



Original Article

# Cardiac effects of exercise rehabilitation on quality of life, depression and anxiety in patients with heart failure patients

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## Abstract

**Introduction:** Exercise training has well documented beneficial effects in a variety of cardiac disorders. This study was designed to assess the effects of exercise on an exercise rehabilitation program on the quality of life, depression and anxiety in heart failure patients referred for cardiac rehabilitation.

**Materials and Methods:** In this clinical trial, 65 patients aged 50-70 years with heart failure among patients who referred to Institute of Heart Rehabilitation of Isfahan were assigned randomly to two groups of experimental (n=33) and control (n=32). Subjects in the experimental group participated in a supervised 8-week aerobic training program of 30-45 min sessions (3 days per week on alternate days), while those in the control group received standard medical care and were not involved in any regular training program during this period. At the beginning and the end of the exercise rehabilitation program, the Beck Anxiety and Depression inventories and short form of quality of life questionnaire were fulfilled for the assessment of depression, anxiety and quality of life.

**Results:** The scores of quality of life, depression and anxiety showed a significant improvement in experimental compared to control group after 8 weeks exercise rehabilitation ( $P=0.001$ ).

**Conclusion:** It seems that an appropriate application of exercise rehabilitation program would improve the psychological status and quality of life in long-term maintenance chronic heart failure patients.

**Keywords:** Anxiety, Depression, Exercise, Heart failure Quality of life

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## Introduction

Heart failure (HF) is one of the most prevalent cardiovascular disorders that considered as chronic, progressive and debilitating disorder (1). Heart failure is often accompanied by restricted physical activity, inappropriate life quality, severe complaints in several areas of quality of life, repeated hospitalization and patients hard life (2,3), although this condition can alter with appearance of different treatments.

The prevalence and incidence of HF increases with aging, so that in the United State almost one percent of people over 50 years and 10% percent of elderly over 80 years suffer from heart failure. In the United

States, heart failure affects about 5 million people, and 550,000 new cases are diagnosed every year (4). In developing countries, heart failure accounts for about 4% of hospitalizations and 31% of those are due to heart failure (5). In addition, heart failure has a high mortality rate (20%) and it is estimated that, after diagnosis, only 15% of patients are still alive after 12 years (2, 4). The number of heart failure patients have been reported 3337 from 100,000 people in 18 provinces of Iran. One study had shown that 25 percent of hospitalized patients had heart failure in 1377 (7).

Cardiovascular disease and stroke are the first and the fourth leading cause of disability in the list of debilitating disease by 2020 (7). According to WHO estimates, in 2002, 22% of people in the world and 35% of people in Iran die of cardiovascular diseases and coronary artery disease is now the first cause of death in the Iranian people over 35 years (8).

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Symptoms of heart failure are fatigue and dyspnea that is accompanied by severe mental disorders such as anxiety, depression, and decreased quality of life in elderly patients (9). The World Health Organization, defines quality of life as a complex combination of physical health, psychological state, level of independence, social relationships and personal beliefs (10). On the other hand, depression is one of the most prevalent mental disorders and pressing public health issues of human life. Depression was the fourth leading cause of disease burden in 2000 and is predicted to be the second leading cause of disease burden worldwide in 2020 (11). Vaccarino et al. showed that depressive symptoms are associated with high mortality and reduced performance in 391 heart failure patients (12). The level of depression is also associated with functional disability in heart failure patients (13). In recent years, various medication have been developed in order to control hemodynamic disorders and symptoms, as well as to reduce mortality and improve the quality of life of heart failure patients, although a large number of drugs that successfully reduce mortality, the effects on range of therapeutic changes are modest, because even patients with guideline-based optimized therapy often remain limited by their symptoms and, depending on their conditions, their functional capacity and quality of life may be substantially reduced (4-14,16). So it appears for overcoming this problem, better methods must be found in addition to medication. Exercise therapy is one of these methods. Although previous studies had shown that exercise training stimulated physical stress, recent researches have reported that physical activities are safe and beneficial even for heart failure patients (17-23).

