

# Comparison of the Effectiveness of Repetitive Transcranial Magnetic Stimulation and Theta Burst Stimulation on Visual-Auditory Attention and Planning in Depressed Individuals Attempting and non-Attempting Suicide

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## ABSTRACT

**Introduction:** One of the characteristics of depressed people is suicidal ideation. There are many ways to improve the characteristics of depressed people, including repeated transcranial magnetic stimulation and tetanus. Therefore, the aim of this study was to compare the effectiveness of transcranial repetitive magnetic stimulation and theta burst stimulation on visual-auditory attention and planning in depressed individuals attempting and non-attempting suicide.

**Method:** The present study was semi-experimental with pre-test and post-test design with four groups. The study population was patients with depressive disorder who referred to clinics in Mashhad in 1398. The research sample consisted of 40 people who were selected by purposive sampling method and were replaced in four groups of 10 people and were treated with tms and tbs. Data were collected by Depression Inventory, Integrated Audiovisual Test and Tower of London Test and analyzed by Chi-square, correlated t-test and multivariate analysis of covariance in SPSS software.

**Results:** The results of correlated t-test showed that in all four groups of repetitive magnetic stimulation of attempting and non-attempting suicide groups and theta burst stimulating of attempting and non-attempting suicide groups, the post-test scores of visual-auditory attention and programming increased significantly compared to pre-test scores ( $p < 0.05$ ).

**Conclusion:** The results showed the effectiveness of both methods, especially in the attempting suicide group. Therefore, therapists and specialists can use both methods, especially theta burst stimulation, due to the effectiveness and short time of this method to reduce depression and increase visual-auditory attention and planning in depressed people who attempt and non-attempting suicide.

**Keywords:** Repetitive transcranial magnetic stimulation; Theta burst; Audiovisual attention; Planning; Depression; Suicide

## INTRODUCTION

Depression is one of the most common psychological and psychiatric disorders, the main feature of which includes a period of at least two weeks during which the depressed mood is accompanied by apathy or lack of pleasure in almost everything (1). Characteristics of depressed people include changes in appetite, weight and sleep, decreased energy and motivation,

feelings of worthlessness and guilt, difficulty thinking, concentrating, decision-making and planning, recurring thoughts about death and suicide, and plotting and attempting suicide. (2). Mood disorders are associated with suicide attempts, and among mood disorders, depression has the highest risk of suicide in both sexes (3). About two-thirds of people with major depression think about suicide, and 10 to 15 percent of them end their lives through suicide (4). Suicide is a conscious attempt

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to end one's personal life, which sometimes manifests as suicidal feelings and thoughts and sometimes as suicidal behavior (suicide attempt) (5). Every year, about one million people in the world die due to suicide. Of course, the actual suicide rate is 10 to 20 times higher (6). Depressed people who attempt suicide have no hope for their future (one of the main reasons for suicide is despair), are passive and withdrawn, need a lot of approval, and often have negative beliefs about themselves, others, and the world (7). Depressed people who attempt or do not commit suicide have problems with cognitive functions such as visual auditory attention and planning. Cognitive functions are high-level psychological processes connected to neural networks (8). Cognitive functions are a subset of executive functions that allow an individual to perform an independent and purposeful behavior through self-direction (9). Attention is a process that makes information available to the senses for processing and includes focusing or engaging with the goal, maintaining attention, coding stimulus characteristics, and shifting focus from one goal to another (10). Visual-auditory attention means paying attention to visual and auditory stimuli (11). Also, planning as a cognitive function means the ability to identify and organize the steps and elements needed to perform an activity and achieve the goal (12).

There are many therapies for improving cognitive function, and today, methods derived from the biological approach are of great help due to the increasing growth of technology, such as electric shock and repetitive transcranial magnetic stimulation (13). About 35 to 40 percent of depressed people do not respond to antidepressants, and repeated transcranial magnetic stimulation is used as a relatively new technique in the treatment of major depression and drug-resistant depression (14). In the transcranial magnetic stimulation method, a magnetic field is created by the first coil and transferred to the second coil, the brain, which stimulates the cells in that area. In other words, when magnetic fields enter the brain, they generate a secondary electric current, which in turn de-polarizes or changes the electrical charge of nerve cells (15). Repetitive high-frequency transcranial magnetic stimulation temporarily facilitates cortical responses, but low-frequency stimulation reduces excitability. Typically, these effects are short-term and have variable consequences and are moderately effective, so a more appropriate method should be used in which theta burst stimulation in the cerebral cortex can have strong and lasting changes (16). Although much research has been done on repetitive transcranial magnetic stimulation, little research has been done on theta burst stimulation. For example, the results of Zheng et al.'s research showed that repeated transcranial magnetic stimulation reduced resistant depression (17). In another study, Chris et al. Reported that repeated transcranial magnetic stimulation reduced depression in patients with depressive disorder (18). Sattari Sefidan et al., While conducting a study, concluded that repeated transcranial magnetic stimulation reduced depressive disorder in people with major and resistant depression (19). In another study, Nozari et al. Reported that electrical stimulation reduced depressive symptoms in people with major depressive disorder (20). Also, the results of Ashrafi et al.'s study showed that of transcranial electrical brain stimulation improved visual-auditory attention in people with attention deficit hyperactivity disorder (21). In

