

## Comparison of Cardiac Rehabilitation Programs Combined with Relaxation and Meditation Techniques on Reduction of Depression and Anxiety of Cardiovascular Patients

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**Abstract:** Cardiovascular disease (CVD) is a major cause of death in developed countries. Most cardiac rehabilitation programs include psychological interventions. The aim of this study was to determine the effectiveness of rehabilitation techniques in cardiac patients including psychological-physical interventions such as Meditation and Relaxation. We enrolled 45 patients with CVD and depression. The patients were allocated to 3 groups (Relaxation, Meditation and Control). There was a significant reduction on depression, systolic blood pressure and heart rate in the Meditation group compared with the control group. Our findings suggest that meditation techniques have better outcomes in cardiac patients for improving depression, reduction of systolic and diastolic blood pressure, and heart rate than relaxation techniques.

**Keywords:** Cardiac Rehabilitation, Diastolic blood pressure, Heart rate, Meditation, Relaxation, Systolic blood pressure.

### INTRODUCTION

Cardiovascular disease (CVD) is a major cause of death in developed countries (1). At the beginning of the 20th century, less than 10% of world mortality was related to CVD. At the beginning of the 21st century, almost half of the mortality in developed countries and 25% of death in developing countries is caused by CVD [1, 2]. According to recent studies, the prevalence of coronary heart disease (CHD) and mortality rate in Iran has also increased [3]. Most of cardiovascular patients are unable to improve their health level and return to their full capabilities. Furthermore, different issues including absence from work, the high cost of medical procedures, medication and dysfunction are imposed both to society and patients [4].

Cardiac-rehabilitation programs were first developed from the 1960s [5, 6]. The goals of cardiac rehabilitation and secondary prevention are to prevent disability, resulting from CHD, re-hospitalization and death from cardiac events. These techniques aimed to design appropriate interventions, to modify CHD risk factors to improve patient lifestyle [7]. Secondary prevention focuses on control of risk factors in the patients with established CHD [8].

The most important benefits of cardiac rehabilitation from the patients' insight, falls within the psychological part. Based on literature, after rehabilitation almost all of the psychological problems including anxiety, emotional stress, lack of self-confidence, depression, social isolation and patients-reported quality-of-life improve [9-12]. Besides, most of the cardiac rehabilitation programs, in many centers, include psychological interventions, particularly, stress management for depressed patients, as, it is reported that post-cardiac attack depression increases the mortality rate [13, 14].

Besides, depression is 3 times more common in patients after a heart attack than general population. It is estimated that 15 to 20% of heart attack victims qualify for diagnosis of major depressive disorder, and a far greater proportion experience increased levels of depressive symptoms [15]. Depression after a heart attack is bad not only because of the accompanying emotional distress and suffering; it also increases mortality rate with increased risk of having another heart attack compared with non-depressed [15]. Even it has been reported that depression is a predictor of death in the first 6 months, following the heart attack [16].

Psychosocial interventions in standard cardiac rehabilitation programs might be able to clinically reduce the psychosocial pressure (such as depression and anxiety) and also the cardiovascular risk factors like high blood pressure and hyperlipidemia [17].

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For the first time, Jakobson described relaxation techniques in 1929. In these techniques attempted to induce the physiological effects such as decreasing the heart rate, increasing peripheral blood flow, and neuromuscular stabilization, that are contrary to anxiety effects [18]. Relaxation techniques reduce the heart rate, blood pressure, and improve energy consumption, insomnia, headache and subsequent depression [19, 20].

Besides, meditation is the altered state of consciousness that achieves through meditation practice with proper training. These exercises consists control and regulation of breathing, major reduction of peripheral attention, Ignoring external stimulants, inserting Yoga modes and making mental images of a pleasant event or a particular symbol [21]. The purpose of meditation is to increase a person's ability to be relaxed, meanwhile dealing with stress situations and to obtain clear awareness or insight about nature of the experiences, away from the current emotional and cognitive distortions [17, 21].

