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Effectiveness of direct electrical stimulation from the skull on depression symptoms in male patients with post-traumatic stress disorder due to war

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Abstract

Purpose: The purpose of this study was to determine the effectiveness of direct electrical stimulation from the skull on depression symptoms in men suffering from post-traumatic stress disorder in war. The research design was a semi-experimental design with repeated tests. **Methodology**: The sample included 15 patients with post-traumatic stress disorder men who were admitted to the Delaram Psychiatric Hospital and were voluntarily and voluntarily selected. **Findings:** The instrument used in this study was Beck's 21-item depression questionnaire. Subjects were first subjected to pretest and then subjects received 12 sessions of electrical stimulation therapy (TDCS). After receiving each 4 sessions of treatment, subjects were assessed once by a depression questionnaire. **Discussion:** The results showed that the difference in mean scores of subjects in different levels of application of independent variable was significant (P <0.001). The symptoms of depression in subjects with repeated actions of electrical stimulation from the skull have decreased relative to the pre-test.

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1. Introduction

Studies of hostages and prisoners of war show that indifference and depression are common among them. Research shows that prisoners of war are a series of psychological and psychiatric problems such as distraction, lack of sexual interest, fear of returning to the homeland, separation from reality, anxiety, psycho-dynamic disorders, irritability, withdrawal, hostility, lack of self-esteem, Isolationism, severe depression, and suicide attempts (Karaminia, et al., 2007).

According to statistics provided by the Veterans Foundation in 1999, 36,354 psychiatric patients with psychiatric diagnosis are among war devotees throughout Iran (Sirjan, 2002). Veterans are more likely to become more psychiatric in general, and research in Iran shows that over 13% of them have severe psychiatric disorders such as depression, anxiety, obsession, aggression, panic, psychosis and other psychiatric disorders. Meanwhile, depression is of great importance because it is the leading cause of people's disability worldwide and has ranked fourth among the world's most prevalent mental disorders (Mohammadinia, 2017).

2. literature Review

Depression is treatable by various methods such as medication, psychotherapy, and electrotherapy treatment. By 1946, antidepressants were considered as a primary treatment of mood disorders, especially depression, and three types of electrical shock treatments were only for patients who had no reaction to drugs or intolerable to medication. Was. Unfortunately, some patients do not fully respond to these treatments, and others in general, do not respond to any of the above treatments and are resistant, and most of the symptoms of half of the patients remain depressed, given that the treatment Depression is progressing; now, other treatments such as vagal nerve stimulation, skull magnetic stimulation, direct skull and head stimulation, skull stimulation and neurotherapy are considered as possible and alternative therapies. Mohammadi, 2015).

On the other hand, skull stimulation or electrotherapy was used in Russia in the 1946s to treat anxiety, depression and insomnia, which affects the health of the body and leads to heart disease and accelerates the aging process. Direct brain electrical stimulation is a promising inferior intervention for the treatment of major depressive disorder. In one of these studies, it was found that stimulation of the posterior posterior posterior foramen side with positive electrical state by using direct electric current with mood change (Bajevi et al., 2010).

Many researchers in their studies have confirmed the validity and validity of treatment for direct-electrical depression (Arrow Anandam and Lev, 2008; Bart, Lyssabbi and Sakem, 2002; Kalou, Sexton, Lu and Amaeir, 2013; Martin, Barbanj, Sklopfr, Thomson and Koliyski, 2003; Hadley et al., 2011; Hermann and Amour, 2006; Holtzimmer, Rassou and Ouri, 2001). This treatment was performed on 50 patients 18 years of age with treatment-resistant depressive disorder for 4 weeks. The results from these subjects showed a significant improvement.

Also, in a study by Vafaee and Arzani (1396), the results indicated that treatment with direct brain stimulation beyond the limb had significant therapeutic effects on the mental health of devotees. The result of this study is consistent with the results of research conducted by Alipour et al. (2016) and Fergie et al. (2006). Thus, the problem that is being investigated in this study is whether direct electrical stimulation from the skull on the symptoms of depression in patients Is a man suffering from post-traumatic stress disorder caused by war?

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3. Methodology

The present study is a semi-experimental method of repeated tests, in which four subjects were tested from a group of 15 subjects. The statistical population of this study was male patients admitted to Tehran Psychiatric and Psychiatric Rehabilitation Center in 1396.

The sample size of the study is 15 patients with posttraumatic stress disorder admitted to the Neurological and Psychiatric Rehabilitation Center selected by voluntary and voluntary sampling. Sample selection was available voluntarily and included 15 male patients with post-traumatic stress disorder in the heart of Delarm, who were examined by a diagnostic interview and Beck depression test in a group of 15 subjects. Before the start of the treatment, subjects were pre-tested; then, 12 sessions and one day in between, they were treated with direct electrical stimulation from the skull, and after completing each 4 sessions, and one day after the end of the session The fourth one was repeatedly assessed by Beck depression test. Finally, four times in a 25-day period, Beck Depression test was measured.

