The Research of Medical Science Review
ISSN: 3007-1208 & 3007-1216 Volume 4, Issue 1, 2026

EFFECTS OF COMBINED AEROBIC AND RESISTANCE INTERVAL TRAINING VERSUS AEROBIC INTERVAL ON QUALITY OF LIFE, FATIGUE AND DYSPNEA IN POST MI PATIENTS

Uswa Ehsan*1, Noor Ul Ain2, Hafsa Fatima3

[1]Senior Physical Therapist
[2]Head Practitioner Physical Therapist
[3]Physical Therapist, King's College Hospital London, Dubai

*[1]mail.uswaehsan@gmail.com , [2]noor.sheeraz@hotmail.com, [3]hafsa_09@yahoo.com

DOI: https://doi.org/10.5281/zenodo.18426024

Keywords
Aerobic Interval Training, Aerobic and Resistance Interval Training, Dyspnea, Fatigue, MI Patients, Quality of Life

Article History
Received: 05 December 2025
Accepted: 15 January 2026
Published: 30 January 2026

Corresponding Author: *
Uswa Ehsan

Abstract

PURPOSE:
The aim of the study will be to establish that combination of aerobic and resistance interval training has a better effect in improving quality of life, fatigue and dyspnea compared to aerobic interval training.

METHODS:
Informed consent was taken after which randomized controlled trial was conducted at Armed Forces Institute of Cardiology between September 2019 and February 2020. There were 30 participants in the study who were enrolled based on inclusion and exclusion criteria. Both male and female aged 35 to 75 with a single MI in terms of time were included and those with ejection fraction less than 40 percent and cardiac surgery were excluded. By lottery technique, the respondents were randomly split into the interventional (n=15) and control (n=15) group. Both groups of patients engaged in 3 bouts of aerobic interval training that was conducted at 65 -85% of VO2max and resistance exercises were incorporated at 40 50 percent of 1RM to interventional group and 3 days/week over a period of 4 weeks. Before and after the 4 weeks of training, the quality of life, fatigue as well as dyspnea were evaluated using Mac New Quality of Life, Fatigue Severity Scale and Modified Borg Rating of Perceived.

RESULTS:
The average age of interventional group was 56.47 with a standard deviation of 9.576 and that of control group was 55.73 with a standard deviation 9.830. Following 4 weeks of training statistic significant difference was found between the groups in all three domains of quality of life (p=<0.05). There was no significant difference between interventional and control group with respect to dyspnea and fatigue (p=>0.05). Comparison between the groups on QoL, fatigue and dyspnea showed a significant difference in both the interventional and the control groups (p=<0.05).

CONCLUSION:
The present research concludes that aerobic and resistance interval training combination is the one that is better placed in the context of quality-of-life improvement. On the contrary, the same effect was observed on fatigue and dyspnea in both groups.

INTRODUCTION

Cardiovascular diseases (CVDs) have been the major cause of morbidity and mortality in all parts of the world with an estimated death rate of 17.9 million per year, which is almost 31 percent of all deaths in the world. It is noteworthy that death rates caused by CVD are due to heart attacks and strokes, and more than three-quarters of those are found in middle- and low-income countries (1). Myocardial infarction (MI), as one of the central pathologies in the spectrum, causes about 1.5 million cases annually in the United States alone. Reduced physiological parameters including heart rate, blood pressure, and other vital signs are among the frequent effects of MI survivors, where quality of life (QoL) is significantly compromised, both at the physical and emotional levels (2,3).

Additional symptoms affecting the reduction of QoL are exertional dyspnea and fatigue, which hinders activities of daily living and worsens comorbid health conditions (4,5). QoL is an important measure needed to comprehend the effect of disease, treatment efficacy, and implications of MI on patient well-being in general. The evidence that there is an inverse, independent relationship between exercise (and fitness condition) and death is strong in healthy and non-healthy populations (6). In order to reduce the consequences of MI and prevent further complications, cardiac rehabilitation (CR) programs became an essential part of the entire patient care. The programs provide a comprehensive solution that entails patient education, formal exercise, adjustment of risks and psychological counseling as recommended by international guidelines (4,7).

