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Metacognitive Therapy, Neurofeedback and Treatment With Fluvoxamine on Cognitive Attentional Syndrome and Cognitive Emotion Regulation Strategies in Patients With Obsessive-Compulsive Disorder

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Abstract

Background: Due to the lack of enough researches on the impaired underlying mechanisms in the obsessive-compulsive disorder (OCD) and also existence of new psychological therapies such as metacognitive therapy and neurofeedback, the application of mentioned mechanisms in the new therapies can be introduced as a possible effective option with more long term effects to treat OCD.
Objectives: The current study aimed to compare the effectiveness of metacognitive therapy, neurofeedback and treatment with fluvoxamine on the cognitive attentional syndrome and cognitive emotion regulation strategies in the patients with OCD.
Methods: In a quasi-experimental study, on the clients referring to two psychiatry and psychology centers in Kerman city, Iran, 40 patients with OCD were selected using purposive sampling and randomly divided into three experimental groups and one control group. Each of the experimental groups was under treatment for 10 weeks, while the control group was just followed-up during the mentioned period. The subjects were assessed before and after treatment using Yale-Brown obsessive-compulsive scale, cognitive attentional syndrome scale and cognitive emotion regulation questionnaire.
Results: The results of covariance analysis and paired comparisons of the groups indicated that metacognitive therapy and neurofeedback had equal effects on the reduction of cognitive attentional syndrome scores, and little effect of treatment with fluvoxamine on this variable. In addition, the results indicated the effectiveness of metacognitive therapy and neurofeedback on cognitive emotion regulation strategies and the effectiveness of fluvoxamine on the maladaptive strategies. It should be noted that metacognitive therapy was more effective than neurofeedback to improve cognitive emotion regulation strategies of patients with OCD.
Conclusions: The current research showed that metacognitive therapy and neurofeedback can be used as effective treatments on underlying mechanisms of the obsessive-compulsive disorders such as cognitive attentional syndrome and cognitive emotion regulation strategies.

Keywords: Obsessive-Compulsive Disorder, Cognitive Attentional Syndrome, Cognitive Emotion Regulation Strategies, Metacognitive Therapy, Neurofeedback, Fluvoxamine

1. Background

Cognitive attentional syndrome (CAS) is a kind of iterative thinking that emerges in the form of anxiety, rumination and focused attention on the threat and maladaptive emotion regulation strategies (1). In this regard, Wells and Matthews investigated the role of transdiagnostic processes such as CAS in creating and persistence of psychological disorders, and managed to design therapeutic intervention titled metacognitive therapy (MCT) to achieve the significant short time improvement in such underlying mechanisms. This treatment showed that OCD was associated with the activation of maladaptive thinking styles, including negative beliefs about the meaning and power of intrusive thoughts, and it can lead to negative assessment of disturbing thoughts as a sign of threat (2). Also, they can draw person's attention toward negative information and by activation and persistence of the sense of threat expose the person to long time negative emotions that mainly present in the form of anxiety. As a result, to avoid these situations and achieving emotion regulation person uses maladaptive coping strategies (1).

In fact, according to the theoretical model proposed by Welles, to understand psychological disorders, in addition to CAS, coping strategies such as emotion regulation strategies should be considered (3).

Cognitive emotion regulation strategies (CERS) are a subset of emotion regulation strategies and include cognitive strategies, which in time of experiencing negative emotions manage the information that is emotionally incentive and lead to the application of emotional strategies that are flexible and appropriate to the situation (1). Garnefski, Kraaij and Spinhoven considered nine adaptive and maladaptive strategies for CER (4). Researches showed that people with OCD mostly use maladaptive cognitive strategies and barely use adaptive strategies to regulate their emotions (5, 6). This emotional failing also leads to increase the severity of OCD symptoms (4), cause biasing in the pre-attention processes (low awareness) and selective attention to the threatening stimulus (7). Few researches confirmed the efficacy of MCT on the reduction of CAS and improvement of CERS among the patients with anxiety disorders (3).

