89$ ) (Rachman 1997, quoted from Turner and Weillel). In Iran, Stikti (1976) the reliability of this tool was 0.88 (0.876), the reliability of the whole test was 0.84 and its convergent validity was 0.87 with obsessive-compulsive measure of Wil-Brown.

Beck's questionnaire is a self-report questionnaire designed to measure the intensity of anxiety in adolescents and adults. Beck (1998) introduced Beck's Anxiety Inventory, which specifically tests the severity of clinical anxiety symptoms. Studies show that the validity of the questionnaire is high. Its internal consistency coefficient (alpha coefficient (0.92), its validity is 0.75 with a rehearsal method, and the affinity of its females varies from 0.21 to 0.76. The five types of content validity, concurrent, the structure, diagnostic and factor for this test have been measured which all indicate the high efficiency of this instrument in measuring the severity of anxiety.

the severity of anxiety. Four options for each question are scored in a four-dimensional range from 0 to 3. Each test item is one of the common symptoms of anxiety (symptoms) mental, physical and fear. Therefore, the total score of the questionnaire is in the range of from 0 to 63 (Kaviani and Mosavi (1999), in the study of the psychometric properties of this test in the Iranian population, the validity coefficient is about 72% of the validity of the test-retest has been reported at 83% for one month and Cronbach's alpha is 92%.

Therapeutic course was performed for a period of 10 weeks, in terms of week for three times and each session lasting 40 minutes in the neuro-feedback group. Both the Madesley and Beck anxiety inventory were performed before and after the treatment for 10 weeks. First, based on the international system of 10-20, electrodes with special adhesion were installed at appropriate locations that were based on the pre-specified treatment protocol, at the beginning of each session, the base line was recorded for 2 minutes and 10 seconds with open/close eyes. All subjects of the group one and two alpha / theta programs in the post-serial area were trained in two windows for 15 minutes and the beta / theta program and smr in the right region of the head for 15 minutes. Right hemisphere supports the auditory and visual feedback. When A person determine his beta, SMR, 0.05 seconds higher than the set threshold, and at the

same time hold the beta lower than the threshold; therefore, it can receive a prize His homework takes a step further and receives visual and auditing feedback so that the brain cells are conditioned and during the 30 training sessions they will be able to adjust the waves themselves. Also, the alpha / theta training series will follow the feedback listening-visual, meditation and nature sounds, here the goal is to establishing harmony between the alpha / theta wave In group 2 or pharmacotherapy which included 4 patients, a preliminary test was performed at first for the 10 weeks only pharmacotherapy was performed then the post-test was re-implemented.

### Research Findings

Descriptive data were analyzed by descriptive statistics and comparison of means by using covariance analysis after modifying the pre-test scores using SPSS software with 95% confidence interval (Table 1).

Table 1. Descriptive data were analyzed by descriptive statistics pre-test and post-test in neuro-feedback group.

Kennedy Index	Rinsing index	Hesitance Index	Checkout Index	Group in pre-test stage
4.59	4.5	4.5	4.5	Neuro-feedback
2.39	1.97	6.75	3.75	Control
				Group in post-test stag
6.75	4.75	2.39	1.62	Neuro-feedback
2.5	3.16	2.50	2.81	Control

Considering that the significance level is more than 0.05, so that the two groups of control and testing are not significantly different in terms of variance; hence, the assumption of variance equation for the covariance test is observed.

In the pretest group, the test index was the index of skeptic index of washing, the Kennedy index

Considering that the significance level is more than 0.05, so the two groups of control and testing are not significantly different in terms of variance, so the assumption of variance equation for the covariance test is observed.

After modifying the pre-test scores, there was a significant effect on checking, Kennedy and rinsing, Due to the fact that the level of significance among the groups is less than 0.05.

On the other hand, the interval distance between the two groups is negative. It means lower post-test score in the neuro-feedback group and indicates a significant effect of neuro-feedback on checking,



Kennedy and rinsing indicators. On the other hand, in the hesitance index indicates a significant level greater than 0.05 that the two groups did not have a significant difference in terms of variance. So neuro-feedback has no significant effect on this component (Table 2).

In the Beck scale, the mean (standard deviation) of the neurofeedback and control group in the pre-test were respectively (1.97, 4.5) (4.75.3.16) and in the post-test the mean (standard deviation) of the neuro-feedback and control group (6.5 , 3.06) and (20.5 and 3.75).

