Journal of Fundamentals of Mental Health

Mashhad University of Medical Sciences

Psychiatry and Behavioral Sciences Research Center

Original Article

Effects of a modern cognitive bias modification program on attentional biases and social anxiety symptoms in socially-anxious students

Mahsa Ahmari [1]; Javad Salehi Fadardi [2*]; Seyed Amir Amin Yazdi [2]; Hamed Saber [3]

[1] *M.Sc. in clinical psychology, Ferdowsi University of Mashhad, Mashhad, Iran*
[2] *Associate professor of psychology, Ferdowsi University of Mashhad, Mashhad, Iran*
[3] *M.Sc. in science, Amirkabir University of Technology, Tehran, Iran*

Abstract

Introduction: The present study aimed to examine the effectiveness of a multi-sessions of Cognitive Bias Modification for Attention (CBM-A) program on reducing the attentional bias to threat and social anxiety symptoms in a population of socially anxious individuals.

Materials and Methods: The statistical population of this clinical trial included all students with social anxiety disorder aged 18-30 who were referred to faculty of psychology clinic of Ferdowsi University of Mashhad in the 2011-12 academic years. Volunteers with a high score on the Conner's Social Phobia Inventory (n=30) were randomly assigned into an experimental and a placebo group. At pre-test, participants completed a computerized attentional bias test and Conner's Social Phobia Inventory. Participants in the experimental group received four sessions of cognitive bias modification training for attentional biases (CBM-A) over 4 weeks for 4 sessions. Placebo group received identical numbers of training sessions with experimental group. At post-test (1 week after training) and 12 weeks follow-up (90 days), all participants also completed the measures of visual attentional biases and social anxiety. The data were analyzed using SPSS version 16 and MANCOVA test.

Results: According to results the experimental group showed significant reductions in their attentional bias to threat than the placebo group at post-test (P<0.01) and follow-up (P<0.01) assessments. These results indicate participants in the experiment group reported significantly less social anxiety symptoms than those in the placebo group at both post-test (P<0.05) and 12 weeks follow-up (P<0.01).

Conclusion: It seems that using a multi-session Cognitive Bias Modification for Attention (CBM-A) program for facilitating disengagement attention from threat may have clinical implications in the treatment of social anxiety.

Keywords: Attention, Bias, Cognitive, Social anxiety

Please cite this paper as:
Ahmari M, Salehi Fadardi J, Amin Yazdi SA, Saber H. Effects of a modern cognitive bias modification program on attentional biases and social anxiety symptoms in socially-anxious students. Journal of Fundamentals of Mental Health 2016 Jan-Feb; 18(1): 35-41.

Introduction

Social anxiety disorder is a sort of behavioral disorder that is highly affected, developed and maintained by implicit cognitions (1-6). People with this disorder tend to interpret events and social situations that are emotionally ambiguous, as negative or of threatening manner. In addition, recent findings on existence of a causal connection between attentional bias and anxiety encourage researchers to create ways to modify or modulate the attentional bias. One method of modulating cognitive biases is modulating attentional bias (CBM-A). The CBM method not only made threat causal mode clear, but also suggested the potential therapeutic benefits (7).

The term cognitive bias modification refers to strategies that use regular practice to change a specific style of cognitive processing (which is assumed to be involved in unpleasant emotional reactions or disorders) (8). Studies on CBM have shown that cognitive biases can be modified and these changes, will affect subsequent emotional activities. The CBM approach is not a new approach; but it includes the basic principles of experimentation to discover the nature of the relationship between cognition and emotion: the variable it is believed that impacts on presumed causal process can be manipulated and its effects on

***Corresponding Author:** Faculty of Psychology and Education Sciences, Ferdowsi University of Mashhad, Mashhad, Iran
J.s.fadardi@um.ac.ir
Received: Nov. 22, 2014
Accepted: Aug. 12, 2015

outcome measurement scale should be observed (9).

In cognitive researches, a usual way is changing emotional modes to study the effect of mood on subsequent cognitions (for example the use of songs to change the mood). CBM, on the opposite, wants to determine whether or not changes in cognition can affect emotional characteristics (9). The main idea behind the methods such as CBM is by reversing the direction of processing causality that in implementation of a simple task which is designed to strengthen or weaken the acquisition of certain types of biases in information processing (attention, interpretation, and memory), Participants are exposed to a form of conditioning which takes place experimentally (9).