Nowadays, neuropsychological studies also confirm the presence of bias in pre-attention processes and selective attention to the threatening stimulus in patients with OCD (7). The quantitative electroencephalography (QEEG) studies showed abnormal EEG patterns such as the lower absolute power of delta, Beta1 and Beta2 waves in the right hemisphere of patients with OCD, and extremely low activity of relative beta power, decreased relative beta power in the left frontal lobe, increased alpha wave in most parts of the brain especially in the frontal, temporal, parietal and occipital lobes along with increased average beta waves in the posterior temporal parts. Of course, the theta abnormality is also reported in patients with OCD (8). The right hemisphere of the brain is responsible to control and regulate the emotions, and the left hemisphere especially frontal lobe is responsible for the brain executive functions such as attention, concentration and performing high-level cognitive activities. Therefore, each of the brain waves involved in some special cerebral activities such as theta, alpha, and beta waves are involved in cognitive activities, creating emotional balance and stability. On the other hand, for the proper functioning of the brain, each of these waves in the different parts of the brain should have a certain amount of activity and any anomaly in these waves leads to brain dysfunction (9). Changes in electroencephalography (EEG) indicators of this group of people may contribute to their treatment; this strategy can be followed through neurofeedback. Neurofeedback is the response of technology to psychotherapy, cognitive rehabilitation and poor cortical function, which is based on operant conditioning paradigm to train individuals to see their abnormal cerebral waves and control themselves accordingly. In neurofeedback therapy, EEG acts as the basis of treatment; initially, brain wave patterns are determined, then the measure of deviation from the normal pattern is recognized through QEEG (10). So far, few researches confirmed the effect of neurofeedback on the treatment of OCD, increasing cognitive control and flexibility of patients with OCD (10), and improved self-regulation of emotional networks in other psychological disorders (11). In addition, one research reported the effect of cognitive rehabilitation on reducing executive functional deficits among the patients with OCD such as strategies of attention and cognition processing (12). Therefore, based on the preceding researches, it could be expected that underlying mechanisms such as CAS and CERS are associated with the severity of OCD and the exacerbation of the disorder. Thus, to treat OCD, giving due attention to such processes seems necessary.

2. Objectives

The importance of due attention to the underlying mechanisms of the OCD to achieve more effective treatment strategies, and the lack of researches on the effects of new therapeutic approaches such as MCT and neurofeedback on the underlying mechanisms such as CAS and CERS in the patients with OCD, and the comparison of the mentioned therapies with preceding solutions such as medication therapy (with fluvoxamine as a reuptake inhibitor of serotonin, which is a neurotransmitter affecting the cognitive and emotional functioning of the brain), encouraged the authors to conduct the current research aimed to compare the effectiveness of metacognitive therapy and neurofeedback and treatment with fluvoxamine on the cognitive attentional syndrome and cognitive emotion regulation strategies in the patients with obsessive-compulsive disorder.

3. Methods

In a quasi-experimental pretest-posttest study, 40 patients with OCD who referred to the two psychiatry and psychology centers in Kerman city, Iran, were selected through purposive sampling and randomly divided into three experimental groups (MCT, neurofeedback and fluvoxamine) and one control group. There were 10 subjects in each group. Inclusion criteria included the diagnosis of OCD in the patient by a psychiatrist and confirmation based on the scores of Yale-Brown obsessive-compulsive scale, receiving no other treatments for at least one month before entering the study, having at least high

school diploma and lacking the symptoms of psychosis, drug abuse and personality disorders. Intervention in the metacognitive group was based on the existing practical guide for anxiety and depression (2) for 10 sessions (duration of each session was 90 minutes) held once a week for 10 weeks. Intervention in the neurofeedback group was implemented by the design of neurofeedback protocol for each individual based on the brain map obtained through QEEG technology (The reinforcement of sensorimotor rhythm (SMR) and inhibition of Theta, Beta2 and Beta3 waves in the frontal and temporal lobes and cingulate gyrus; and the Alpha/Theta training on PZ point in some subjects); the neurofeedback intervention was implemented in 30 sessions for 10 weeks (three sessions per week and duration of each session was 45 minutes). In the fluvoxamine group, the maximum standardized dose of fluvoxamine that should be taken by each individual per day was 50-300 mg (patients had never taken this drug before). This intervention was implemented during 10 sessions of interview with psychiatrist to determine the pathophysiology of the disease, the drugs, the effects and side effects of drugs, and determine the appropriate dose for each patient for 10 weeks (one session per week). After determining the control group, the researchers explained to the participants that the subject and purpose of the study was based on comparing three therapeutic methods. They were told that if till distinguishing the results of the study (approximately 75 days) wait and do not receive any therapeutic intervention, after completion of the study, therapeutic method for them will be done according to the result of the study, which was more effective and with a cost of half of the psychotherapy sessions tariff. After the necessary explanations, they signed informed consent forms. All four groups were evaluated before and after the intervention using Yale-Brown obsessive-compulsive scale, cognitive-attentional syndrome scale and cognitive emotion regulation strategies questionnaire.