In this study, Activa Tek's Activadose Iontophoresis device was used to stimulate the brain electrical. The current source of this device is a 9-volt battery. The maximum current is 4 mA and the maximum voltage is 80 volts DC. The stimulation value in this test, with a 2 mAh current flow rate for 20 minutes, was carried out through two anode and cathode electrodes in sizes 5 to 7 in the posterior-lateral forebrain (F3) and the posterior-lateral forward forehead (F4) applied.

The electrode was soaked with salt water or special creams to establish a proper connection between the electrode and the skull. The initial design of the TDCS dates back more than 100 years. A number of elementary experiments were carried out using this technique on animal and human specimens before the 19th century.

In 1804, Adelini began a study on the use of TDCS that was effective in improving the mood of depressed people. In the 1960s, a person named Albert was able to show that this method affects the brain function by altering the cortical excitability. He also discovered that positive and negative stimuli have different effects on cortical excitability. Although these findings were important for the clinical use of TDCS, due to a reduction in research in this field, drug therapy was shown to be more effective in treatment. This argument continued until the present time, with the increasing interest in studies of brain functions and therapeutic applications, as well as new brain stimulation techniques and brain-imaging new techniques such as TMS and FMRI. The therapeutic protocol of direct brain electrical stimulation for 10 days of Ananda in the left prenygium area and electrical stimulation of the brain from the cathodic skull was presented to the subject in the right prefrontal region. The electrodes can be used to report the brain area (EEG10 / 20) (Optional, 2008). An 20/20 model electrode system is an international model for detecting brain regions for electro-encephalography electrodes on the skull. This method has been promoted to the purpose of obtaining a reciprocal standard for studies on individuals to compare the information obtained from brain regions at different times and with different individuals.

In the TDCS device, the following factors are important in transmitting electrical current inside the brain: Stress intensity: It is natural that the higher the current flow, the more effects it will have. The current flows from the anode electrode (negative pole) to the cathode electrode (positive pole). The intensity of the flow has a direct relation to the current density of the brain. The shape and size of the electrodes: It can be said that the flow density of the brain is more than the intensity of the current. The current density or flow path represents the flow rate of every square centimeter. In most studies, the density is 0.029-0.08 mA / cm2. for a period of electrical stimulation.

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One of the most famous instruments for measuring depression is Beck Depression Inventory. The questionnaire was originally developed in 1961 by Beck and colleagues. The revised version was published in 1978 and included 21 questions. This questionnaire was translated by Ganji (1366). The score for each of your questions is from 0 to 3. The minimum and maximum score obtained from this questionnaire is 0 and the maximum is 63. The questions in this questionnaire include mood, pessimism, feeling of failure, self-knowledge, guilty, punishment, self-abomination, suicidal thoughts, crying, irritability, hesitation, insomnia, lack of appetite, and mental retardation and decreased libido. A score of 1-10 normal, 11-16 slightly depressed, 17-20 need to refer, 30-30% depressed, 30-40 severely depressed, and 40 upward hypertensive depressions.

Beck et al. (1988) obtained the validity of the questionnaire by correlating it with the Hamilton Psychoanalytic Grading Questionnaire (73/0) and with the form of the Band of the Questionnaire (76/0) at the level of 0.001 and the reliability coefficient of the questionnaire by the method of two halves and Spearman-Brown reported 0.81.

Various studies have also been conducted within the country that measure the psychometric properties of this tool. Among these studies, we can refer to the study of metharia and methane in 1373, whose reliability coefficient in Iran was 0.78. In other researches such as Chegini's research in 2002, the reliability coefficient of the questionnaire was reported through Cronbach's alpha (90/0) (Khalili, 1392). Rwandost (2002) reported the reliability of the questionnaire by Cronbach's and Pushup's alpha methods, respectively, 0.80 and 0.79 respectively (Saatchi et al., 2011).

Khalili (1392) also reported on the validity of the questionnaire by correlating with the short form of Beck Depression Inventory 0.44 at 0.01, and the reliability of the questionnaire through Cronbach's alpha was 0.83, indicating high validity and reliability of the questionnaire has it.

4. Findings

The descriptive findings of this study include the mean and standard deviation that are presented in Table (1).

Table1. Descriptive statistics in successive papers

	Mean	Number	Standard deviation
pre-exam	35	15	6/53
First test	27/53	15	7/72
Second test	23/53	15	7/98
Third test	21/06	15	8/42

According to the above table, the highest mean of depression is related to the pretest (35) and the lowest mean depression is related to the third test (21.06). Also, the highest standard deviation is related to the third test (8.42) and the lowest standard deviation is related to the pretest (6.33).

