

A Comparison of the Effectiveness of Cognitive Behavioral Therapy and Mindfulness-Based Stress Reduction Therapy on Anxiety Sensitivity in patients with Cardiovascular Disease

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Abstract

Introduction: Cardiovascular disease is a major medical problem worldwide. The purpose of the present research was to examine a comparison of the effectiveness of cognitive-behavioral therapy and mindfulness-based stress reduction therapy on anxiety sensitivity in patients with cardiovascular disease (CVD).

Method: This research was a quasi-experimental one with the plan of the pre-test posttest, and control group. The statistics of this research consisted of patients with CVD who were treated at Kasra Hospital in Tehran in 2019. The samples were 135 patients aged 40-65 years with CVD identified among patients assigned to the two groups experimental and one control group. Data were collected using the Anxiety Sensitivity Index. The research data results were analyzed using the methods of multivariate analysis of covariance (MANCOVA).

Results: Multivariate analysis of covariance showed that cognitive-behavioral therapy and mindfulness-based therapy significantly decreased anxiety sensitivity, physical concern, social concern, and cognitive concern in the experimental group ($p < 0.001$).

Discussion: These results suggest that cognitive-behavioral therapy and mindfulness-based therapy could adjust anxiety sensitivity in patients with CVD. Based on the results, these two interventions can by promoting social skills, realistic view of cognitive abilities and adaptive coping styles, reduce the anxiety sensitivity in patients with CVD.

Declaration of Interest: None

Keywords: Cognitive behavioral therapy, Mindfulness-based stress reduction therapy, Anxiety sensitivity, Cardiovascular disease.

Introduction

Cardiovascular disease (CVD) is the global leading cause of premature death (1). In Iran, the most prevalent causes of death have transitioned from infectious and diarrheal diseases in 1960 to CVD a few decades ago (2). An estimated 17.9 million people died from CVDs in 2015. By 2030 more than 22.2 million people will die annually from CVDs (3). Populations in low and middle-income countries now contribute 75% of the CVD deaths (2, 3). CVD has a combination of biological and psychological risk factors (4, 5). Some of these factors include depression, anxiety, obesity, decreased physical activity, alcohol abuse and smoking (4). One of these psychological constructs is anxiety sensitivity (AS) (6).

AS is the extent to which anxiety-induced physiological symptoms (e.g., nausea, pounding heart) are more concerning to an individual than the behavioral concerns (5-7). The phenomenon of AS is different than trait anxiety such that the focus of the fear is related to the somatic symptoms instead of general stress (7). For individuals with high AS, anxiety symptoms themselves are distressing and maintain the anxiety (6,7). AS is an important trans-diagnostic factor in etiology, assessment, and treatment of multiple emotional disorders including obsessive-compulsive disorder, depression, post-traumatic stress disorder, and generalized anxiety disorder (6, 7, 8, 9, 10). Some studies, employing factor analyses, have also revealed the hierarchical and multifaceted nature of AS, consisting of a higher-order factor, the general AS, and lower-order factors, including fear of somatic sensations, fear of cognitive decontrol and fear of socially observable anxiety symptoms (8,10). Fear of somatic sensations is associated with worries about the consequences of arousal sensations (11).

Anxiety sensitivity now has been presented as a psychological characteristic capable of detecting subjects at increased CVD risk. Farris & Abrantes (12) showed that smokers

with CVD indicators had significantly higher scores on the AS, relative to smokers without CVD. Those with CVD were significantly more likely to have moderate or high AS relative to those without CVD. Theoretically, AS may be elevated among individuals with CVD due to increased presence of physiological and autonomic disturbance (13), which may serve as a prominent cue for perceived danger and risk (11). Indeed, among non-cardiac patients, anxiety sensitivity is associated with greater cardiopulmonary fears (14). It is possible that anxiety sensitivity may contribute to risk for CVD through engagement in various health risk behaviors, such as smoking, emotional eating and physical inactivity (15,16). In addition, anxiety sensitivity may have a direct effect on CVD (15, 16, 17). For example, higher anxiety sensitivity is associated with an increased likelihood of carotid plaques and arterial stiffness among individuals without CVD (17). Therefore, according to the above-mentioned research results, the necessity of effective therapeutic interventions is necessary. In recent years, however, psychological therapies have been used to reduce physical and psychological complications. What should be noted is the difference between these interventions in terms of ease of implementation and continuity of treatment outcomes. In this regard, among many therapies, cognitive-behavioral therapy (CBT) is considered as one of the most effective therapies that deal with cognitions that lead to a change of emotions, thoughts and behaviors (18). CBT is an effective treatment for reducing symptoms of anxiety disorders and improving quality of life (QoL) in patients with anxiety (19). Freedland et al. (20) found that cognitive-behavioral therapy is effective in improving anxiety, depression, physical functioning, fatigue, social roles and activities, and quality of life in anxiety patients. Doering et al. (21) also studied CBT on depression, pain, and pain control in cardiac surgery patients. The results showed that CBT improves depression, pain and pain control.