In addition, regular exercise training may lead to an increase in autonomy for daily and routine activities, preventing functional incapacity and dependency conditions (18,20). Exercise and physical activity may constitute as a valuable tool in attempting to implement more efficient therapeutic approaches that effectively progress functional capacities and quality of life (24,25). Numerous studies have investigated the effect of exercise on life quality, anxiety and depression in patients (26-28). Although, the concept of the harmlessness of exercise for heart failure patients must be explored further, mainly due to outcomes from studies reporting severe cardiac events and an increase of mortality with exercise (24). Thus, due to the prevalence of heart disease and its

impact on the lives of patients with HF, examine the role of exercise rehabilitation on patients' depression and life quality of patients, especially in patients with HF can be a basis for understanding as a non-drug treatment. Thus, the purpose of the present study was to evaluate the effects of an eight-week exercise rehabilitation programs on quality of life, anxiety and depression in patients with HF.

## Materials and Methods

The Clinical trial population consists of all patients suffering from heart failure who have been admitted to the institute of cardiovascular rehabilitation in Isfahan in 2012. The subjects included 65 male and female patients with heart failure who were selected via convenience sampling and were randomly divided into experimental groups of 33 subjects (11 females and 22 males) and control group of 32 subjects (15 females and 17 males). After signing the consent form, the participants took part in the research voluntarily. After selecting the patients, the questionnaires related to the studied variables were given submitted to them so that demographic and other necessary data could be collected.

After explaining the purpose of the research and the testing method to the subjects they were asked to do their best in performing the tests. Moreover, they were requested to follow normal sleep patterns (at least 8 hours of sleep), daily activity pattern, and dietary patterns during the research and to avoid eating and drinking any materials that would affect the tests performance. The study criteria included the diagnosis of heart failure recorded in the patient medical file, age over 60 years, At least 6 months after the disease diagnosis, ejection fraction equal to or less than 35%, lack of neuromuscular disorders, lack of history of acute cardiopulmonary disease, brain injuries, and Parkinson's disease. Furthermore, all the participants in the present study were asked to submit written consent and they were assured that their information would remain confidential and they would have the authority to opt out from the experiment at any stage of the research.

Before and after cardiac rehabilitation exercise program, the reviewed variables such as age, physical characteristics (height, weight, and body mass index), physiological characteristics (heart beat, practical capacity) and psychological characteristics (anxiety and depression) and quality of life were measured. Experimental group participated in a cardiac rehabilitation exercise

program including 8 weeks of exercise training program and 8 sessions of 90-minute nutritional and psychological training programs while the control group were just followed up during the study and didn't participate in any exercise programs and continued their own normal life activities. 8-week exercise program consisted of 40-60-minute sessions three times a week which was performed increasingly and progressively by the intensity of 50-80% of maximal heart beat resulting from the exercise test according to Naughton protocol. Each session included 10-15 minutes warm-up, 30-40 minutes aerobic exercises with 50% to 80% of maximum heart beat according to physiological capability of the patients resulting from exercise test and under ECG monitoring if necessary and 10-15 minutes of cooling and relaxing. All exercise sessions of patients were supervised by the physician, exercise physiologist, physiotherapist, and trained nurses. It should be noted that all the patients under study took beta blocker and angiotensin inhibitor drugs during the rehabilitation therapy.

#### Research Tools

a) *Short-form 36-item questionnaire of quality of life (SF-36)*: The questionnaire consists of two general parts: physical health and mental health including 8 subgroups as physical functioning, limitations due to physical problems, limitations due to emotional problems, vitality, mental health, social functioning, pain, and general health. Each part of the questionnaire is scored on a scale of 0 to 100, so that the score of 100 indicates the best state of the health of an individual (29). The validity and reliability of the questionnaire have been confirmed in many studies for determining the effect of rehabilitation (30-32).