Repetitive measure assumptions:

The distribution of variables in groups is normal: Kolmogorov-Smirnov test was used to test this assumption.

Table 2. Kolmogorov-Smirnov test to verify the normal distribution of data

	k-s	number	Significance
Pre-test results	0/154	15	0/200
First test results	0/190	15	0/148
Second test results	0/153	15	0/200
Third Test Results	0/120	15	0/200

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Table 2 shows the results of the Kolmogorov-Smirnov test. Accordingly, the distribution of data in all four tests with normal distribution was not significant and the distribution of data for all four tests was normal.

Table 3. Swirling test for covariance uniformity

	Degree of freedom	Mauchly's *test* sphericity	Significance
Electric stimulation	5	0/542	0/169

Table 3 shows the results of Mauchly's *test* sphericity Based on this test, variance and covariance matrices of subjects are symmetric at different levels of application of the independent variable.

Table 4. Testing the internal effects of subjects

	sum of squares	Degree of freedom	Mean of squares	F	Significance
Internal effects test	1669/783	3	556/59	28/01	0/001
Error	834/46	42	19/86		

According to Table 4, the difference in mean scores of subjects in different levels of application of independent variable was significant and thus the research hypothesis is confirmed.

Table 5. A paired comparison between the different levels of the application of the independent variable

Significance	standard deviation	Mean Differences	stimulation (J)	stimulation (J)
0/001	1/373	7/467	2	
0/00	1/009	11/467	3	1
0/00	1/811	13/933	4	
0/001	1/373	-7/467	1	
0/178	1/682	4/00	3	2
0/035	1/997	6/467	4	
00/0	1/009	-11/467	1	
0/178	1/682	-4/00	2	3
0/671	1/701	2/467	4	

The results of the T-dependent and Bonferroni T-test are shown in Table 5. Accordingly, there is a significant difference between the pre-test depression score of the subjects with the score of the subjects in the first test and after receipt of the four electrical stimulation. There was a significant difference between the pre-test depression score and the subjects' score after receiving 8 electrical stimulations in the second test. There was a significant difference between the pre-test depression score and the subjects' score after receiving 12 sessions of electrical stimulation in the third test. There was no significant difference between the depression scores of the subjects in the first test with their scores in the second test. There was a significant difference between the depression scores of the subjects in the first test and the third test. There was no significant difference between the depression scores of the subjects in the second test and the third test.

5. Discussion

Research hypothesis: Direct stimulation of the skull is effective on the symptoms of depression in male patients with post-traumatic stress disorder. Depending on the results, TDCS-based therapy is effective on depression symptoms in patients with post-traumatic stress disorder. Therefore, the research hypothesis was confirmed. The result of this hypothesis was the study of Gholampour (1394), which concluded that

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electrical stimulation of the brain reduced the rate of depression; also, Alidadi et al. (1393) and Akbari et al. (1393) showed that TDCS-based treatment reduced the rate Depression is consistent. Also, Wei et al. (2014, quoted by Ghulampour, 1394), Russell et al. (2013, quoted by Alidadi et al., 2014), Mitchell et al. (2012), Kalow et al. (2012), Mill et al. 2012), Placiser (2011), Hadley et al. (2011), Arrow et al. (2009), Bajiou (2008), Bagio et al. (2007).

Depression is one of the most important psychiatric disorders that causes people to leak. Depressed people tend to pay more attention to negative events due to the processing of defective information (Akbari et al., 2014). The results of this study showed that TDCS-based therapy is effective in decreasing depression of injured veterans with post-traumatic stress disorder. The ease of using this method is the advantage. The electrical stimulation of the pre-frontal cortex leads to increased emotional excitement in depressed people and also improves the cognitive and behavioral efficiency of veterans. In addition, by stimulating the left prefrontal cortex, it can reduce the defective processes of these patients.

Direct brain electrical therapy results in increased brain power in the processing of information and inferior thoughts as well as the improvement of the level of performance, the increase in mood and increased ability, due to the formation of the prefrontal cortex in the neural network. The devotees are in the lead. Because this treatment is a non-invasive technique in which a poorly flowing direct current is introduced into the scalp, using long-term changes in the cerebral cortical polarization, and ultimately can be effective in creating the skin.

The principle is that two electrodes are one positive pole and the other negative pole is placed on the head through a sponge pad soaked with a conductive solution. The electric current through these electrodes passes through the various areas (scalp, skull, etc.) to the cortical surface. The flow to this region of the neurons has an electrical charge and creates a positive and negative pole, which leads to a change in the activity of that area. Due to the disorder that exists, the following should be specified: the intensity of the current, its duration and direction, the location of each of the electrodes, the size of the spatula pads used and the number of sessions. As a result, it can be said that TDCS-based therapy by stimulating the left prefrontal cortex can be an effective treatment to reduce the symptoms of depression in war veterans.

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