Exercise planning is considered to be one of the primary components of CR, and aerobic training (AT) is the most desirable modality because of the well-documented effectiveness in improving the state of the cardiovascular system, cardiac risk reduction, and physical performance (8). Aerobic exercise increases the heart rate reserve (HRR) in a person with known heart disease (9). Although standard performance has focused more on constant aerobic performance, current findings advocate the effectiveness of the aerobic interval training (AIT) over continuous exercise (10) in enhancing maximal oxygen uptake (VO2max).

The exercise has pronounced health advantages and thus continuous studies are done on the best type and dosage of exercising to ensure the physiological and functional advantages are maximized. Two main training paradigms high-intensity interval training (HIIT) and moderate-intensity continuous training (MICT) have become popular training consideration to enhance the cardiorespiratory fitness (VO2max). The sustained moderate-intensity activity of MICT has a long history of application and is also the conventional standard. It has also proved to improve cardiometabolic risk factors and psychological health of physically inactive adults in a great way (11).

The mode of operation of interval training is that of a consecutive taxation of both aerobic and anaerobic metabolic pathways. When performing intense determined exercises, predominant processes include glycogen degradation and lactic acid generation (anaerobic metabolism). The buildup of lactic acid also leads to fatigue but the following recovery process allows the aerobic system to use the lactic acid up, thus making them adapt and be better able to carry on with exercise with time (12).

Moreover, the intermittent quality of interval training increases the demand on oxygen, thereby increasing the consumption of the oxygen during the recovery period and increasing the consumption of VO2. Evidence shows that MICT 45 minutes or longer sessions help to decrease abdominal visceral fat (13-16), body composition, cardiovascular fitness, insulin sensitivity and lipid profiles (17,18). Notably, interval training is more effective in enhancing the anaerobic tolerance than the conventional models, with the plants not increasing the risk factors among patients with coronary artery disease (19).

Resistance training or strength training is also being introduced in CR. The cross-sectional studies have determined a negative relationship between muscular strength and all-cause deaths (20). This has resulted in the advocacy of the incorporation of resistance training in health promotion and disease prevention programs by leading organizations like the American Heart Association, American College of Sports Medicine and American Diabetes Association (21). Resistance training in patients with chronic heart failure improves aerobic and exercise capacity, skeletal muscle strength, and overall QoL outcomes that form the objectives of CR (22). Strengthening exercises enhance the mitochondrial ATP production which is an important predictor of aerobic capacity (23) and the dynamic strength of muscle which is associated with the peak performance and endurance. Besides, resistance training has also shown positive effects on mood, depression, fatigue, and emotional health in MI patients (24).

Comparative research indicates that aerobic exercise is preferential to enhance peak VO 2 and the cardiac structure/function of chronic heart failure (CHF) patients, whereas resistance exercise is better suited to enhance muscle strength, endurance, and positive arterial remodeling. The combination of both modalities provides the best results in terms of functional capacity, strength, performance and health-related QoL (25,26).

MI has a high contribution to the CVD-burden worldwide, and survivors often report poor-quality life, exertional dyspnea, and fatigue, which limit the daily activities and influence the health status negatively. The existing rehabilitation interventions are more concerned with lowering cardiovascular mortality. Nonetheless, the outcomes of interest to patients like angina, quality of life, fatigue, and dyspnea are underrepresented in clinical studies, or are not taken into account in the secondary analysis. Direct interventions that effectively improve QoL, dyspnea, and fatigue in survivors of MI have not been utilized, although the patients are interested in receiving treatment which considers both of the physical variables and symptom management.

The majority of research that is available assesses the impact of aerobic or strength training on patients with coronary artery disease alone. No comparative researches that measured the impact of aerobic interval training versus a combination of aerobic interval training and resistance training and especially in a short time (4 weeks) of intervention have been identified. Due to the fact that the majority of current research has been conducted over 6-12 weeks, limited data on the effectiveness of short interventions exists. This gap will be filled by examining the research question regarding the benefits of a short-duration intervention to enhance the QoL, dyspnea and fatigue in MI patients under conservative management.