Additional treatments are mindfulness-based therapy (MT). Mindfulness has been commonly defined as "paying attention in a particular way: on purpose, in the present moment and non-judgmentally" (22). Mindfulness has been commonly claimed to involve regulation to focus of attention towards the current experience, a willingness to come in contact with and be receptive to experience rather than avoid it or cope by means of repression (23). Mindfulness-based interventions have been shown to alleviate symptoms of a variety of clinical conditions such as suicidal ideation and manic symptoms, relapse reduction in recurrent major depression, rumination, addictions and substance use disorders, eating disorders, generalized anxiety, obsessive-compulsive disorder (24). Mohammadpour et al. (25) in their study aimed to investigate the effectiveness of mindfulness-based cognitive therapy on quality of life and hope in patients with CVD showed that this intervention increased the level of quality of life and hope in the participants of the experimental group. Cho's (26) study examined the impact of mindfulness-based stress reduction and found that this intervention helped individual's better control for coronary heart disease risk factors such as hypertension, type 2 diabetes, mental stress, obesity, and smoking. Alsubaie et al. (23) in a systematic study examined the mechanism of action of mindfulness-based cognitive therapy and the reduction of mindfulness-based stress in people with critical physical and mental conditions. The results showed that these interventions are effective in improving the mental and physical condition of these patients.

Finally, considering the problems that cardiovascular patients face and the needs identified in this group of patients, addressing the psychological problems of these patients and providing strategies to reduce them are important. To this end, the present study seeks to answer this fundamental question: Is there a difference between the effectiveness of two

methods of cognitive-behavioral therapy and mindfulness-based therapy in reducing anxiety in cardiovascular patients?

Method

This research has been conducted by a semi-experimental method with a pretest-posttest design and control group. In this research, treatment methods have been considered as independent variables at three levels (cognitive-behavioral therapy, mindfulness-based therapy, and non-intervention), and anxiety sensitivity has been considered as a dependent variable. The research population includes all the patients with coronary heart diseases at the age of 40-65 years who have been under treatment in hospitals of Tehran in 2019. The sample includes 135 patients with CVD who have been selected by convenience sampling and randomly assigned to experimental and control groups. The sample size was determined by using the following formula. As the population was specific and limited, the sample size was obtained by the following formula with an accuracy of 5% and a confidence level of 95%.

$$n = \frac{2 \left(1 - \frac{\alpha}{2} + 1 - \beta\right)^2}{\Delta^2} + 1$$

The inclusion criteria included: the patient's willingness to participate in the study, female and male patients with CVD at the age of 40-65 years, diagnosis of the patient's disease by a specialist, and the patients with the education level of at least a middle school degree. The exclusion criteria included: patients not collaborating with the therapist, patients' unwillingness to continue participating in the study, a history of serious mental and physical illnesses, mental disability, simultaneous receiving a psychiatric and psychological intervention, and drug addiction or abuse. Using the following tool data collection was completed:

Anxiety Sensitivity Index-3 (ASI-3): ASI includes 18 items that assess anxiety-related physical (e.g., "When my stomach is upset, I

worry that I might be seriously ill”), cognitive (e.g., “When my thoughts seem to speed up, I worry that I might be going crazy”), or social (e.g., “It scares me when I blush in front of people”) concerns. Participants were asked to rate how much they share these concerns on a 5-point scale (0 = I agree very little, 4 = I agree very much) (27). The Farsi version showed good reliability (Cronbach’s $\alpha = 0.95$) in healthy Farsi women and correlated

moderately with the SCL90 Inventory (Pearson’s $r = 0.32$ to 0.42) (28).

Group Cognitive-Behavioral Therapy: Content of education based on the headings of cognitive-behavioral therapy for chronic medical diseases (29), cognitive therapy techniques (30) and research background studies to identify the specific problems of cardiovascular patients. The intervention was presented in 9 90-minute sessions.