Considering that the significance level is more than 0.05, so the two groups of control and testing are not significantly different in terms of variance, so the assumption of variance equation for the covariance test is observed (Table 3 and 4).

The result of the test showed the effect of neuro-feedback on anxiety reduction, after modifying the pre-test scores, there was a significant difference between the subjects.

Considering that the significance level between groups is less than 0.05, it shows the significant effect of neuro-feedback on anxiety.

The results of this study showed that neuro-feedback significantly reduces participants' anxiety.

## Discussion and Conclusion

The present study suggests that the neuro-feedback affects checking, Kennedy and rinsing and does not effect on hesitant. Since hesitation is thought to be a component of obsessive compulsive disorder, it seems that the effect of neuro-feedback training on effective obsessive compulsive disorder is effective.

The current research is in line with the research carried out by (Moore, 2000; Hammond, 2003 and 2004,). Studies conducted over the past decades showed that neuro-feedback training is effective in the treatment of obsessive-compulsive disorder.

As, this study was performed on obsessive-compulsive components and it is unique in its kind. Also, the results of this study showed that neuro-feedback had a significant reduction in participants' anxiety

The present research is in line with other findings such as Hammond (2003) Moore (6) Heller (10) and colleagues. Therefore, it can be concluded that neurofeedback training has reduced the anxiety symptoms in participations with anxiety disorder.

The results of neuro-feedback on obsessive-compulsive disorder and anxiety indicates a reduction in anxiety symptoms in comparison with obsessive-compulsive disorder.

Table 2. Result from covariance the indicators of obsessive compulsive disorder.

Indicators	Variable	Sum of Squares	Degree of Freedom	Average Squares	Coefficient f	Significant
Checking Index	In-group	6.98	1	6.98	25.7	0.004
	Inter-group	2.93	1	2.93	6.98	0.04
	Remaining	28.2	8	3.53		
Hesitance index	In-group	4.88	1	4.88	2.91	0.14
	Inter-group	0.22	2	0.11	0.68	0.93
	Remaining	8.63	5	1.67	6.98	
Kennedy Index	In-group	2.93	1	2.93	20.4	0.04
	Inter-group	10.1	2	5.55		0.002
	Remaining	2.09	5	0.41		
Rinsing Index	In-group	9.13	1	9.13	16.9	0.009
	Inter-group	200.7	2	1.00	1.86	0.02
	Remaining	2.69	5	0.53		

Table 3. The results of Leven test in neuro-feedback & control group.

Significant (SIG)	Degree of Freedom 2	Degree of Freedom 1	Coefficient F	
0.985	9	1	0.016	Beck test

Table 4. The results of covariance in Beck Index.

The size of the effect	Significant (SIG)	Coefficient F	Mean square	Degree of freedom	The sum of square	The source of changes
0.594	0.005	13.192	139.1	1	139/10	In-group
0.691	0.009	8.948	372.833	2	745/665	Inter-group
			54/10	9	94/897	Remaining



The evidence support from unconscious learning and it has been discussed for more than a century since the neuro-feedback scope formed. Learning and conditioning is a factor. The duration of the treatment is usually long-term (at least 30 sessions), especially when neuro-feedback involves brain conditions and changes in brain studies which makes this period more volatile (Hammond 2006). Therefore, the results are observed over time.

In the direction of the effectiveness of neuro-feedback, anxiety and obsessive-compulsive disorder have been shown to help individuals through conditioning to adapt psychosocial responses and anxiety control skills. In this regard, all research suggests that neuro-feedback can reduce the condition of brain waves of individuals in different age groups such as mood disorders. In this way, individuals can reduce their anxiety by focusing on the animation presented in their particular circumstances and increase their relaxation time by repeating the sessions. In protocols that are effective in reducing anxiety, one can see that people experience relaxation after about 5 minutes. The anxious person can increase his / her exercise and repeat it after experiencing his physiological and neurological changes. This method is safe and completely painless and at the same time, no harm has been reported.

One of the limitations of this research is the lack of control on other variables that could affect the results. These variables may include changes in the living environment or family life and other influential factors. Of course, the researcher has tried to test the conditions of the particular conditions in the sampling, but other factors such as personality traits, duration of anxiety and obsessive-compulsive disorder, etc... are not controlled. The low number of subjects makes it difficult to generalize the results.

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