Yale-Brown obsessive compulsive scale (YBOCS) was devised by Goodman et al. to determine the severity of OCD. It comprised of 10 items. The score of this scale ranges from zero to 40, which the cut-off point of 17 or higher is considered as OCD. The reliability of the scale in 40 patients based on different reports is 0.98, and its internal consistency through Cronbach's alpha coefficient is 0.98 (13).

Cognitive-attentional syndrome scale (CAS-1) is comprised of 16 items to evaluate the activation of cognitive-attentional symptoms. The first two questions measure the frequency of patient concerns and his/her attention toward threatening factors, respectively. The next six items are associated with the frequency of the strategies that individuals use to cope with negative thoughts and feelings. These eight items are responded based on 8-point Likert scale from zero to eight. The next eight items measure the subject's faith to the metacognitive beliefs about the CAS based on grading from zero to 100. The total score of CAS is determined based on all of its 16 items. Higher scores in this scale signify more activation in the CAS. Cronbach's alpha of the scale was reported 0.85 (1). Currently, there are limited data to support the psychometric properties of cognitive-attentional syndrome scale. However, this scale is the only known tool so far that can assess all components of cognitive-attentional syndrome at the same time. That is why it was used in the current study.

Cognitive emotion regulation questionnaire (CERQ) was devised by Garnefski et al. and includes 36 questions; 20 questions measure adaptive style and 16 questions measure maladaptive style. The questionnaire items are graded based on Likert scale ranging from one (never) to five (always). The total score of each sub-scale is obtained through the scores of all the items. The Persian version of CERQ has the high internal consistency (Cronbach's alpha range of 0.76 to 0.92), the relatively high degree of inter-relationship between subscales (0.32 to 0.67), and desirable reliability (correlation coefficients of test-retest are from 0.51 to 0.77). Also concurrent criterion validity of the questionnaire (correlation coefficients of device its subscales) was confirmed by the Beck depression inventory (1).

In this research, two-channel neurofeedback device of Canadian technology thought company and Procomp2 model and BioGraph Infiniti software were used. The mentioned device was used in previous researches (14).

The efficacies of different methods were compared through multivariate analysis of covariance and Tukey post hoc test. All statistical analyses were performed using SPSS ver. 19.

4. Results

As indicated in Table 1, the posttest mean score of the subjects' CAS and maladaptive strategies in metacognitive and neurofeedback groups considerably reduced after treatment period compared to their pretest score mean. The fluvoxamine group also showed a slight reduction after treatment period, while the control group showed no reduction in their scores. In addition, the mean scores of the subjects' adaptive strategies in the metacognitive and neurofeedback groups after treatment period were considerably higher than the pre-treatment scores, while no changes were observed in the scores of the same items of fluvoxamine and control groups after treatment period.

The results obtained from the covariance analysis showed a significant difference between the adjusted posttest means of the four groups in each three variables CAS ($F = 281.57$, $P > 0.01$), maladaptive strategies ($F = 426.98$, P

Table 1. Comparison of the Performance of Experiment and Control Groups in Tests Before and After the Interventions[a]

	Metacognition		Neurofeedback		Fluvoxamine		Control	
Variables	**Pre-Test**	**Post-Test**	**Pre-Test**	**Post-Test**	**Pre-Test**	**Post-Test**	**Pre-Test**	**Post-Test**
Attentional- cognitive syndrome	583.1 (37.26)	212.5 (47.59)	598.7 (65.75)	220.5 (21.87)	607.2 (51.74)	523.3 (40.79)	616.7 (43.8)	617.9 (41.74)
Maladaptive regulation strategies	69.3 (3.56)	29.9 (2.99)	70.5 (1.9)	38.7 (3.71)	69.8 (2.78)	59.2 (2.48)	68.8 (2.97)	73.8 (3.08)
Adaptive regulation strategies	34.5 (4.45)	76.3 (5.67)	37 (3.68)	69.8 (3.93)	36.6 (3.71)	35.8 (3.55)	39.5 (3.37)	38.8 (2.65)

Abbreviation: SD, standard deviation.
[a]Values are expressed as mean (SD).

> 0.01)) and adaptive strategies (F = 257.42, P > 0.01). Influence coefficients also indicated the efficacy of therapeutic interventions on the dependent variables (Table 2).