According to the role of attentional bias in the etiology of anxiety disorders, it can be predicted that by reducing these biases, the severity of disorder is reduced. Attentional bias modification training as a subset of cognitive behavioral therapy has been formed for this purpose and targets a range of biases (10). Attentional bias modification training is different with cognitive behavioral therapy; it is a therapeutic activity which targets a particular attentional bias and spreads with attentional bias related to implicit Threat (11).

Attentional bias modification training was first introduced in 1995 by McLeod. McLeod was the first to show that training to healthy people can increase their attentional bias to threat, and subsequently their anxiety. Thereafter, other researchers have attempted to use this effect to reduce attentional bias and severity of disorder (referred to10).

Researches using brain imaging technique show attentional bias in anxiety disorders includes disorders of cerebral cortex and sub-cortical cortex. Some certain types of cognitive behavioral therapy, which use top-down interpretation processing, are probably unable to target this sub-cortical cortex component. Compared to explicit teaching techniques in cognitive-behavioral therapy, attention deficit will probably modify easier since attentional bias modification training uses repeated computer training practices which targets sub-cortical and implicit processes (11). Therefore, Attentional bias modification training could represent a new treatment that directly targets the area of disrupted neural activity.

The results of the studies in this regard were inconsistent. Some researchers reported that after a period of intensive treatment on reducing the attentional bias, in terms of reducing the symptoms, no significant difference between control and experimental groups were observed (12). But others have found that manipulating attentional bias through practice, led to improvement of symptoms (13-17).

Regarding the role of attentional bias to threat in existence and persistence of social anxiety disorder (18-25). It may be hypothesized that by manipulating the data processing and a change in threat bias and a reduction in saccades of these individuals to threat, the severity of disorder symptoms can be reduced? Despite the many studies that have investigated the role of attentional bias in anxiety disorders, it seems that there are very few studies about treatment methods focus on changing the threat bias towards emotional expressions.

Due to the advantages of attentional control training, the present study intends to compare the effectiveness of training attention control to emotional faces on reducing attentional bias to threat and improving social anxiety symptoms.

Materials and Methods

This study is a clinical trial, using pre-test and post-test design and a control group. Statistical population of this clinical trial included all students at Ferdowsi University of Mashhad in response to the call for research voluntarily participated in this study. Inclusion criteria to enter this study were being older than 18 and younger than 30 years, the relative health (lack of psychiatric disorder or a history of psychiatric drugs), social anxiety score higher than 21 in Connor's social anxiety questionnaire and Having normal vision or vision corrected with glasses or contact lenses were necessary. Exclusion criteria included lack of desire to continue the cooperation.

Estimating the sample size was done according to hypothesis testing procedures and measures derived from previous researches. To estimate the required sample size, the size of the effects obtained in previous similar research was used (17). Present research groups included socially anxious group and non-clinical anxious group (15 participants in each group). Multi variable analysis of covariance was used to determine the effectiveness of cognitive bias modification program on attentional biases and social anxiety symptoms.

Research instruments

- *Conner's Social Phobia Inventory:* It developed in order to measure social anxiety disorder. The inventory comprises 17 questions and three subscale: fear (six questions), avoidance (seven questions), and physiological symptoms (four questions). Connor et al. reported this scale's

validity in groups with social anxiety disorder equal to 0.78 up to 0.89 using retest method. The internal consistency in a group of normal people was reported for the whole scale equal to 0.94 and 0.89 for the fear subscales, 0.91 for avoidance and 0.80 for physiological discomfort. The questionnaire (cut-off point 19 with efficiency or accuracy of 79%) differentiates socially anxious people from non-anxious people. Cut off point of 15 with 78% efficiency and cut off point of 16 with 80% efficiency separates participants with a diagnosis of social anxiety disorder apart from the control group (people without any psychiatric problem or people with psychiatric disorder except social anxiety disorder). Abdi reported internal consistency of the questionnaire using Cronbach's alpha equal to 0.86, validity using retest method equal to 0.83 and content validity of questionnaire was to approve by three psychology professors (26-29).

15 people with social anxiety due to attentional bias to threat were selected for each group, So that attention control training effectiveness was evaluated on 15 participants with social anxiety with 15 participants with social anxiety who did not receive training. For each Participant after reading the research information sheet and signing the consent to participate in research, a series of tests (Conner's Social Phobia Inventory, visual bias for emotional expressions) were conducted. Then cognitive bias modification program was down for experimental group in 4 weeks (4 sessions, every session 30 minutes).