Table1. Summary of cognitive-behavioral group therapy intervention sessions

Session	Content
1	Communication, teaching the logic of cognitive-behavioral therapy, pre-test
2	Coping skills training: relaxation, mental imagery
3	Automatic thought identification
4	Automatic thought assessment
5	Challenging automatic thoughts and replacing realistic responses
6	Help to understand the mediating and fundamental beliefs associated with the disease
7	Coping chants
8	Assertive communication
9	Summary, post-execution, and conclusions

Mindfulness-Based Therapy (MT): Kabat Zain defines mindfulness in a specific, goal-oriented way, in the present, without judgment (24). This treatment is a multi-component

therapy that was given in 8, 90-minute sessions based on the Kabat Zein protocol (24).

Table1. Summary of MT intervention sessions

Session	Content
1	Introduction, mindfulness as a way of life, eating exercises, feedback & discussion on eating exercises, body scan and body scan discussion
2	Yoga, talking about the interaction between mindfulness activities, Familiarity with home exercises and body scanning, talking about mindfulness attitude: (non-conflict, starting mind, etc.), introducing sitting meditation, sitting meditation guide (10 minutes), reflection, and sitting meditation
3	Yoga, sitting meditation (15 minutes), seeing and hearing exercises (5 minutes), discussing mindful attitude: (judgment and moderation), sharing the mindful mind: introducing the mindful mind dialogue as a practice, meditation guide, walking ON STOP (one-minute breathing space)
4	Yoga, sitting meditation: breathing awareness, body of voices and thoughts, discussing mindful attitude: (acceptance and release), dealing with troubleshooting emotions and problems
5	Yoga, sitting meditation: awareness of breathing, body, voices, and thoughts; introducing troubled thoughts and memories, breathing exercises (3 minutes)
6	Yoga, sitting meditation: mind awareness thoughts, breathing exercises for anger management, mindfulness and communication, mountain and lake meditation
7	Yoga, sitting meditation: awareness of breathing, body, voices, and thoughts; mindfulness and compassion, meditation.
8	Yoga, sitting meditation: conclusions, discussing how to integrate

After getting permission from the university and necessary actions were taken for

collaborating with Kasrahospital of Tehran and performing the interventions. Then, the study sample was selected by the available method and randomly assigned to experimental and control groups. The subjects were made aware of the research goals and asked to participate in the treatment programs. Before applying the treatment methods, all three groups underwent a pre-test and were asked to complete the questionnaires. The duration of treatment sessions in cognitive-behavioral therapy was 9 sessions of 90 minutes and mindfulness-based therapy was 8 sessions of 90 minutes. These sessions were conducted in a group setting at the hospital once a week. After completing the training

course, three groups of posttest were taken and then the data were analyzed using SPSS.

Results

The results of the research showed that the mean (and standard deviation) age of patients affected by CVD were respectively 59.08 and 9.14 in the CBT group, 58.48 and 8.58 in the mindfulness-based therapy group, and 59.57 and 8.69 in the control group.

Table 3 presents the mean and standard deviation of anxiety sensitivity components for patients affected by CVD in control and experimental groups based on the pretest and posttest results.

Table 3: Mean and standard deviation of anxiety sensitivity components scores of groups in pretest and posttest

Anxiety sensitivity components		CBT group		MT group		Control Group	
		Mean	SD	Mean	SD	Mean	SD
Physical concern	Pretest	25.69	3.45	25.66	3.46	24.51	4.22
	Posttest	13.53	2.62	13.89	3.11	23.51	4.26
Social concern	Pretest	14.38	1.25	14.51	1.15	13.09	2.06
	Posttest	8.55	2.82	8.95	2.71	13.24	2.13
Cognitive concern	Pretest	14.93	1.86	14.51	2.44	12.09	2.25
	Posttest	10.64	2.82	10.73	1.75	12.24	2.06

As seen in the table, there is an obvious difference between the mean posttest scores of anxiety sensitivity components in the control and experimental groups. In the experimental groups, the mean scores of anxiety sensitivity components in the posttest are lower than the scores of the pretest.

In order to observe the assumptions of parametric tests, Box and Levene's tests were used before using the parametric test of multivariate analysis of covariance. The results of the Box test were not significant for any of the variables; based on this test, the presumption of homogeneity of variance/covariance matrixes have been well observed (Box=13.37, F=1.96, p>0.05).