Mounting evidence have consistently indicated that relaxation therapy is effective in alleviating anxiety and depressive moods [22–25]; reducing sympathetic-related manifestations on cardiovascular variables such as blood pressure [22], heart rate [23], and heart rate variability [26]; and lowering the frequency of angina attack and supraventricular tachycardia [27,28] in patients with hypertension and coronary artery disease.

Earlier Studies have shown beneficial effects of Transcendental meditation (TM) on cardiovascular risk factors and quality of life [29, 30]. TM program had positive impact on the treatment of hypertension in Africans Americans [31-33]. Two randomized control studies of TM interventions in African Americans reported reductions in left ventricular mass and a regression of carotid atherosclerosis compared to controls [32-34].

The aim of this study was to hypothesize the effectiveness amount of rehabilitation techniques in cardiac patients including psychological-physical interventions such as meditation and muscle relaxation practices, to reduce depression and anxiety in cardiac patients, in addition to the exercise and diet regime and find the differences between them.

## MATERIAL AND METHODOLOGY

The subjects of this quasi-experimental study were 45 patients with CVD and depression (18 female and 27 male), referred to Pasargad cardiac rehabilitation center in Mashhad, Iran. The patients were allocated in 3 groups randomly and 15 patients were enrolled in each group. Patient age, gender, literacy level and marital status were matched among the groups. The inclusion criteria were as follows: ages "between" 40-65 years old, at least primary education level, known CHD, and present depression. Depression was assessed by using Beck Depression questionnaire. These patients in both groups selected randomly among the records of registered patients of our center, not regarding the severity or extent of their disease to evaluate overall usability of interventions on the CHD patients.

In the first step, all the patients informed about of the study protocol. The Ethics Committee (of the Research

Council of Mashhad University of Medical sciences) approved the study protocol. All the patients filled in the informed consent form, prior to participation in the study.

Then we assessed depression and anxiety of the patients by Beck questionnaire and Zung Self-Rating Anxiety Scale (SAS) before the intervention [35, 36]. Case and control groups obtained equivalent scores in pre- and post-tests by taking Fisher test between average scores of 3 groups in pre-test stage. Therefore, the depression and anxiety scores were matched in case and control groups. When the test is scored, a value of 0 to 3 is assigned for each answer and then the total score is compared to a key to determine the depression's severity. The standard cut-offs for Beck questionnaire are as follows:

- 0-9: indicates minimal depression
- 10-18: indicates mild depression
- 19-29: indicates moderate depression
- 30-63: indicates severe depression.

Higher total scores indicate more severe depressive symptoms. Also the total scores range for Zung Self-Rating Anxiety Scale (SAS) is from 20-80.

- 20-44 Normal Range
- 45-59 Mild to Moderate Anxiety Levels
- 60-74 Marked to Severe Anxiety Levels
- 75-80 Extreme Anxiety Levels

We held ten sessions of Jacobson's Progressive muscle relaxation (PMR) in the first group, and the second group was taught Mindfulness meditation techniques for ten sessions and the third group did not receive any trainings or intervention.

Each relaxation and meditation session lasted 20 and 25 min. All the patients in 2 intervention groups practiced related Techniques, after routine rehabilitation programs. Furthermore, they practiced their related Techniques 3 times at home with an educational compact disk, given to them. Trained nurses assessed and recorded blood pressure and heart rate of the patients at the beginning and the end of each session of rehabilitation. Also depression and anxiety were assessed at the end of tenth session. In addition, the post-treatment measures were conducted by individuals blinded to the study treatment conditions. The collected data were analyzed using Social Package for Social Statistical SPSS program version 10. The One-way analysis and independent t-test was used to determine the difference between various variables and the P-Value was set as <0.05 for significance.