In the first step, both emotional and neutral expressions are presented together. At this step participant was assigned to look at the neutral expression for 500 milliseconds (without any saccade) and must do it quickly.at this step the difficulty of task increased gradually: A) Number of images presented simultaneously, increased. Example: first, participant must look at the neutral expression for 500 milliseconds between two images (negative-neutral) that are presented and the number of images gradually increased (2, 3, 5, 10); B) the number of negative images increases in each step too. Example: in the step that 3 images simultaneously presented to participants the images were more neutral images (2 neutral images and 1 threatening image) and threatening images gradually increased (2 threatening images and 1 neutral image). The second step of the task is similar to the first step with this difference that the participant should establish his/her attention to neutral stimuli longer (1000 milliseconds). Difficulty grade of the task was the same as the first step. In the third step the participant should establish his/her attention to the eye of the neutral image for 500 milliseconds without any jump to the threatening image. Difficulty of this step was the same as first step. Fourth step was like the second step except that the participant should establish his/her attention to the eye of neutral image for 1000 milliseconds. At this step the difficulty level was exactly same as other steps.

Picture 1 - An example of the stimulants presented in the steps of attention control training program.

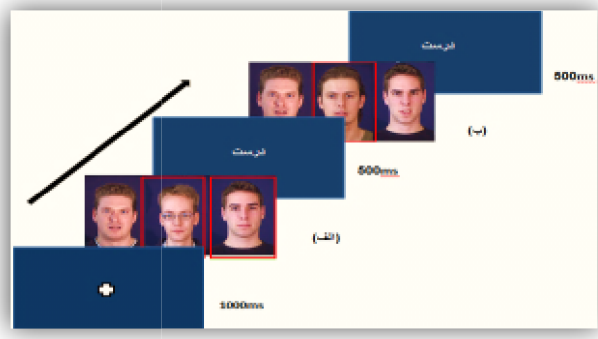
At the end of each exercise, it was explained to the participants that the purpose of this exercise is to increase the ability to control his/her attention to make a healthy choice in the least possible time (about half a second) and be able to look at this choice for a specific period of time (500, 1000 milliseconds) And during the task do not any jump to negative emotional expression.

The criterion of progress in the exercise was defined according to its speed. In the first step, success was the correct diagnosis, and the reduction in response time to neutral face to about half a second. In second step, success was correct diagnosis of neutral face and looking at neutral eye for a certain period (1000 milliseconds). In third and fourth steps, success was correct and rapid diagnosis of the eye of neutral face and consolidating attention on this area for a certain period (500, 1000 milliseconds). The participant was encouraged to apply more precision and speed in practice in each step by providing appropriate feedback.

The purpose of designing this program is to help the social anxious so that: A) They correct auto and extreme attention to threatening emotional expressions; B) They reduce the time spent to turn attention from threatening emotional expressions stimulus; C) They make cognitive chain searching and selection of neutral and positive facial expressions automatic. And; D) they experience less confusion in functional social situations. Four mentioned steps are consistent with four stages of cognitive bias modification training.

Training program for control-treated group used Images that were used in the original training program. The difference was, "the area of interest defined in both emotional and neutral pictures" in a manner that participants would pass the neutral or emotional stimuli one by one by looking even at one of them for a certain period of time. Control-treated group worked in this period, four sessions (one session per week), and each session lasting 15-20 minutes with a program that was prepared for them. The participants were told that this program is a

training program for attention control and they were asked to note on paper at the end of each training session, the number of neutral emotional expressions that they remember.



After the completion of the exercise in the control treatment and experimental group, which lasted four weeks for each person (1 session per week).a set of tests were administered to subjects in both groups. After 3 months (participants did not do any training in these three months) once again sets of tests were administered to all participants and then the control treatment group were given the possibility to participate in the original training program.

Results

To examine demographic differences between the two groups (experimental and control treatment), t test, were used for variables age and years of education. The results showed that There is no significant difference between the two experimental and control treatment groups, in the variables age (*P*= 72.0, t (30)= -36.0) and years of education (*P*= 36.0, t (30)= -92.0). None of the individuals in both groups had any history of diagnosis and treatment of a mental disorder. Mean age was 21.06 and standard deviation 1.93.

The two indicators of attentional bias reduction are: A) facilitation of attention to threat indicator, B) disengagement from threat. These two important indicators of attentinal bias were used to survey the effectiveness of attentional bias modification program. These two indicators of attentional bias reduction in separate analyses were entered in the analysis as dependent variable.

