THE EFFECT OF SUPERVISED EXERCISE TRAINING ON PSYCHOLOGICAL CHARACTERISTICS AND PHYSICAL FITNESS AFTER MYOCARDIAL INFARCTION

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Abstract - Regarding the increasing prevalence of cardiovascular diseases (CVD) especially myocardial infarction (MI), and the insufficiency of information in the field of physical rehabilitation, this study aimed to investigate the effectiveness of a course of physical rehabilitation on the psychological status and physical characteristics of cardiac patients. In this study, the effect of 8 weeks exercise training, 3 sessions of 45 minutes duration per week, on the physical and psychological function of MI patients was evaluated. Eighty patients who were referred to the rehabilitation unit of Isfahan Cardiovascular Research Center were randomly divided into two groups of exercise and non-exercise. The data of pre and post exercise course were analysed with the SPSS software using the two-sample t-test and multiple linear regression. The comparison of the mean changes of functional capacity, weight, body mass index (BMI), heart rate, and systolic and diastolic blood pressures between exercise and non-exercise groups after 8 weeks showed significant differences for all studied factors ($p<0.05$). Also, investigating the psychological characteristics such as depression, anxiety and hostility scores indicated a significant change after exercise training ($p<0.05$). Personality and behaviour showed no significant difference. This study suggests that exercise training has a significant effect on improving the functional capacity and psychological behaviour in post MI patients.

Acta Medica Iranica 38 (4): 224-228; 2000

Key Words: Rehabilitation, myocardial infarction, depression, anxiety, personality

INTRODUCTION

Cardiovascular diseases (CVD) are the major cause of death in western countries (1,2). The prevalence of CVD in Iran is rapidly increasing so that the mortality rate from these diseases has increased from 20-25% in 1985 to 35-40% in 1990 (3). Coronary heart diseases and myocardial infarction (MI) have been the leading causes of death in the population over 35 years old in Iran. The occurance of CVD is observed not only in middle aged, but also in young people (4,5). Due to the advanced technology, sedentary lifestyle, stresses and social failures, MI is a lifetime disaster including negative physical and psychological effects. It is assumed that rehabilitation programs can decrease the complications of MI, and modify the physical and psychological potentials of MI patients (6). Appropriate prevention and therapy can promote functional capacity and prevent fatal and nonfatal complications of coronary heart disease (7). Almost 30-50% of cardiovascular patients have experienced some degree of depression (8-11).

Those who work in rehabilitation fields believe that exercise has beneficial psychologic effects, especially improving anxiety and depression and providing a desirable feeling (12). One of the psychologic characteristics in focus is personality type A, which is a known risk factor for CVD (13).

Controling stresses and modifying the behaviour pattern of type A personality is an important goal in CVD prevention (14). Some studies indicate that exercise is effective in modifying this behaviour pattern (15).

This study is aimed at investigating the physical and psychologic effects of exercise training in patients suffering from MI.

SUBJECTS AND METHODS

This study is a clinical trial on 80 MI patients 35-65 years old who had one month history of MI and have been referred to the rehabilitation unit of Isfahan Cardiovascular Research Center in 1996. By random allocation, 40 subjects were selected as exercise group (80% male) and 40 subjects as non-exercise group (85% male). Exercise was practised from 40% to 85% of the maximum heart rate achieved during the primary maximal symptom limited treadmill exercise testing

according to the Bruce protocol, for 8 weeks of 3 sessions per week.

Each session had a mean duration of 30-60 minutes consisting of 10-15 minutes warm-up (dynamic and static stretching exercises), 15-25 minutes aerobic and muscular conditioning (walking, bike riding, slow running), and finally 10 minutes cool down period (stretching exercises).

The psychological characteristics and functional capacity as well as type of personality were evaluated at the begining and 8 weeks later by means of Symptom Check List 90 (SCL 90) standardized for Iran (16) and exercise testing, respectively.

The data were analysed with the SPSS software using two-sample t-test and multiple linear regression. P values less than 0.05 were considered to be significant.

RESULTS

Patients' characterstics have been presented fully in Table 1. These characteristics are almost similar in both groups. Table 2 shows the mean changes of the studied parameters before and after the intervention in both groups. For instance, the mean increase of exercise capacity in the exercise group is 3.15 ± 0.34 METs* while in control group is significantly less, (0.72 ± 0.31) ($p<0.05$).

Table 1. Comparison of the studied characteristics between two groups before cardiac rehabilitation program

	Exercise group Mean±SE* (n=40)	Non-exerxise group Mean±SE (n=40)	p**
Age (year)	54.03±1.11	55.15±1.44	0.538
Weight (kg)	74.27±1.56	73.45±0.87	0.648
Body mass index(kg/m^2)	26.6±0.49	26.4±0.4	0.751
Functional capacity(mets)	9.76±0.35	9.45±0.27	0.483
Heart rate (per minute)	75.53±1.11	74.15±0.82	0.321
Systolic blood pressure (mmHg)	113.25±1.87	117.45±1.94	0.120
Diastolic blood pressure (mmHg)	77.5±1.2	79.7±1.04	0.167
Depression	0.83±0.1	0.91±0.09	0.547
Anxiety	0.79±0.11	0.89±0.09	0.400
Hostility	1.12±0.15	0.98±0.17	0.827
Type A behaviour	3.53±0.25	3.45±0.27	0.827

* SE: Standard error of mean, ** p-value of t-test

According to the results of Table 3 after adjustment for age, sex and, educational degree, it was identified that physical rehabilitation has a good effect on decreasing BMI, weight, resting heart rate, resting systolic and diastolic blood pressures, hostility, anxiety and depression ($p<0.05$). The functional capacity showed a significant increase in the exercise group compared to the non-exercise group ($p<0.05$). There was no significant difference between the two groups regarding the type A personality ($p>0.05$).