METHODOLOGY

A randomized controlled trial (RCT) was used to measure the effects of aerobic interval training against combined aerobic interval and resistance training in patients who had undergone post-myocardial infarction (MI). It was carried out between September and February 2020, which is a period of 6 months, at the Armed Forces Institute of Cardiology (AFIC), Rawalpindi, Pakistan.

The online software Epi-tool was used to calculate the required sample size and the power of 0.8 with a variance of 5 and a confidence interval of 0.95 were used. The results of the means of population 1 and 2 using the main result (quality of life) were 17.3 and 17.8 respectively. The sample size calculated was 10 in each group (27). The study took into consideration male and female patients aged 35 years to 75 years with one pure episode of MI, clinical stability with no resting or exertional angina during the last six weeks and had the ability to take the treadmill 6-minute walk test without any manifestation in the last three minutes. On the other hand, Patients with the pulmonary pathologies or history of cardiac surgery, left ventricular ejection fraction that was below 40 percent, and post MI arrhythmias or unstable MI were not included in the study.

The non-probability convenient sampling was employed to recruit 32 stable patients after screening 50 60 post-MI patients. Randomly, the sealed envelope technique was applied to the random assignment between two groups, i.e., the interventional group (n=16) and the control group (n=16). After two of the participants dropped out, 30 participants engaged in the study (intervention group: n=15, control group: n=15)

OUTCOME TOOLS

The data were gathered through a self-administered questionnaire that was profane to gather demographic and family history, previous medical and surgical history, drug history, allergies, comorbidities, the history of MI episode, and the vital signs, including blood pressure (BP), respiratory rate (RR), heart rate (HR), and oxygen saturation (SpO 2).

Submaximal functional capacity was tested using the treadmill 6-minute walk test (6MWT). It provides an effective and dependable method to assess functional status of patients who are not able to undertake advanced exercises tests and gives prognostic and therapeutic facts in cardiac populations (27, 28).

Quality of life was measured using Mac New Quality of Life after Myocardial Infarction (MacNew QLMI) Questionnaire. It is composed of 27 items that include physical limitations (13 items), emotional function (14 items) and social function (13 items), ranging between 1 (poor) and 7 (high). Mean domain scores were computed, according to the guidelines that were described (29,30).

Modified Borg Scale (010) was also used to assess perceived dyspnea at the pre- and post-training stages. It is well known in its reliability and validity in the exercise intensity measure especially in cardiopulmonary population (31).

The level of fatigue after the exercise was determined by the use of the Rating of Fatigue scale that consisted of 11 numerical points (010) supplemented with descriptors and diagrams to make it easier to be understood by the participants.

DATA COLLECTION PROCEDURE

Out of the eligible patients (over 50 patients) who were screened, 34 patients were recruited based on the inclusion and exclusion criteria. The informed consent was taken by means of written forms. A cardiopulmonary therapist was in charge of the study, and the participants were monitored to guarantee their safety. Each of the participants was first subjected to the treadmill 6MWT with a starting speed of 1.5 km/h which increased with time by 30 seconds based on the tolerance, and without going beyond the target heart rate or a maximum speed of 5 km/h. The test was discontinued in case the person suffered chest pain, extreme dyspnea or fatigue.

Measurements were done on vital, dyspnea and fatigue prior and post the 6MWT. Day 1 Baseline assessments, such as self-structured questionnaire completion and MacNew QLMI and pre-exercise echocardiography, were carried out. The physical activity program took four weeks, where the sessions were three times a week and on alternate days. In each session, pre- and post-exercise vitals (HR, BP, RR, SpO 2) were measured with the help of a cardiac monitor, sphygmomanometer, and pulse oximeter.