To evaluate changes in facilitation of attention to threat indicator "multivariate statistical analysis covariance" model was used under influence of attention Control Training in a way that Group scores were entered as the independent variables and facilitation of attention to threat indicator in the post-test and follow-up test were entered as the dependent variables in the model. In order to control the effect of pretest, facilitation of attention to threat indicator entered in the model as covariate in pretest.

The results showed that facilitation of attention to threat indicator in pretest, in the post-test step (đ=2.28, *P*= 0.000; F (1,159)= 36.55) and in the follow up test step (đ= 2.78, *P*= 0.000; F(1,159)= 54.12) had a significant effect. After controlling the pre-test scores, effects of group was significant in the post test (đ= 1.36, *P*=0.00; F (1,159)= 12.97) and also in the fallow up test (đ= 0.80, *P*=0.03; F (1,159)= 4.43).

To evaluate "disengagement attention from threat" indicator (receiving attention Control Training decreased attention deviation towards socially threatening stimuli in the training group rather than control-treated group), multivariate covariance analysis statistical model was used. In the mentioned statistical model, first, scores that were more than three standard deviations from the mean were filtered (6.6 percent). Then, "delays in releasing of attention from threat" indicator was entered in the post-test and follow up as dependent variable and in group as independent variable. Also, in order to control the effect of pre-test "delays in releasing of attention from threat" indicator in pre-test entered the model as covariate. The results showed that the pre-test "delays in releasing of attention from threat" indicator had no significant effect on the post-test (đ= 0.33, *P*=0.78; F (1,697)=0.07) and follow-up (đ= 0.74, *P*=0.05; F (1,697)= 3.85) scores. Group had a significant effect

on the post-test (đ= 0.89, *P*= 0.01; F (1,697)= 5.64). There was a significant effect of group on the follow up test (đ= 1.41, *P*=0.00; F (1,697)= 13.94).

Based on the results, "reducing facilitation of attention to threat indicator" hypothesis in both post-test and follow-up tests, confirmed. In other words, the results indicate that the experimental group at post-test and follow-up tests, compared to control Treatment group, makes relieve their attention quicker from negative emotional expressions.

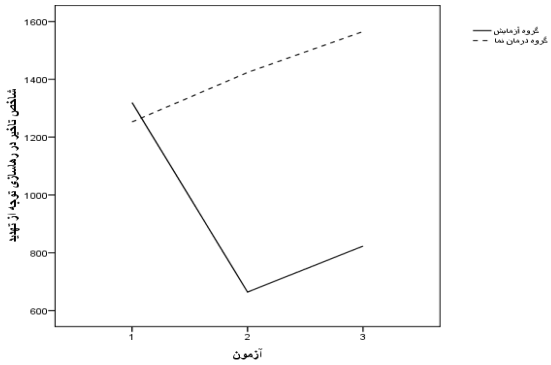


Figure 1. The pattern of disengagement from threat index in the experimental group and control

In order to evaluate treatment indicators by intervention, change in social anxiety score of the groups in the pre-test, post-test and follow-up was analyzed by multivariate analysis of covariance. Social anxiety score was entered in the post-test and the follow up test as the dependent variable and group was entered as the independent variable. In order to control the effect of pre- test, social anxiety scores in pre-test entered the model as covariate. The results indicate that after controlling pretest effect, Group had a significant effect on the post-test (đ= 0.80, p =0.04; F (1, 29) =4.54). There was a notable effect of group on the follow up test (đ =1.11, p =0.00; F (1, 29) =8.65).

Based on the results, this hypothesis in both post-test and follow-up tests, were confirmed. In other words, the results indicates that the experimental group at post-test and follow-up tests, compared to control Treatment group, shows less social anxiety symptoms in comparison with pretest.

In an aggregation we can say that in the experimental group, facilitation of attention to threat indicator and delay in the releasing attention from threat indicator which is a major form of attentional bias to threatening social stimuli, decreased in the post-test and follow up test compared to pre-test. Also symptoms of social anxiety in the experimental group decreased compared with the control-treated group in post-test and follow up test than pretest.