Pairwise comparison of the groups based on the results of Tukey test showed a significant difference between experimental and control groups in the CAS and CERS (P = 0.001). In addition, pairwise comparison of the experimental groups in the CAS analysis indicated no significant differences between the efficacy of MCT with neurofeedback (P = 0.001), and a significant difference between MCT and neurofeedback with fluvoxamine (P = 0.001). In the analysis of maladaptive strategies, a significant difference was observed between the efficacy of all treatments in comparison with each other and with the control group (P = 0.001). For the adaptive strategies, a significant difference was observed between the efficacy of metacognitive and neurofeedback in comparison with each other, and with fluvoxamine and control groups (P = 0.001). However, the results indicated no significant difference between the results of the fluvoxamine group with those of the control group (P = 0.34). Reviewing the mean difference and significance levels indicated that MCT and neurofeedback were effective on the improvement of CAS and CERS but fluvoxamine treatment showed no such influence.

5. Discussion

The obtained results of the current study showed that the MCT and neurofeedback can significantly decrease CAS and reduce maladaptive strategies in the patients with OCD and increase the use of adaptive strategies in them. While no significant difference was observed between the effect of MCT and neurofeedback on the CAS, there was a significant difference between their effects on the adaptive and maladaptive strategies of CERS, since MCT showed higher effects than neurofeedback approach. Treatment with fluvoxamine showed less effect than the other two methods on reducing CAS scores in patients with OCD, but it had no effect on improvement of adaptive strategies. Previous researches reported the higher efficacy of Welles MCT on reducing CAS compared to that of the medication therapy in the patients with generalized anxiety disorder (3), which seems to be consistent with result of the current study. In addition, previous researches proved the effect of cognitive rehabilitation treatment on reducing the deficits of processing strategies of CAS in patients with OCD (12), which were consistent with the results obtained from neurofeedback treatment as a rehabilitation and self-regulation plan of brain functions (such as cognition and attention). The current study results confirmed the efficacy of medication therapy on improving cognitive-attentional syndrome, but this finding was not consistent with the results of previous researches (3).

The efficacy of MCT on reduction of CAS scores and maladaptive strategies and its effectiveness on increasing the adaptive strategies of CERS was somewhat predictable; since this treatment is focused on changing the patient's relationship with his/her inefficient thoughts and feelings and on the role of beliefs in processing style, attention processes such as attention biasing and cognitive control, and employs techniques such as faulting mindfulness, postponing the concerns and neutralizing the coping strategies (which target the components of CAS) to reverse the cycle of CAS (3); and thereby it helps the patients to avoid their negative thoughts and gain accurate understanding of the events based on the evidence of behavioral experiments, and also challenge their internal events such as anxious emotions to avoid negative assessment of events and protect themselves against rumination and iterative actions (2); hence this treatment can reduce CERS especially rumination, catastrophizing and self-blame and teaches patients how to use adaptive strategies.

To explain the efficacy of neurofeedback, the role of brain waves in brain activities and the existing abnormal pattern of brain wave in the patients with OCD can be pointed out. In this treatment, patients can observe their brain abnormalities and can train themselves to reduce abnormal wave and increase desirable waves through audio-visual feedbacks and operant conditioning principles. Neurofeedback through operant conditioning can

Table 2. Covariance Analysis of Attentional-Cognitive Syndrome and Emotion Cognitive Regulation strategies in Different Treatment Groups

Groups/Source	Sum Square	Degree of Freedom	Mean Square	F	P Value	Effect Size Eta
Attentional-Cognitive syndrome				281.57	0.001	0.95
Group	1298933.9	3	432977.967			
Error	5535.8	36	1537.722			
Maladaptive regulation strategies				426.98	0.001	0.97
Group	11635.4	3	3878.467			
Error	327	36	9.083			
Adaptive Regulation strategies				257.42	0.001	0.95
Group	13004.2	3	4334.733			
Error	606.2	36	16.839			

significantly affect the regulation of attention, enable patient to change attention from a specific task to another, balance vigilance and arousal, awareness and manage the stress, increase capability for quick returning to the present time and distancing from negative thoughts, increase the willingness to change and improve internal management and emotional reactions (9). Therefore, the effects of neurofeedback on improving CAS and CERS of the patients could be expected.

Fluvoxamine treatment triggered for bio-chemical changes in the underlying thoughts, emotions and negative behaviors, thus led to a considerable reduction in the use of CAS and maladaptive strategies in patients with OCD; however the measure of reduction in the scores of patients with OCD was not significant, since these patients were not trained to identify the CAS, methods of countering it and to challenge the inefficient beliefs about anxious emotions. Moreover, after the treatment period, the scores of this group in adaptive strategies remained low.