another study, Nermasheiri et al. Reported that transcranial electrical stimulation increased auditory visual attention processing in people with ADHD (22). In addition, the results of research by Beynel et al. Showed the effectiveness of repeated transcranial magnetic stimulation on improving attention and working memory of young and elderly (23). The results of Fitzgerald et al. Showed that the intensive protocol of theta burst stimulation reduced depressive symptoms in patients with resistant depression (24). In another study, Dharmo et al. Reported that stimulation of the theta burst stimulation reduced depressive symptoms in young people with major depression (25). Also, the results of the study of Viejo-Sobera et al. Showed the effectiveness of intermittent and continuous theta burst stimulation on improving working memory and reducing attention bias (26). In addition, Kaller et al., While conducting research, concluded that continuous theta burst stimulation of the right and left hemisphere improved programming (27). On the one hand, the number of people with depression is high and depression is directly related to suicide attempts; About two-thirds of people with major depression think about suicide. On the other hand, today, due to the growth of technology, the role of therapies derived from the biological approach, such as repeated transcranial magnetic stimulation and theta burst, has become more prominent. Also, no research on theta burst stimulation has been found in Iran and few studies have been conducted in the world on comparing the effectiveness of repetitive transcranial magnetic stimulation with theta burst, and most of these studies have less focused on their effectiveness on visual-auditory attention and programming. As a result, due to the high prevalence of depression and the relationship between depression and suicide, the role of transcranial repetitive magnetic stimulation methods and theta burst stimulation in improving cognitive functions and little research background on these methods on auditory visual attention and planning, The aim of this study was to compare the effectiveness of repetitive transcranial magnetic stimulation and theta burst stimulation on visual-auditory attention and planning in depressed individuals who attempting and non-attempting suicide.

## METHODOLOGY

The present study was quasi-experimental with pre-test and post-test design with four groups. The study population was patients with depressive disorder who referred to clinics in Mashhad in 1398. The research sample was 40 people who were selected by purposive sampling method after reviewing the inclusion criteria. Inclusion criteria included obtaining a score higher than 20 in the Depression Inventory, being 20-50 years old, minimum diploma education, no history of receiving psychological services, no pregnancy in female patients and no occurrence of stressful events such as divorce and death of relatives in three months Past and exclusion criteria included no history of seizures and brain surgery, absence of more than 2 sessions, and cancellation. To conduct this study, after obtaining the necessary permits and coordination with the officials of psychological services clinics, they were asked to introduce people with depression with a history of suicide and without it to the researcher and sampling until the number of samples

reached 40, continued. The samples were then randomly divided into four equal groups, including the groups of repetitive transcranial magnetic stimulation of suicide attempters, repetitive magnetic stimulation of non-attempting suicide, theta burst stimulation of suicide attempters group and theta burst stimulation of suicide non-attempters group. The first and second groups were treated with repeated transcranial magnetic stimulation for 12 sessions and the third and fourth groups were treated with theta burst stimulation for 12 sessions. All four groups were evaluated for depression, visual auditory attention and planning in the pre-test and post-test stages.

In the method of repeated transcranial magnetic stimulation by creating magnetic fields, excitations were created in dorsolateral prefrontal cortex of the left hemisphere (dlpfc). In this study, the frequency of each stimulus was 10 Hz, the intensity of each stimulus was 120% of the motor threshold, the duration of each stimulus was 4 seconds, and the rest time between the two stimuli was 26 seconds. In addition, the number of pulses per session was 3,000 and the number of attempts was 75 times, which was done for 12 sessions (average of each session 38 minutes). Also, in the theta burst stimulation method, participants sat in an armchair and received stimulation in the dorsal lateral prefrontal cortex of the left hemisphere. In this study, the frequency was 5 and 50 Hz with coil 8, the excitation intensity was 80% of the motor threshold, the number of pulses per session was 600 and the number of attempts was 20 times. This process was performed for 12 sessions (average of each session was 3.3 minutes).