Discussion

The main purpose of the present study was to evaluate the efficacy of Attention control training in reducing attentional bias to threatening social stimuli in people with social anxiety. In addition, it examined whether or not the reduction in attentional bias towards socially threatening stimuli brings along a reduction in social anxiety? Results of the analysis conducted to test the first hypothesis suggests that delay in the releasing attention from negative emotional faces which is one of the most important indicators in attention biases to the threatening social stimuli, significantly reduced from pretest to posttest and also from pretest to follow-up test. In other words, attention control training was associated with reduced attention biases in short term and this effect was continued over time. This finding supports the results of previous studies (12,14,15,22,24).

Analysis of the results in relation to social anxiety showed that after attention control training, social anxiety of participants significantly decreased. In other words, those who had received the intervention, showed a reduction in symptoms of social anxiety, in addition to reducing attentional bias to environments threatening sings. In explaining this result, we can say that many aspects of social anxiety are caused by this attentional bias to threatening stimuli (12,14,15,18,29). Thus, by reducing attentional bias to threatening signs and encouraging attention to neutral signs, the negative contribution of attentional bias to threatening signs will change to its positive contribution in away from threatening signs, which its consequence is reducing the signs of social anxiety. It is a two-way effect. Thus, some researchers have suggested that the rate of attentional bias to threatening information can be an indication of the impact of treatment on anxiety disorders. If improvement has occurred, Anxiety-related attentional bias mutually (same ratio) should be reduced (30).

Briefly, it can be said that attentional control training to people with social anxiety helps them reduce their attentional bias to threat and finally by greater control over their attention as entrance gate of information, experience fewer symptoms of social anxiety and also reduce their vulnerability in social stressful situations.

We were faced with the following limitations: It was hard to attract participants with social anxiety diagnosis for cooperation. Because they didn't have any information about intervention and working

with eye-tracking device was strange for them. Since participation in this study was voluntary, maybe socially anxious volunteers have more motivation than other socially anxious people for change. And the result of this study is not generalizable for all of socially anxious people. Although we tried to minimize confounding variables in this study but we didn't have an appropriate place with laboratory conditions to maintain all confounding variables (noise, light, temperature and …) constant.

Conclusion

The results of this study shows that by a four session intervention with the aim of breaking cognitive behavioral automatic chain which is formed in result of inefficient attention to threatening stimuli, we can significantly reduce attention bias to this stimulus in short term and also long term. It seems this intervention strengthened participant's inhibition skill by training them to release attention from threatening stimulus and attention to neutral stimulus. It also taught them to intervene on their attention and gain control over what was always an automatic process. After the sessions and with generalization of this strategy in real life situations, participants strengthen their inhibition skill so that their attention bias in the follow-up test was significantly decreased.

Finally, we can say that the attentional bias modification treatment is a promising new therapy for anxiety disorders.