Table 2. The mean changes in the studied variables of both groups after cardiac rehabilitation program

	Exercise group Mean±SE* (n=40)	Non-exerxise group Mean±SE (n=40)	p**
Weight (kg)	-1.62±0.25	0.73±0.28	0.001
Body mass index(kg/m^2)	-0.58±0.09	0.26±0.10	0.011
Functional capacity(mets)	3.15±0.34	0.72±0.31	0.001
Heart rate (per minute)	-3.46±0.29	0.25±0.22	0.001
Systolic blood pressure (mmHg)	-5.05±1.17	1.75±1.09	0.001
Diastolic blood pressure (mmHg)	-1.15±0.84	0.75±0.74	0.0.90
Depression	-0.36±0.07	-0.08±0.05	0.001
Anxiety	-0.11±0.06	0.04±0.04	0.038
Hostility	-0.62±0.18	-0.14±0.21	0.048
Type A behaviour	-0.32±0.20	-0.25±0.14	0.775

* SE: Standard error of mean, ** p-value of t-test

Table 3. The multiple linear regression of physical rehabilitation on studied parameters

Body mass index(kg/m^2)	0.48	0.84	0.001
Heart rate (per minute)	0.25	2.35	0.001
Weight (Kg)	0.50	2.35	0.001
Systolic blood pressure (mmHg)	0.21	6.90	0.001
Diastolic blood pressure (mmHg)	0.48	0.84	0.001
Depression	0.62	0.96	0.001
Psychological characteristics	0.48	0.81	0.001
Hostility	0.33	0.84	0.001
Personality type A behaviour	0.07	0.21	0.880
Functional capacity (mets)	0.26	-1.83	0.001

The effects of age, sex and educational degree were adjusted.

DISCUSSION

Results show that specific differences exist in physical and psychological characteristics of MI patients who undergo exercise program compared to the non-exercise group. Regarding the results of Table 1,

* - MET = 3.5 ml/O_2 consumed per Kg/min body weight

the primary characteristics such as age, sex, weight and psychological behaviour of both groups are similar. The main findings of our study demonstrated that physical rehabilitation has a positive effect on depression (R^2 = 0.62, B = 0.96, p < 0.001) and anxiety (R^2 = 0.48, B = 0.81, p <0.001) which is similar to some studies done in other countries (15,17-19). On the other hand, a significant relation exists between personality type A and hostility with the severity of coronary artery disease in angiography (20-22) but till now, any relation between personality type and exercise has been not observed (23). Also, other results demonstrated that exercise programs do not have a significant effect on personality behaviour (R^2 = 0.07, B = 0.21, p=0.880) (Table 3). Other studies carried out on MI patients demonstrated that psychiatric consultation in addition to diet and exercise training has a beneficial effect on personality type A (23,24).

The significant increase in exercise capacity of patients participating in the rehabilitation program compared to the control group demonstrates that physical rehabilitation has a beneficial effect on physiologic function and physical conditioning of pateints (p<0.001).

Regularl, high intensity physical activity can play a basic role in prevention of coronary disease (25-28). According to the results of several studies, exercise can increase the functional capacity of coronary patients (29,30), so it can decrease dyspnea and angina. Therefore, this factor can help patients to regain their psychological balance (31).

Based on the results of multiple linear regression in Table 3, we found out that physical rehabilitation can modify BMI, resting heart rate, weight, resting systolic and diastolic blood pressures, functional capacity, depression, anxiety, and hostility. Comparing the results of multiple linear regression in Table 3 with the two-sample t-test (Table 2), it is found that, for instance, functional capacity has a significant increase and depression has a significant decrease in exercise group compared with non-exercise group (P <0.05). Exercise training in coronary disease patients can promote oxygen absorption and metabolism in muscles, leading to a decrease in heart overactivity. Furthermore, it can improve circulation in the collaterals (32-34), thus, heart rates and blood pressures decrease by exercise (26). In healthy people, regular activities with an appropriate intensity can improve body function and result in physiologic adaptation. This adaptation forms in both the cardiac system and peripheral organs and results in increase of cardiac output which improves the ability of peripheral organs to utilize oxygen (10). Therefore, to understand the actual role of exercise in the field of body adaptations, we need to do more research.

Finally, the results of this study suggest that exercise program plays an important role in improving functional capacity as well as having a positive impact on some psychologic characteristics of cardiac patients without psychiatric consult or psychotherapy.

More research and larger studies are needed to explain whether these improvements are due solely to exercise or not.

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