In addition to the demographic information form including age, education, gender and marriage, the Depression Inventory, Continuous Audio-Visual Test and the Tower of London test were used to collect data.

Depression Inventory: This questionnaire was developed by Beck & Clarck with 21 items. The items were scored using a four-point Likert scale (0 = not at all to severe = 3) and the instrument score was calculated with the total score of the items, so the range of scores between 0-63 and a higher score indicates more depression. The instrument shows a score of 0-10 for normal depression, 11-16 for mild depression, 17-20 for moderate depression, 21-30 for moderately depressed and 31-40 for severe depression and more than 40 for severe depression. They confirmed the predictive validity of the instrument and reported its reliability by Cronbach's alpha method of 0.89 (28). In Iran, the face and content validity of the instrument were confirmed by ten experts in educational sciences and psychology and its reliability was reported to be 0.85 by Cronbach's alpha method (29).

Integrated Audio-Visual Test: This test was based on the fourth edition of the Diagnostic and Statistical Manual of Mental Disorders by Sandford et al. The test has four parts: warm-up, exercise, main performance and cooling. The main performance includes responding or not responding to 500 stimuli (the duration of each stimulus is one and a half seconds). The age range of this test is 6-66 years and the duration of this test is 20-25 minutes. They reported the sensitivity of the test as 92%, its predictive power as 89% and its reliability with the retest method as 0.75 (30).

Tower of London Test: This test was created by Shallice with 12 positions. In this test, participants are asked to move colored beads mounted on three vertical bars in each position to match a specific goal, and the answer is correct when created with minimal movement. In the mentioned test, in each situation, if the correct answer is given in the first attempt, a score of 3 is assigned to it, and thus in the second attempt, a score of 2, in the third attempt, a score of 1, and more than 3 attempts, a score of 0. A higher score indicates greater programming ability. The convergent validity of this test with Pertussis maze test is 0.41 and its validity was reported to be 0.79 by retest method (31).

For the participants, observing ethical points such as the principle of confidentiality, confidentiality of personal information, etc., and the purpose, importance and necessity of the research were expressed and they were informed of the written consent of the company in the research. Finally, the data were analyzed by Chi-square, paired t-test and multivariate analysis of covariance in SPSS software version 19.

## RESULTS

No shedding occurred in the samples of any of the four groups and the analyzes were performed for four groups of 10 people. Frequency and frequency of demographic characteristics of age, education, gender and marital status of the groups and their comparison based on Chi-square test were presented in (Table 1).

**Table 1:** Demographic characteristics of groups and their comparison based on Chi-square test.

Att rib utes	Lev els	rtms		rtm s		tbs		Stat istic Chi squ are		Sig nifi can ce	
		Non-attempting	attempting	Non-attempting	attempting	Non-attempting	attempting	freq uen cy	perc ent	freq uen cy	perc ent
Age	30-21	5	50	3	30	4	40	4	40	731	943
	40-31	3	30	3	30	3	30	4	40	/1	/0
	50-41	2	20	4	40	3	30	2	20		
edu cation	diploma	4	40	3	30	5	50	4	40	833	934
	Ass ociate Degree	2	20	4	40	3	30	3	30	/1	/0
	Bac helor	4	40	3	30	2	20	3	30		

Gender	Female	70	50	60	70	173	759
Marital status	Married	60	70	70	80	952	813
Age	30-40	3	5	4	3	40	30
	40-50	3	3	3	2	30	20

According to the results of (Table 1), there is no significant difference between the four groups in terms of any of the demographic variables including age, education, gender and marriage ( $P>0.05$ ). The results of mean and standard deviation of depression, auditory visual attention and group planning were presented in (Table 2).

**Table 2:** Mean and standard deviation of depression, auditory visual attention and planning in groups.

Variables	rtms		rtms		tbs		tbs		
	Non-attempting	attempting	Non-attempting	attempting	Non-attempting	attempting	Non-attempting	attempting	
	Mean	SD	Mean	SD	Mean	SD	Mean	SD	
Depression	20/31	63/4	10/31	65/4	40/30	08/5	30/30	64/4	
	Post-test	50/23	56/3	30/20	94/2	90/22	33/4	30/20	30/3
auditory visual attention	60/50	73/6	30/51	32/6	30/51	69/5	40/50	50/5	
	Post-test	60/59	56/7	70/63	76/4	70/70	07/5	10/62	99/4
planning	90/19	60/3	50/19	37/3	70/19	88/3	30/19	12/3	
	Post-test	10/27	23/2	00/30	62/2	30/26	09/3	30/29	88/1

According to the results of (Table 2), in all four groups, the mean post-test compared to the pre-test shows that this index decreased for depression and increased for visual-auditory attention and planning. The results of correlated t-test to compare post-test with pre-test of depression, visual-auditory attention and group planning were presented in (Table 3).