The Modified Borg Scale and Rating of Fatigue Scale measured the dyspnea and fatigue respectively before and after the exercise, respectively, in each session. The Karvonen heart rate formula was used to determine the target heart rate and the range of target heart rate was determined at 65-85% of the heart rate reserve.

INTERVENTION PROTOCOLS

Control Group:

The 3-5 minutes warm-up (gentle stretches and breathing exercises) was done followed by three sets of aerobic interval training: 6 minutes cycling to 3 minutes rest; 6 minutes cycling to 3 minutes rest; 6 minutes treadmill walking to 3 minutes rest.

Combined Aerobic and Resistance Training (Experimental Group):

After a warm-up, the participants were made to do three sets:

Set 1: 3 minutes cycling, 1 set of 10-12 repetition hand grippers (1.5-2.5lbs), 1 set of 10-12 repetition biceps resistance exercise (1-3 kg), and 3 minutes rest.

Set 2: 3 minutes bicycling, 1 set of 10-12 repetitions quadriceps resistance exercise (1-3kg), followed by 3 minutes rest.

Set 3: 3 minutes of the treadmill running (1.5-4 km/h), 1 set of 10-12 repetitions of standing ankle pumps and rest. Incrementation of weights increased resistance gradually per tolerance whereas repetitions were kept constant (32). In both groups, cool-down activities (5-7 minutes) comprising of breathing exercises and active exercises were done at the end of each session. Two of the participants dropped out in the course of the intervention leaving the overall sample of 30. Figure 1 summarizes the flow of the study. Outcome measures such as the MacNew QLMI were reinstated at the end of the 4-week intervention.