b) *Beck Depression Inventory*: This inventory consists of 21 items and is made to measure the feedbacks and the severity of depression symptoms. Its items have been developed based on the observation and the abridgement of common attitudes and depression symptoms among the psychiatric patients (33, 34). A lot of

studies have been conducted within the country that have measured the psychometric properties of the instrument and have reported its reliability as 0.70 to 0.90 (35). The minimum test score is 0 and the maximum is 63. The individual's score is obtained directly through the sum of their scores for each item. The following scores can be used to display the overall level of depression: 0-13: no or minimal depression, 13-19: mild depression, 20-28: moderate depression, 29-63: severe depression (35, 36).

c) *Beck Anxiety Inventory*: This inventory consists of 21 items and evaluates anxiety independent of depression. The inventory has been evaluated in our country (Iran) and its validity (0.72) and reliability (0.83) have been approved. The minimal test score is 0 and the maximum is 63. The individual's score is obtained directly through the sum of their scores for each item. The following scores can be used to display the overall level of anxiety: 0-21: very low anxiety, 22-35: moderate anxiety, 36 and more: severe anxiety that requires treatment (36).

Finally, the obtained data were analyzed using descriptive statistics. Kolmogorov-Smirnov test was used to determine the normal distribution of data, and the mean and standard deviation were calculated via descriptive statistics and the groups were compared through inferential statistics such as dependent T-test and analysis of covariance. The Statistical Program for the Social Sciences (SPSS Inc., Chicago, IL), version 19.0, was used for all statistical analysis. SPSS for windows (version 18; SPSS Inc., Chicago, IL., USA) was used to analyze all data. The significance level was considered as  $P < 0.05$ .

#### Results

The aim of current study was to evaluate the effects of an 8-week cardiac rehabilitation on quality of life, anxiety and depression of heart failure patients by using experimental and control group. Table 1 shows the general characteristics of the subjects (mean  $\pm$  SD).

**Table 1:** The general characteristics of the subjects (mean  $\pm$  SD)

General characteristics	Exercise group (n = 33)	Control group (n = 32)	P
Age (year)	61.54 $\pm$ 5.89	60.94 $\pm$ 5.03	0.66
Weight (kg)	73.54 $\pm$ 7.54	72.56 $\pm$ 8.16	0.62
Height (cm)	168.30 $\pm$ 7.94	165.91 $\pm$ 7.88	0.23
Body mass index (kg/mm)	25.93 $\pm$ 1.44	26.30 $\pm$ 1.46	0.32
Functional capacity (met)	5.11 $\pm$ 0.93	5.19 $\pm$ 0.83	0.70

Table 2 shows the various aspects of quality of life, anxiety and depression before and after 8 weeks cardiac rehabilitation in exercise and

control group. The results show (table 2) that there were significant differences in various aspects of quality of life, anxiety and depression

before and after 8 weeks cardiac rehabilitation in exercise group. There were no significant differences in various aspects of quality of life

excluding mental health and anxiety in control group.

**Table 2:** Comparison of various aspects of quality of life, anxiety and depression in heart failure patients (mean  $\pm$  SD)