**Table 3:** Comparison of Depression, Audiovisual and Planning variables in groups based on correlated t-test.

Groups	Variables	Mean differences	Standard estimation error	Statistic t	significance
rtms Non-attempting	Depression	70/7	49/0	53/15	001/0
	audio visual attention	00/9-	47/0	09/19-	001/0
	Planning	20/7-	57/0	55/12-	001/0
rtms attempting	Depression	80/10	69/0	51/15	001/0
	audio visual attention	40/12-	73/0	90/16-	001/0
	planning	50/10-	84/0	40/12-	001/0
tbs Non-attempting	Depression	50/7	52/0	37/14	001/0
	audio visual attention	40/9-	47/0	74/19-	001/0
	planning	60/6-	61/0	67/10-	001/0
tbs attempting	Depression	00/10	51/0	36/19	001/0
	audio visual attention	70/11-	39/0	56/29-	001/0
	planning	00/10-	49/0	22/20-	001/0

According to the results of (Table 3), all four groups are significantly different in terms of all dependent variables of depression, visual-auditory attention and planning based on the comparison of post-test and pre-test scores ( $P < 0.001$ ). Due to the difference in means, it can be said that in all groups, the intervention reduced depression and increased visual, auditory attention and planning in depressed people.

Multivariate analysis of covariance hypotheses showed that the assumption of normality based on Kolmogorov-Smirnov test for variables in pre-test and post-test stages, homogeneity of covariance matrices based on Mbox test and homogeneity of variance based on Levin test were established ( $p>0.05$ ). As a result, there are conditions for using multivariate analysis of covariance. The results of Wilkes lambda test from a set of

Multivariate tests showed that there was a significant difference between the groups in terms of at least one of the variables of depression, auditory visual attention and planning ( $P < 0.001$ ,  $F = 5.72$ ). Therefore, the results of multivariate analysis of covariance to determine the effectiveness of intervention methods on each of the variables of depression, visual auditory attention and planning were presented in (Table 4).

**Table 4:** Results of multivariate analysis of covariance to determine the effectiveness of intervention methods on each of the variables.

Variables	Source	Sum of squares	Df	Squares mean	Statistic F	Significance	Effect size	Statistical power
Depression	pre-test	56/314	1	56/314	56/238	001/0	89/0	00/1
	group	02/72	3	00/24	20/18	001/0	66/0	00/1
audio visual attention	pre-test	66/893	1	66/893	69/333	001/0	92/0	00/1
	group	92/84	3	30/28	57/10	001/0	53/0	99/0
planning	pre-test	88/109	1	88/109	64/44	001/0	61/0	00/1
	group	08/101	3	69/33	69/13	001/0	59/0	00/1

Based on the results of Table 4, the group has a significant effect on all three variables of depression, visual auditory attention and planning ( $P < 0.001$ ). Therefore, it can be said that there is a significant difference between the intervention methods in all three variables. The results of Bonferroni post hoc test to compare the effectiveness of intervention methods on each of the variables of depression, visual auditory attention and planning were presented in (Table 5).

**Table 5:** Results of Bonferroni post hoc test to compare the effectiveness of intervention methods on each of the variables.

Variables	Groups	Mean difference	standard error	significance	
Depression	Tbs Non-attempting	Tbs attempting	57/2	53/0	001/0
	Tbs Non-attempting	Rtms Non-attempting	05/0	52/0	000/1

	Tbs Non-attempting	Rtms attempting	06/3	54/0	001/0
	Tbs attempting	Rtms Non-attempting	62/2	53/0	001/0
	Tbs attempting	Rtms attempting	49/0	52/0	000/1
	Rtms Non-attempting	Rtms attempting	11/3	53/0	001/0
audio visual attention	Tbs Non-attempting	Tbs attempting	55/2	76/0	014/0
	Tbs Non-attempting	Rtms Non-attempting	40/0	74/0	000/1
	Tbs Non-attempting	Rtms attempting	16/3	77/0	002/0
	Tbs attempting	Rtms Non-attempting	96/2	76/0	003/0
	Tbs attempting	Rtms attempting	60/0	74/0	000/1
	Rtms Non-attempting	Rtms attempting	57/3	76/0	001/0
planning	Tbs Non-attempting	Tbs attempting	35/3	73/0	001/0
	Tbs Non-attempting	Rtms Non-attempting	58/0	72/0	000/1