The control group, which did not received any treatment, showed no changes in the CAS and CERS after the research period. However, their scores in the maladaptive strategies increased; an increase which can be attributed to the chronic nature of OCD and its rising severity over time.

Finally based on the findings of the current study, confirming the efficacy of MCT and neurofeedback on the underlying mechanisms of OCD such as CAS and CERS, the mentioned treatments can be used to reduce the severity of OCD and preventing its recurrence.

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Footnote

Authors' Contribution: Hassan Bani Asadi: acquiring brain maps using QEEG and designing neurofeedback protocols; Mahjoubeh Pourebrahimi: responsible neurofeedback sessions; Reza Amirteymoori: responsible for metacognitive therapy sessions. The manuscript was prepared by Mahjoubeh Pourebrahimi and Reza Amirteymoori under the supervision of Hassan Bani Asadi.

References

1. Salmani B, Hasani J. Cognitive attentional syndrome (cas) & cognitive emotion regulation strategies: Transdiagnostic processes or diagnostic based on mood & anxiety disorders. *J Clin Psycol.* 2013;**5**(3):91–104.
2. Wells A. Metacognitive therapy for anxiety and depression. Tehran: Varayedanesh; 2011.
3. Salmani B, Hasani J, Karami G, Mohammadkhani S. Effectiveness of meta-cognitive therapy on cognitive attentional syndrome and cognitive emotion regulation strategies of patients suffering from Generalized Anxiety Disorder (GAD). *J Behav Sci.* 2013;**7**(3):15–6.
4. Hashemi T, Mahmoudalilou M, Hosseinzadeh S. Structural relationships of cognitive emotion regulation, extraversion and neuroticism with obsessive- compulsive symptoms in non-clinical people. *J Behav Sci.* 2014;**8**(4):365–73.
5. Davoodi A, Neshat Doost HT, Abdi MR, Talebi H. Comparison of Cognitive Emotion Regulation Strategies and Understanding Emotions in Obsessive Compulsive, Generalized Anxiety, and Social Anxiety Disorders. *JSR.* 2014;**15**(58):69–78.
6. Talee-Baktash S, Yaghoubi H, Yousefi R. Comparing the early maladaptive schemas and cognitive emotion regulation strategies in obsessive-compulsive disorder patients and healthy people. *KAUMS J (FEYZ).* 2013;**17**(5):471–81.
7. Ahmadi Bejagh A, Bakhshipoor B, Saeedinezhad H, Ahmadi Bejagh S. The comparison of selective attention and working memory in people suffering from obsessive- compulsive disorder and depression with normal individuals; a neuropsychology perspective. *Adv Cogn Sci.* 2014;**16**(2):37–47.
8. Hammond DC. QEEG-guided neurofeedback in the treatment of obsessive compulsive disorder. *J Neurother.* 2003;**7**(2):25–52.

9. Demos J. Getting started with neurofeedback 1. Tehran: Danjeh; 2014.
10. Barzegari L, Yaghobi H. The effectiveness of neurofeedback treatment based on quantitative electroencephalography (QEEG) compared with drug therapy in reducing symptoms of obsessive-compulsive disorder. *J Psychol.* 2009;**4**(15):29–48.
11. Linden DE, Habes I, Johnston SJ, Linden S, Tatineni R, Subramanian L, et al. Real-time self-regulation of emotion networks in patients with depression. *PLoS One.* 2012;**7**(6):ee38115. doi: 10.1371/journal.pone.0038115. [PubMed: 22675513].
12. Bahrami Hidaji M, Ahadi H, Askari P, Mazaheri MM. The Role and Effect of Cognitive Rehabilitation in Reducing Executive Function Deficits in OCD Patients. *J Am Sci.* 2013;**9**(8).
13. Ghamarigivi H, Nader M, Dehghani F. Examine the effectiveness of cognitive rehabilitation in reconstruction of executive functions of patients with obsessive-compulsive. *J Clin Psychol Stud.* 2014;**4**(16):101–28.
14. Eskandari Z, Taremian F, Nazari MA, Bakhtiari M, Momtazi S, Rezae M. Effectiveness of Neurofeedback Treatment to Decrease Severity Symptoms in Major Depression Disorder. *J Zanjan Univ Med Sci Health Serv.* 2014;**22**(92).