Parameters	Exercise group (n = 33)		P	Control group (n = 32)		P
Physical function	45.91 $\pm$ 20.86	65.76 $\pm$ 14.74	0.001	46.87 $\pm$ 15.38	50.16 $\pm$ 13.76	0.08
Limitations as a result of physical problems	28.79 $\pm$ 26.60	40.15 $\pm$ 27.91	0.001	33.59 $\pm$ 29.52	32.81 $\pm$ 24.95	0.83
Limitations resulting from emotional problems	34.34 $\pm$ 35.82	45.45 $\pm$ 38.92	0.04	30.21 $\pm$ 27.25	27.08 $\pm$ 28.63	0.08
Vitality	37.42 $\pm$ 17.46	59.85 $\pm$ 18.51	0.001	50.16 $\pm$ 15.05	50.47 $\pm$ 11.38	0.90
Mental health	48.36 $\pm$ 27.15	60.12 $\pm$ 22.92	0.03	55.62 $\pm$ 16.01	52.25 $\pm$ 14.50	0.02
Social function	37.50 $\pm$ 20.73	57.20 $\pm$ 21.65	0.001	47.26 $\pm$ 14.10	51.17 $\pm$ 16.61	0.10
Pain	40.00 $\pm$ 22.76	52.27 $\pm$ 21.87	0.001	55.00 $\pm$ 19.14	59.21 $\pm$ 16.34	0.05
General health	32.12 $\pm$ 22.78	52.27 $\pm$ 23.15	0.001	38.59 $\pm$ 13.15	39.06 $\pm$ 13.04	0.73
Anxiety	51.79 $\pm$ 7.75	47.82 $\pm$ 7.93	0.001	49.03 $\pm$ 8.36	51.22 $\pm$ 8.12	0.001
Depression	42.24 $\pm$ 8.51	33.03 $\pm$ 9.03	0.001	44.38 $\pm$ 9.01	43.69 $\pm$ 10.69	0.75

Table 3 indicates the covariance analysis of various aspects of quality of life, anxiety and depression after cardiac rehabilitation in both groups. The results show that there were no significant differences in pain, anxiety and depression between groups. Eight weeks cardiac

rehabilitation had effects on life quality and mental indices when compared to control group. Although, gender was only effective in depression but positive effects of physical activity were similar in both genders.

**Table 3:** Comparison of various aspects of quality of life, anxiety and depression after cardiac rehabilitation in heart failure patients, using (mean  $\pm$  SD) covariance

Parameters	Exercise group (n = 33)		Control group (n = 32)		Group	Gender	P	Interaction of group and sex
	Woman (11)	Man (22)	Woman (15)	Man (17)				
Physical function	64.54 $\pm$ 17.24	66.36 $\pm$ 13.73	50.33 $\pm$ 13.42	50.00 $\pm$ 14.17	0.001	0.28	0.90	
Limitations as a result of physical problems	38.64 $\pm$ 30.34	40.91 $\pm$ 27.32	31.67 $\pm$ 25.82	33.82 $\pm$ 24.91	0.02	0.97	0.90	
Limitations resulting from emotional problems	39.39 $\pm$ 41.68	48.48 $\pm$ 18.11	26.67 $\pm$ 31.37	21.45 $\pm$ 26.96	0.01	0.81	0.64	
Vitality	65.00 $\pm$ 13.78	57.27 $\pm$ 20.28	52.33 $\pm$ 12.52	48.82 $\pm$ 10.39	0.001	0.04	0.98	
Mental health	60.36 $\pm$ 25.51	60.00 $\pm$ 22.15	53.33 $\pm$ 15.09	51.29 $\pm$ 14.37	0.001	0.76	0.69	
Social function	60.23 $\pm$ 17.52	55.68 $\pm$ 23.69	50.00 $\pm$ 17.03	52.20 $\pm$ 16.67	0.009	0.59	0.62	
Pain	55.45 $\pm$ 22.38	50.68 $\pm$ 21.97	62.83 $\pm$ 11.68	56.03 $\pm$ 19.27	0.27	0.09	0.73	
General health	54.09 $\pm$ 24.88	51.36 $\pm$ 22.79	41.66 $\pm$ 15.54	34.76 $\pm$ 10.30	0.001	0.60	0.73	
Anxiety	48.09 $\pm$ 8.30	47.27 $\pm$ 7.47	49.00 $\pm$ 8.44	53.73 $\pm$ 7.20	0.001	0.45	0.16	
Depression	40.91 $\pm$ 7.94	44.91 $\pm$ 8.26	29.91 $\pm$ 6.31	39.27 $\pm$ 10.36	0.001	0.001	0.67	