Tbs	Rtms	91/3-	73/0	001/0
Non-attempting	attempting			
Tbs	Rtms	77/2	73/0	004/0
attempting	Non-attempting			
Tbs	Rtms	55/0-	71/0	000/1
attempting	attempting			
Rtms	rtms	33/3-	73/0	001/0
Non-attempting	attempting			

According to the results of (Table 5), in all three variables of depression, visual-auditory attention and planning, the effectiveness of the non- attempting tbs group was lower than that of the attempting tbs and attempting rtms groups, the effective attempting tbs group was more effective than the non-attempting rtms group and the non- attempting rtms group was less effective than the attempting rtms group (P<0.05), but in all three variables there is no significant difference between the effectiveness of the non- attempting tbs group with the non-attempting rtms and the attempting tbs with the attempting rtms group (P>0.05).

## Discussions

Considering the high prevalence of depressive disorder and the direct relationship between depression and suicidal attempt and thoughts, the present study was conducted to compare the effectiveness of repetitive transcranial magnetic stimulation and theta burst stimulation on visual auditory attention and planning in in depressed people who attempting suicide and not attempting suicide.

Findings of the present study showed that repeated transcranial magnetic stimulation reduced depression and increased visual auditory attention and planning in depressed individuals who attempted suicide and did not attempt suicide. The results of the effectiveness of repeated transcranial magnetic stimulation method on reducing depression are in accordance with with the results of Zheng et al (17), Chris et al (18), Sattari Sefidan Jadid et al (19) and Nozari et al (20). in increasing attention Auditory visual was in line with the results of Ashrafi et al (21) and Normashiri et al (22) and in terms of increasing planning with the results of Beynel et al (23). Explaining the effectiveness of repetitive transcranial magnetic stimulation on reducing depression and increasing visual and auditory attention and planning in depressed individuals who attempt and do not commit suicide based on Asbaghi and colleagues research (32), it can be said that repetitive transcranial magnetic stimulation Magnetic waves affect cortical activity in the stimulated area and affect the area by altering glucose levels and the activity of

neurotransmitters. In this method, after passing through the coil that is placed on the person's head, magnetic fields are created, which lead to a lighter electric current in the cerebral cortex and thus the potential for action in the stimulated nerve tissue. Repeated transcranial magnetic stimulation devices can produce waves with a frequency of 1 to 100 Hz, which can produce excitatory or inhibitory effects depending on the type of frequency. Another important point about the effectiveness of this method in reducing depression and increasing visual-auditory attention and planning is that this method can have a lasting effect on recovery due to its long-term potential, and this strong synaptic activity leads to a strong continuous synaptic transmission. The long-term potential mechanism is a widely accepted model of neural flexibility that underlies learning and memory. In fact, it is a powerful technique for enhancing the effects of other interventions, such as pharmacotherapy, which are strongly associated with working memory processes. Another reason could be related to the improvement of mood (depression) that occurred in this period compared to the baseline before the intervention, which leads to an improvement in the scores of different cognitive domains. Many cognitive impairments in patients with mood disorders improve after a variety of therapeutic interventions. However, many experts believe that this treatment independently improves various aspects of cognitive functions, including visual auditory attention and planning. Other findings of the present study showed that theta burst stimulation reduced depression and increased visual, auditory attention and planning in depressed individuals who attempted suicide and did not attempt suicide. The results of the effectiveness of theta burst stimulation on reducing depression are in accordance with the results. In the field of increasing auditory visual attention with the results and in the field of planning it was consistent with the results. Explaining the effectiveness of theta burst stimulation on reducing depression and increasing visual-auditory attention and planning in depressed individuals who attempt and do not commit suicide, it can be said that theta burst stimulation causes strong and lasting changes. In other words, using this method causes long-term excitatory and inhibitory changes in cerebral cortex irritability. Another important point about theta burst stimulation is that the duration of each stimulus in this method is very short and about 3 to 6 minutes, and this short time not only does not reduce its effectiveness, but can increase its effectiveness due to its short duration. Because one of the factors preventing changes is fatigue. Since theta burst stimulation therapy is a safe, short-term, and relatively effective method, it can be expected that it can reduce depression and increase cognitive function, including auditory visual attention and planning in people with depression (including attempting or non-attempting suicide). Other findings of the present study showed that in all three variables of depression, visual-auditory attention and planning, the effectiveness of the non-attempt theta burst group compared to the attempt theta burst and attempt repetitive magnetic stimulation groups was less , the effectiveness of the attempt theta burst group was higher than that of the non-attempt Tms group.And the effectiveness of the non-attempt transcranial magnetic stimulation was less than attempt repetitive transcranial magnetic stimulation group , but in all three variables there was no difference between the