According to the results of Levene's test, the presumption of equality of intergroup variances has been observed for the posttest and its insignificant results for all variables (p>0.05). Therefore, multivariate analysis of covariance can be completed. The results of Wilks Lambda showed that there is a significant difference between the posttest of the studied groups in terms of at least one of the dependent variables (Wilks Lambda= 0.25, F=41.18, p < 0.001). According to the results of eta-squared, it was found that the difference between the two groups is significant regarding the dependent variables and this difference in posttest is 49% based on Wilks Lambda; i.e. 49% of the variance is related to

the difference between the two groups which results from the mutual effect of dependent

variables.

Table4. The results of the analysis of covariance

Variable	Source change	SS	Df	MS	F	Eta squared
Physical concern	Pretest	311.86	1	311.86	35.81***	0.217
	Group	2389.05	2	1194.5	135.17***	0.618
Social concern	Pretest	3.18	1	3.18	0.48	0.004
	Group	523.07	2	261.85	39.54***	0.384
Cognitive concern	Pretest	2.53	1	2.53	0.66	0.005
	Group	102.08	2	51.04	13.25***	0.174

*p<0.05 **p<0.01 ***p<0.001

As presented in table 4, with the controlled effect of the pretest, there is a significant difference between the posttest results of experimental and control groups in terms of

the mean scores of physical concern (F=135.17), social concern (F=39.54), and cognitive concern (F=13.25) (p < 0.001).

Table4. Posthoc test results to compare mean posttest of its components of anxiety sensitivity in experimental and control groups

Variable	Group	MT		Control group	
		(I-J)	P	(I-J)	P
Physical concern	CBT	-0.391	0.53	-10.32	0.0001
	MT	-	-	-9.934	0.0001
Social concern	CBT	-0.395	0.468	-4.924	0.0001
	MT	-	-	-4.521	0.0001
Cognitive concern	CBT	-0.801	0.846	-2.053	0.0001
	MT	-	-	-2.134	0.0001

Discussion and Conclusion

As presented in table 4, the results of the follow-up test showed that the mean scores of the components of anxiety sensitivity were significantly lower in the posttest in both the CBT and the MT groups than the control group (p<0.001), but no significant difference was found between the mean scores of the components of anxiety sensitivity in the two experimental groups.

The purpose of this study was to compare the effectiveness of CBT and MT on reducing anxiety sensitivity in patients with CVD. Based on the findings of the study, CBT and MT have an effect on reducing anxiety sensitivity in patients with CVD. In other words, the posttest scores of physical, social, and cognitive concerns of the experimental

groups were significantly lower than those in the control group. The results also showed that there was no significant difference between the two methods of CBT and MT in the components of anxiety sensitivity. The results of this study are in line with the results of previous studies in this field. For example, Freedland et al. (20) investigated the effectiveness of CBT on depression and self-care in patients with heart failure. The results of this study showed that CBT can reduce depression, anxiety, and fatigue and increase social function and quality of life in cardiac patients. Doering et al. (21), in a study aimed at investigating the effect of cognitive-behavioral therapy on depression and pain control in cardiac surgery patients, showed that CBT reduced depression, pain, and improved pain control. Similarly, Hofmann et al. also showed in his research that cognitive-behavioral stress management training can be effective in enhancing the quality of life and reducing the clinical symptoms of patients with CVD (31). The results of another study showed that mindfulness-based cognitive therapy increased the level of quality of life and hope in patients with CVD (25). Another study showed that mindfulness-based cognitive therapy and mindfulness-based stress reduction are effective in improving the mental and physical condition of people with critical physical and mental conditions (23). In explaining the effectiveness of CBT, it can be argued that it can affect public health through altered cognitive dysfunctions (18, 19).

One possible explanation is that a person's familiarity with own positive traits, the promotion of social skills related to their acceptance, and coping with maladaptive attribution styles, reduces the anxiety sensitivity that occurs during a person's life during a regular program (32). CBT provides patients with a realistic view of their cognitive abilities and can affect the quality of life by reducing negative emotions (31). Group CBT emphasizes enhancing life skills that help reduce stress and increase coping skills and