## Discussion

The aim of this research was to investigate the effects of 8-week exercise cardiac rehabilitation on quality of life, anxiety, and depression in patients with heart failure. The results showed that 8 weeks of rehabilitation exercise program had a significant effect on improvement of life quality and reduction of anxiety and depression in patients with heart failure. The findings of the present study are consistent with the findings of Sales Bocalini et al. (25), Koukouvou et al. (26), Quittan et al. (27), and Belardinelli et al. (28). Sales Bocalini et al. investigated the effect of exercise on functional capacity and life quality in

patients with heart attack. 42 patients were randomly divided into two experimental and control groups. The experimental group performed aerobic exercise for 6 months. The results showed that the life quality significantly increased in experimental group after the exercise training period while no significant difference was observed in life quality of control group (25). In another study, Quittan et al. showed correlations between quality of life domains after a regular exercise program and improvements of physical performance in heart failure patients (27). Belardinelli et al. showed that exercise program in heart failure patients led to a significant

improvement in quality of life parallel to peak oxygen consumption gain (28). The results are consistent with the findings of present study. In this research, 8-week cardiac rehabilitation exercise program reduced the level of anxiety and depression and improved the quality of life in patients. Life quality improvement in patients with heart disease can be attributed to beneficial effects of exercising. Specialists believe that life quality is a multidimensional structure with physical, psychological, social and subjective dimensions (37). Furthermore, exercise and physical activity affect life quality dimensions by improving cardiovascular endurance, strengthening muscles, increasing balance, making harmony and peace, reducing stress and anxiety, lifting mood, improving public health and welfare, and increasing mental health and cognitive function (38). Individuals with heart failure are living in bad health condition which affects the quality of their daily life, makes them fatigue, and causes dyspnea (breathlessness). In such patients, avoiding normal daily activities for a long time often causes disability and reduces the quality of life (26). Research has shown that exercising in patients with heart failure not only helps improve physical performance level, but also makes them feel better and improves their perception of life quality associated with health. For instance, Tyni – Lenne et al. observed that there was a direct relationship between life quality improvement and the volume of exercises (39). In the research conducted by Kavanagh et al., after 52 weeks of exercising, a negative relationship between aerobic capacity and the symptoms of fatigue, breathlessness, and mental functions was observed (40). Wielenga et al. concluded that there was a significant relationship between exercise intensity and the decrease of helplessness and increase of public health due to exercising in patients with heart attack (2).

Anxiety and depression are common in patients with coronary disease (41,42). In this regard, the researchers examined the effects of exercising on anxiety and depression in patients with heart attacks (26). Koukouvou et al. investigated the psychological and physiological effects of exercising on patients with heart attack. 26 men by the average age of 55  $\pm$ 9.8 and with heart

attack participated in the research. The participants were randomly divided into two groups: control (10) and experimental (16). The experimental group participated in a sport exercising program for 6 months. The Beck anxiety and depression inventory was used to assess anxiety and depression and the brief inventory of life quality was used to assess the quality of life. The results of the research showed that exercising would reduce depression and would improve life quality in patients (26).

The present study also showed that 8 weeks of rehabilitation exercise program had a significant effect in reducing anxiety and depression and improving life quality in patients. The effect of exercising in reduction of depression can be attributed to the role of serotonin because an imbalance in serotonin levels might affect the mood and lead to depression (43). One of the solutions that will lead to the increase of serotonin is exercising. Exercising naturally raises the level of consciousness and lifts the general spirits of individuals and provides more energy and vitality for them to do their daily routine activities and enjoy their life (44).

In this study, two main restrictions must be considered. The exercise intensity was based on heart rate peak acquired by the Naughton protocol. The rationale for using heart rate for guiding exercise intensity is based on the relatively linear relationship between heart rate and peak oxygen consumption in exercise training programs. However, an exercise training prescription based only on heart rate peak has been shown to overestimate exercise intensity. In addition, although the peak oxygen consumption is often considered the gold standard parameter for assessment of functional capacity, we used tests and physical evaluations based on tasks of daily living according to a method standardized for elderly people.

### Conclusion

The results showed that an exercise rehabilitation program in patients with heart disease can lead to a significant improvement in health-related quality of life in these patients and can reduce their level of depression and anxiety.

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