## STATISTICAL ANALYSIS

Software of package for social statistics (SPSS) version 16.0 was used for statistical analysis. The descriptive data presented in table and as mean  $\pm$  SD. The inferential statistical analysis conducted between three groups, by one-way ANOVA when normality of data approved, otherwise the parallel nonparametric test, Kruskal-Wallis was used. Post-hoc techniques were used for comparison within groups, by using a Tukey test. Significant level for all measurements was < 0.05.

**RESULTS**

The subjects of this quasi-experimental study were 45 patients with CVD and depression (18 females and 27 males), whom were referred to Pasargad cardiac rehabilitation center in Mashhad, Iran. Age ranges of the patients were 40-65 years old and the literacy level of the patients varied between primary school up to higher education (undergraduate degree).

According to the results of Table 1, there was a significant reduction in pre- and post-scores of anxiety, depression,

systolic blood pressure and heart rate in all three groups ( $p < 0.05$ ) after rehabilitation. However, no significant difference was observed in reduction of diastolic blood pressure between groups ( $p = 0.069$ ).

**DEPRESSION AND ANXIETY IMPROVEMENT**

As demonstrated in Table 2, depression and anxiety scores in the relaxation group, compared with the control group, were not significantly different ( $p = 0.496$  and  $p = 0.999$ ). But there was a significant reduction in depression

**Table 1. Pre- and Post-test Scores of Relaxation, Meditation and Control Groups**

Test Result (P)	Groups (Mean ±SD)			Variable
	Control Group n = 15	Relaxation Group n = 15	Meditation Group n = 15	
<0.001	35.73±6.193	36.33±7.326	36.87±6.323	Pre-test anxiety score
	24.67±3.754	25.20±3.590	46.52±12.94	Post-test anxiety score
	<0.001	<0.001	<0.001	P-Value
<0.001	23.27±6.984	21.60±7.491	21.93±7.226	Pre-test depression score
	16.80±5.060	17.00±7.000	9.73±2.685	Post-test depression score
	<0.001	<0.001	<0.001	P-Value
<0.001	111.4±14.9	126.1±17.0	134.4±17.8	Pre-test systolic blood pressure(mmHg)
	105.1±13.2	115.1±11.8	107.9±10.1	Post-test systolic blood pressure(mmHg)
	0.186	0.013	<0.001	P-Value
0.069	68.0±8.0	74.0±9.5	71.7±15.5	Pre-test diastolic blood pressure (mmHg)
	67.3±8.2	70.9±6.9	66.7±7.6	Post-test diastolic blood pressure (mmHg)
	0.751	0.097	0.155	P-Value
<0.001	77.07±16.078	84.33±8.674	84.27±11.732	Pre-test heart rate(beats/min)
	75.53±14.242	78.27±8.128	71.40±11.642	Post-test heart rate(beats/min)
	0.654	<0.001	<0.001	P-Value

**Table 2. Anxiety, Depression, Systolic Blood Pressure, Heart rate of Relaxation and Meditation Groups Compared with Control Group**

Test Result (P-Value)	Groups (Mean Difference ±SE)	Variable		
0.27	3.07±1.95	Relaxation	Meditation	Anxiety score
0.25	3.13±1.95	control		
0.999	3.13±1.95	control	Relaxation	
<0.001	7.60±1.64	Relaxation	Meditation	Depression score
		control		
0.003	5.73±1.64	control	Relaxation	
0.496	-1.87±1.64	control	Relaxation	
0.42	15.6±6.2	Relaxation	Meditation	Systolic blood pressure(mmHg)
0.006	20.2±6.2	control		
0.742	4.6±6.2	control	Relaxation	
0.14	6.80±3.48	Relaxation	Meditation	Heart rate (beats/min)
0.006	11.33±3.48	control	Relaxation	
0.401	4.53±3.48	control	Relaxation	

scores, between meditation and control groups ( $p = 0.003$ ) while no difference in anxiety scores between meditation group and the control group observed ( $p = 0.255$ ).