effectiveness of non-attempt theta burst groups with non-attempt repetitive transcranial magnetic stimulation and attempt theta burst group with attempt transcranial magnetic stimulation groups. In explaining the lack of significant difference between the effectiveness of non-attempt theta burst stimulation groups with non-attempt repetitive transcranial magnetic stimulation group

and attempt theta burst stimulation with attempt repetitive transcranial magnetic stimulation groups in all three variables, can be considered to the advantages of both methods and that the basis of the theta burst is the same as the repeated transcranial magnetic stimulation. And it seems that the factor that is effective here is attempting or non-attempting suicide, which causes differences between groups. Therefore, it can be expected that both methods have almost the same effect in people who attempt suicide or non-attempt suicide individuals and there is no significant difference between them. Another possible reason for the lack of differences between groups is the large number of sessions using both methods. Although previous studies have shown that the theta burst stimulation method is more effective than the transcranial magnetic stimulation method, but it seems that in this study, due to the longer duration of the transcranial magnetic stimulation sessions compared to the theta burst stimulation, no significant difference was observed between the methods. In this study, in the theta burst stimulation method, the average of each session was 3.3 minutes and in the repetitive transcranial magnetic stimulation method, each session was 38 minutes. Considering that the subjects were treated for twelve sessions, it can be said that the theta burst stimulation group underwent a total of 39.6 minutes and the transcranial repetitive magnetic stimulation group underwent a total of 456 minutes. In other words, the transcranial repetitive magnetic stimulation group, although almost 12 times more trained in terms of time than the theta burst stimulation group, there is no significant difference between them in reducing depression and increasing auditory visual attention and programming. Also, in explaining the lower effectiveness of the non-attempt theta burst group compared to the attempt theta burst and attempt suicide repetitive transcranial magnetic stimulation groups, and the less effectiveness of non-attempt repetitive transcranial magnetic stimulation group compared to attempt theta burst group and attempt repetitive transcranial magnetic stimulation group of in reducing depression and Increasing the visual auditory attention and planning can be said to can be said to be a possible reason why attempting suicide groups have more psychological problems and feel more needed to receive psychological services, and this through more active participation in training sessions further reduces depression and increases visual auditory attention and planning in individuals that commit suicide compared to non-committing groups.

The most important limitations of the present study included the use of purposive sampling, insufficient sample size in each group, difficulty of intervention due to its individuality, failure to review the results by gender and lack of follow-up to ensure the continuity of long-term results. Therefore, it is suggested that in future studies to reduce sampling error, random sampling methods should be used, the sample size should be increased in

groups, the results should be evaluated by gender and the continuity of the results should be evaluated in the long run.

## CONCLUSION

The results of the present study showed that both repetitive magnetic stimulation and theta burst stimulation reduce depression and increase visual auditory attention and planning in depressed individuals who have attempted suicide and have not attempted suicide. In all three variables, the effectiveness of the non-attempting theta burst stimulation group compared to attempting theta burst group and attempting Transcranial magnetic stimulation group was less and effectiveness of attempting theta burst group is more than non-attempting Transcranial magnetic stimulation group and effectiveness of non-attempting Transcranial magnetic stimulation group compared to the attempting Transcranial magnetic stimulation group was less. But in all three variables, there was no significant difference between the effectiveness of non-attempting theta burst stimulation group with non-attempting repetitive transcranial magnetic stimulation and attempting theta burst stimulation with attempting repetitive transcranial magnetic stimulation groups. As a result, it showed the effectiveness of both methods of repetitive transcranial magnetic stimulation and theta burst stimulation, especially in the attempting suicide group compared to the non-attempting suicide group.

Therefore, therapists and specialists can use both methods, especially theta burst stimulation, due to their effectiveness and short time to reduce depression and increase visual-auditory attention and planning in depressed people who attempt suicide and do not attempt suicide.

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