References

1. Amir N, Elias J, Klumpp H, Przeworski A. Attentional bias to threat in social phobia: Facilitated processing of threat or difficulty disengaging attention from threat? bias to threat in social. Behav Res Ther 2003; 41: 1325-35.
2. Buckner JD, Maner JK, Schmidt NB. Difficulty disengaging attention from social threat in social anxiety. Cognit Ther *Res* 2010; 34(1): 99-105.
3. Cisler JM, Koster EW. Mechanisms of attentional biases towards threat in anxiety disorders: An integrative review. J Clin Psychol Rev 2010; 30: 203-16.
4. Cisler JM, Olatunji BO, Lohr JM, Williams NL. Attentional bias differences between fear and disgust: Implications for the role of disgust in disgust-related anxiety disorders. Cogn Emot 2009; 23(4): 675-87.
5. Fox E, Russo R, Bowles RG, Dutton K. Do threating stimuli draw or hold visual attention in subclinical anxiety? *J* Exp Psychol 2001; 130: 681-700.
6. Garner M, Mogg K, Bradley BP. Orienting and maintenance of gaze to facial expressions in social anxiety. J Abnorm Psychol 2006; 115: 760-70.
7. Mobini S. Effects of cognitive bias modification and computer-aided cognitive-behavior therapy on modifying attentional and interpretative biases and anticipatory social anxiety. Ph.D. Dissertation. University of East Anglia, 2010.
8. Koster EH, Fox E, McLeod C. Introduction the special section on cognitive bias modification in emotional disorders. J Abnorm Psychol 2009; 118: 1-4.
9. Hertel PT, Mathews A. Cognitive bias modification: Past perspectives, current findings, and futurs application. Perspect Psychol Sci 2011; 6: 521-36.
10. Hakamata Y, Lissek Sh, Bar-Haim Y, Britton Fox JC, Nathan A, Leibenluft E, et al. Attention bias modification treatment: A meta-analysis toward the establishment of novel treatment for anxiety. Biol Psychiatry 2010; 68(11): 982-90.
11. Bar-Haim Y, Lamy D, Pergamin L, Bakermans-Kranenburg M, van Ijzendoorn MH. Threat-related attentional bias in anxious and nonanxious individuals: A meta-analytic study. Psychol Bull 2007b; 133(1): 1-24.
12. Li S, Tan J, Qian M, Liu X. Continual training of attentional bias in social anxiety. Behav Res Ther 2008; 46(8): 905-912.
13. Schmidt NB, Richey JA, Buckner JD, Timpano KR. Attention training for generalized social anxiety disorder. J Abnorm Psychol 2009; 118: 5-14.
14. Amir N, Weber G, Beard C, Bomyea J, Taylor CT. The effect of a single session attention modification program on response to a public speaking challenge in socially anxious individuals. J Abnorm Psychol 2008; 117: 860-8.
15. Amir N, Najmi S, Morrison AS. Attenuation of attention bias in obsessive-compulsive disorder. Behav Res Ther 2009; 47: 153-7.
16. Heeren A, Lievens L, Philippot P. How does attention training work in social phobia: disengagement from threat or re-engagement to non-threat? J Anxiety Disord 2011; 25(8): 1108-15.
17. Memarian S. [The effectiveness of attention bias modification program for decreasing attention bias for threat and social anxiety symptoms in socially anxious individuals]. MA. Dissertation. Mashhad: Ferdowsi University of Mashhad, College of psychology and education science, 2011: 66-72. (Persian)
18. Josh MC. Mechanisms of attentional biases towards threat in anxiety disorders: An integrative review. Clin Psychol Rev 2010; 30(2): 203-16.
19. Koster EH, Crombez G, Verschuere B, De Houwer J. Attention to threat in anxiety- prone individuals: Mechanisms underlying attentional bias. Cognit Behav Ther 2006; 30: 635-43.

20. Koster EH, Crombez G, Verschuere B, Houwer JD. Selective attention to threat in the dot probe paradigm: differentiating vigilance and difficulty to disengage. *Behav Res Ther* 2004; 42: 1183-92.
21. Koster E, Crombez G, Verschuere B, Van Damme S, Wiersema J. Components of attentional bias to threat in high trait anxiety: Facilitated engagement, impaired disengagement, and attentional avoidance. *Behav Res Ther* 2006; 44(12): 1757-71.
22. Lonigan CJ, Vasey MW. Negative affectivity, effortful control, and attention to threat-relevant stimuli. J Abnorm Child Psychol 2009; 37: 387-99.
23. Miltner WH, Krieschel S, Hecht H, Trippe R, Weiss T. Eye movements and behavioral responses to threatening and nonthreatening stimuli during visual search in phobic and non phobic subjects. Emotion 2004; 4: 323-39.
24. Salemink E, van den Hout MA, Kindt M. Selective attention and threat: Quick orienting versus slow disengagement and two versions of the dot probe task. *Behav Res Ther* 2007; 45: 607-15.
25. Sarafraz MR, Taghavi MR, Gudarzi MA, Mohammadi N. Comparison of attentional bias in normal adolescents and adolescents with social phobia (using visual probe task). *J* Cognit Neuroscience 2009; 11: 56-67.
26. Connor KM, Davidson JRT, Churchil LR, Sherwood A, Foa E, Weisler RH. Psychometric properties of the Social Phobia Inventory (SPIN): New self-rating scale. Br J Psychiatry 2000; 176: 379-86.
27. Abdi R. [Interpretation bias in individuals with social anxiety disorder]. MA. Dissertation. Tehran: Tehran University of Medical Sciences, Psychiatric Institute, 2003: 82-4. (Persian)
28. Davidson JRT, Miner CM, De Veaugh-Geiss J, Tupler LA, Colket JT, Potts NLS. The Brief Social Phobia Scale: A psychometric evaluation. Psychol Med 1997; 27: 161-6.
29. McLeod C, Rutherford E, Campbell L, Ebsworthy G, Holker L. Selective attention and emotional vulnerability: Assessing the causal bias of their association through the experimental manipulation of attentional bias. J Abnorm Psychol 2002; 111(1): 107-23.
30. Mattia JI, Heimberg RG, Hopp DA. The revised Stroop color naming task in social phobics. Behav Res Ther 1993; 31: 305-13.