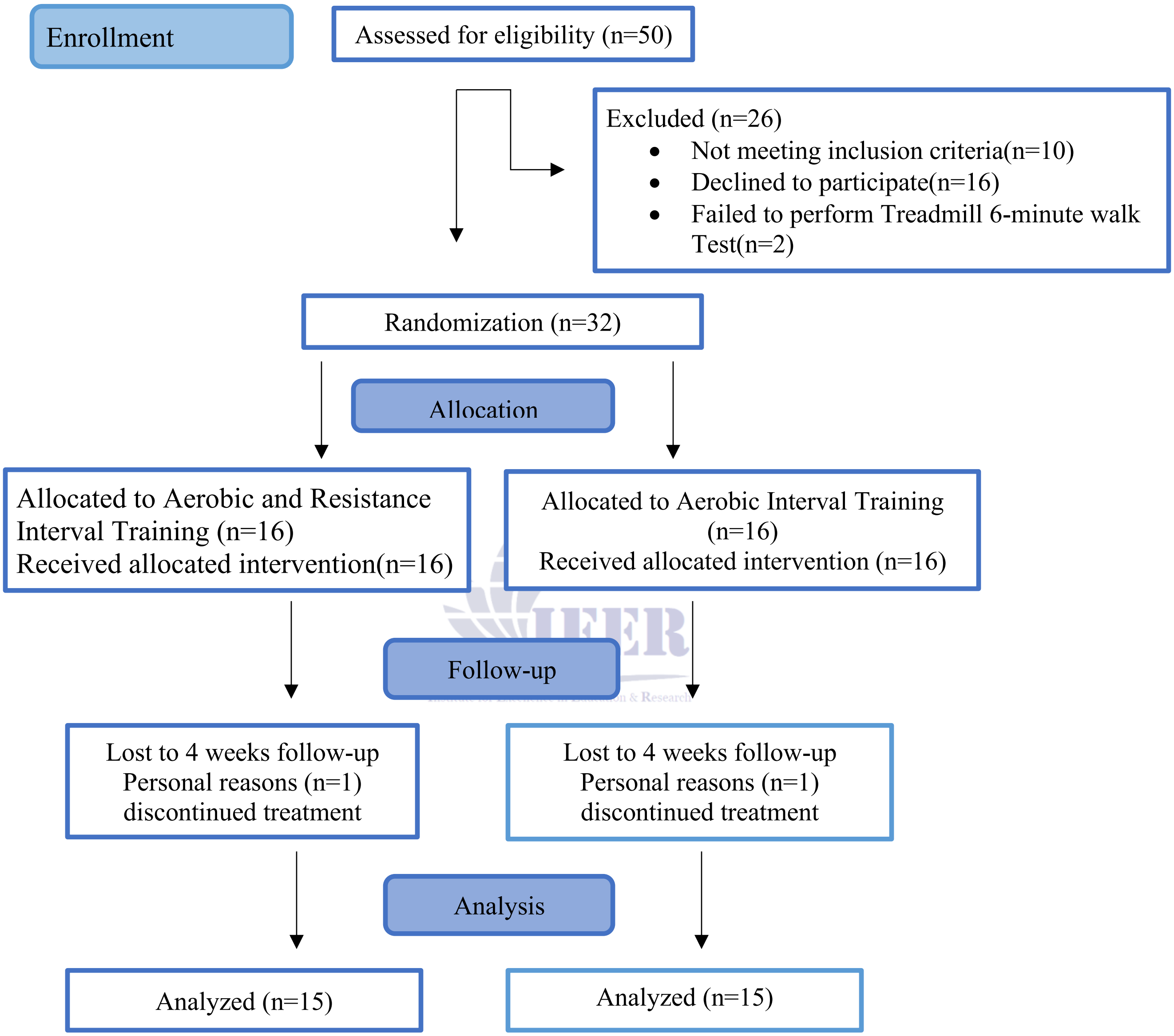

Figure: 1 Flow chart showing data collection procedure

RESULTS

All statistical procedures were done with SPSS 21.0 (IBM Corp., Armonk, NY, USA). There was an assessment of the participants both at baseline and the end of the intervention period. The concept of normal data was evaluated on all variables such as emotional, physical, social areas, and rate of perceived exertion, fatigue pre-intervention, being the variables measured using the Shapiro-Wilk test. The histogram results showed that the majority of the variables were non-normally (skewed) distributed ($P<0.05$), except in the pre-social and pre-physical domains of the MacNew QLMI which showed normal distribution ($P>0.05$).

Since the sample size is small, and most of the variables are non-normally distributed, non-parametric statistical tests were chosen to undertake further analyses. Descriptive statistics were applied to describe the population of the study. The quantitative variable (age) was averaged and standard deviation was performed. The qualitative variables, which consisted of gender, body mass index (BMI), occupation, comorbidities, medication use, and myocardial infarction history, were assessed in terms of frequencies and percentages.

The Mann-Whitney U test was used to compare the results of the interventional and control groups in terms of quality of life, dyspnea, and fatigue. In the case of within-group pre- and post-intervention comparisons, the Wilcoxon Signed-Rank test was applied.

DESCRIPTIVE STATISTICS

The researchers selected 30 patients with stable myocardial infarction (MI) and divided them into an interventional (n=15) and control group (n=15). Table 1 demonstrates the demographic data of the patients. The average age of patients in the control group was 55.73 0.830 years and that of the interventional group was 56.47 0.576. Most of the patients in the two groups were leading an inactive lifestyle (73.3% in the interventional group and 80% in the control group). The most prevalent comorbidity in the control group (33.3%), whereas in the interventional group, 26.7% of the patients had either hypertension, diabetes, or both.

INFERENTIAL STATISTICS

QOL three domains, emotional, physical and social did not demonstrate any significant difference between interventional and control groups (p >0.05). Statistically significant difference (p=0.021), (p= 0.041) and (p=0.023) in all three domains of QOL respectively was found between groups after 4 weeks of training. All the three domains of QOL were more improved with interventional group i.e. emotional 5.35 (0.62), physical 5.14 (0.64) and social 5.46 (0.85) than in control group i.e. 4.5 (1.35), 4.57 (0.87) and 4.92 (0.54) respectively. (Table 1) No significant difference was found in rating of perceived exertion (dyspnea) and fatigue in interventional and control groups (p=1.000) and (p=0.744). (Table 1) The comparison under the groups on pre and post emotional, physical and social domains of quality of life indicated a significant difference in the interventional (P=0.001) and the control group (P=0.001). (Table2) The comparison of rating of perceived exertion (dyspnea) and fatigue in the groups on post exercise day 1 and post exercise day 12 also demonstrated a significant difference both in interventional (P=0.001, P=0.002) and control group (P=0.048, P=0.001) respectively. (Table 3)