mental health components (20). CBT can help the person to reframe how they identify, interpret and evaluate their emotional and behavioral reactions to negative experiences. By drawing links between thoughts, emotions, and behaviors, clients learn that certain thoughts can trigger negative consequences. Then, clients are shown how to evaluate the accuracy of their thoughts—certain thoughts, termed cognitive distortions, are inaccurate beliefs about the self or the world which tend to be negatively skewed. Negative and unrealistic thoughts can cause distress and result in problems (18). When a person suffers from psychological distress, the way in which they interpret situations becomes skewed, which in turn has a negative impact on the actions they take. CBT aims to help people become aware of negative interpretations, and behavioral patterns, which reinforce the distorted thinking (19, 20). Cognitive therapy helps people to develop alternative ways of thinking and behaving which aim to reduce their psychological distress (19). Realizing that emotions and behaviors can be regulated and managed is empowering and can lead to improvements in self-control, emotion regulation, coping skills, and emotional awareness during this critical developmental stage and this, in turn, reduces anxiety sensitivity (29). On the other hand, it should be noted that numerous studies have shown the use of adaptive coping strategies against stressful situations and negative emotions as an important factor in increasing the physical and psychological well-being of individuals (31).

On the other hand, in explaining the effectiveness of mindfulness-based therapy on reducing anxiety sensitivity, it can be said that patients in mindfulness train practice maintaining a moment-by-moment awareness of our thoughts, feelings, bodily sensations, and surrounding environment, through a gentle, nurturing lens (22, 24). Mindfulness also involves acceptance, meaning that we pay attention to our thoughts and feelings without

judging them without believing, for instance, that there's a "right" or "wrong" way to think or feel in a given moment (25). For all mindfulness exercises, participants are instructed to focus attention on the target of observation (e.g., breathing or walking) and to be aware of it in each moment. When emotions, sensations, or cognitions arise, they are observed nonjudgmentally (23, 24). When the participant notices that the mind has wandered into thoughts, memories, or fantasies, the nature or content of them is briefly noted, if possible, and then attention is returned to the present moment. Thus, participants are instructed to notice their thoughts and feelings but not to become absorbed in their content (24). Even judgmental thoughts (e.g., "this is a foolish waste of time") are to be observed nonjudgmentally. Upon noticing such a thought, the participant might label it as a judgmental thought, or simply as "thinking," and then return attention to the present moment (26).

An important consequence of mindfulness practice is the realization that most sensations, thoughts, and emotions fluctuate, or are transient, passing by "like waves in the sea". The goal of any mindfulness technique is to achieve a state of alert, focused relaxation by deliberately paying attention to thoughts and sensations without judgment. Therefore, this treatment teaches cardiovascular patients to pay attention to their emotions and thoughts, but not to drown in their content, and thus modifies the patients' anxiety sensitivity. In other words, the mindfulness targets anxiety sensitivity by confrontation. In this way, mindfulness training teaches patients not to move for pain relief and instead focus on the sense of pain without judgment. In this training, one only observes dysfunctional cognitions (such as this pain is unbearable) and negative emotions such as anxiety, anger, often accompanied by a sense of pain. Applying this strategy for people with chronic pain has several functions. For example, prolonged confrontation with

feelings of chronic pain in the absence of catastrophic consequences can lead to a decrease in the emotional responses evoked by pain. Therefore, mindfulness skill training leads to the ability to experience a sense of pain without emotional reactions and this can reduce distress and distress (24). Long-term observation of emotions and thoughts without attempting to evade or evade them can be an example of confrontation that should increase the silence of fear responses and prior avoidance behaviors. Therefore, mindfulness skill training enhances clients' ability to endure negative emotional states and enables them to effectively counteract (22, 24). In another explanation of the effectiveness of mindfulness treatment on reducing anxiety sensitivity, the effect of this treatment on patients' cognitive changes should be noted. In other words, mindfulness exercises can lead to a change in thinking patterns or a change in attitude. Kabat-Zinn & Hanh (24) suggests that the non-judgmental observation of pain and thoughts about worry can lead to the perception that they are "just thinking" rather than reflecting reality and therefore need not be avoided. Furthermore Observing and labeling thoughts and feelings reinforces the notion that thoughts and feelings are not always an accurate reflection of reality. For example, the feeling of fear does not necessarily mean that danger is inevitable and that the thought of 'I am a failure' is not equivalent to reality (25). In line with this, Cho (26) found that mindfulness-based stress reduction therapy helped individual better control for coronary heart disease risk factors such as hypertension, type 2 diabetes, mental stress, obesity, and smoking.

This study was carried out on cardiovascular patients in Kasra hospital in Tehran in 2019 and should be cautious in generalizing its results. The sampling method is available and non-following are other limitations of this study. It is suggested that future research can achieve more reliable results by performing a follow-up and using random sampling methods.

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