### SYSTOLIC AND DIASTOLIC BLOOD PRESSURES

According to the results there was no significant reduction in systolic and diastolic blood pressures, between relaxation group and the control group ( $p = 0.742$  and  $p = 0.097$ ) But according to the comparison of scores, relaxation training might be able to reduce systolic blood pressure dramatically (Table 2). There was a statically significant reduction in systolic blood pressure of the meditation group compared with control group ( $p = 0.006$ ) but no significant reduction was observed in diastolic blood pressure of them ( $p = 0.155$ ).

### HEART RATE

No significant difference was observed in heart rate of relaxation group compared with control group ( $p = 0.401$ ), but according to the scores, relaxation training might be able to control the reduction of heart rate, to some extent (Table 2). In contrast, there was significant difference in heart rate of the meditation training group compared with control group ( $p = 0.006$ ).

### DISCUSSION

The results of this study indicated that meditation techniques are more effective than relaxation techniques, in improvement of depression, reduction of systolic and diastolic blood pressure and heart rate.

Considering the difference averages in meditation group with control group, reached the conclusion that cardiac rehabilitation programs in the relaxation group might be effective in reducing depression, but it was not very impressive. Our results are consistent with those reported by Collins *et al.* 1997 [37] as they did not support the effectiveness of relaxation techniques on reducing symptoms of depression. The study of You *et al.* 2007[38] showed that muscle relaxation techniques have a moderate effect on depression. Similarly, in the study of Jolliffe *et al.* 2001 [39] any results based on the superiority of relaxation cardiac rehabilitation programs, on usual cardiac rehabilitation programs was not reported.

In contrast, in many other studies such as Jacobs *et al.* 2001 [40], van Dixhoorn *et al.* 2005 [41], Cowan *et al.* 2001 [42], Rees *et al.* 2004 [43], Karlsson *et al.* 2003 [44], Hui *et al.* 2006 [45] relaxation techniques significantly reduced depression in CVD patients. These studies indicated that muscle relaxation techniques were significantly reduced depression and improved the patient lifestyle.

In the present study, anxiety was not significantly different in the relaxation and meditation groups compared with the control group. While, the previous studies revealed that anxiety was reduced in patients after discharge [7]. In Our study, patients were not anxious because the patients that referred to rehabilitation centers were in the recovering time, so it is clear that their anxiety was not significant.

According to the results, there was a significant reduction in depression between meditation and control groups. These

findings are in agreement with previous literature that meditation exercises considered effective in reduction of depression in cardiac rehabilitation programs [46].

There was no significant reduction in systolic and diastolic blood pressure, between relaxation and the control group, which is different with other studies [47]. Also, there was no significant reduction in heart rate, between the relaxation and control groups that is inconsistent with Quiens and Rice *et al.* 1997 [37] findings.

Previously, it was assumed that diastolic pressure is a better indicator than systolic blood pressure, to assess the potential health risks. Even though, a recent long-term study has shown that high systolic blood pressure is not just equally but even more important [48]. In our study, there was a statistically significant reduction in systolic blood pressure of meditation group compared with the control group that is consistent with those reported by Anderson [49].

According to our results, there was significant reduction in heart rate of the meditation group compared with control group, and the same results are found by other studies [50].

Generally, it seems that cardiac rehabilitation along with meditation has better effects in reduction of depression, systolic and diastolic blood pressure and heart rate, so this study confirm usability of this technique in cardiac rehabilitation programs to promote physical and mental health of cardiac patients.

### CONCLUSIONS

Our findings suggest that meditation techniques showed better outcomes in cardiac patients for reduction of systolic and diastolic blood pressure, heart rate and significant improvement of depression compared with relaxation techniques. Besides, we offer to evaluate this technique, in prolonged period, to assess its long term efficacy, in quality of life and well-being of CVD patients.

### CONFLICT OF INTEREST

The authors confirm that this article content has no conflicts of interest.

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