Table 1 Comparison of Pre and Post Domains of QLMI, Fatigue and Dyspnea between the groups

Variables	Interventional Group	Control Group	P value
	Median (IQ)	Median (IQ)	
Pre-Emotional	4.1 (0.58)	3.85 (1.5)	0.285
Post-Emotional	5.35 (0.62)	4.5 (1.35)	0.021*
Pre-Physical	2.92(1.07)	3.07(1.78)	0.775
Post-Physical	5.14(0.64)	4.57(0.87)	0.041*
Pre-Social	3.68(0.85)	3.84(1.77)	0.838
Post-Social	5.46(0.85)	4.92(0.54)	0.023*
Post-Fatigue (Day 1)	02(3)	2(1.5)	0.202
Post-Fatigue (Day 12)	0 (0.5)	0 (0.5)	0.744
Post-Dyspnea (Day 1)	2(2)	1(1.5)	0.056*
Post-Dyspnea (Day 12)	1(0.5)	1(0.5)	1.00

Table 2 Comparison of pre and post training on MacNew QLMI (Emotional, Physical and Social) within the Interventional and Control group.

	Variable	Interventional Group		Control Group	
	MACNEW QLMI	Median (IQ)	P-value	Median (IQ)	P-value
Emotional	Pre exercise	4.1(0.58)	0.001*	3.85(1.5)	0.001*
	Post exercise	5.35(0.62)		4.5(1.4)	
Physical	Pre exercise	2.92(1.07)	0.001*	3.07(1.78)	0.001*
	Post exercise	5.14(0.64)		4.57(0.87)	
Social	Pre exercise	3.68(0.85)	0.001*	3.84(1.77)	0.001*
	Post exercise	5.46(0.85)		4 .92(0.54)	

Table 3 Comparison of post exercise day 1 and post exercise day 12 on rating of perceived exertion (dyspnea) AND Fatigue

Variables	Days	Pre/Post	INTERVENTIONAL GROUP		CONTROL GROUP	
			Median (IQ)	P-value	Median (IQ)	P-value
RATE OF PERCEIVED EXERTION	DAY 1	Post exercise	2(2)	0.001*	1(1.5)	0.048*
	DAY 12	Post exercise	2(0.5)		1(0.5)	
FATIGUE	DAY 1	Post exercise	2(3)	0.002*	2(1.5)	0.001*
	DAY 12	Post exercise	0(0.5)			

DISCUSSION

The main objective of myocardial infarction (MI) rehabilitation is to help the patient to resume active life. This research proves that a four-week intervention that includes aerobic and resistance interval training along with the aerobic interval training have a significant positive impact on the quality of life (QOL) among patients with MI. The interventional group had statistically significant changes in physical, emotional and social domains of QOL than the control group. The results align with the results of the studies carried out in the past, where it was revealed that, in comparison to aerobic training, combined aerobic and resistance training is better in enhancing QOL [(33, 34)].

Resistance training can also cause physiological changes in skeletal muscles and this will result in increased muscle coordination and mechanical efficiency [(35, 36)]. The positive influence of exercise on mood, self-image, and social relations led to the improvement in the QOL in both groups. It has been proven that exercise raises serotonin concentration, improves depression and activates pleasure and satisfaction centers in the brain [(37)].

Nevertheless, the researcher did not find any meaningful difference between the levels of dyspnea and fatigue between the interventional and control groups. This could be explained by the fact that the study took too little time (4 weeks) and that both groups used aerobic interval training, which would have obscured the effects of resistance training on these parameters.

Some of the limitations of this study include a small sample size (n=30) because of the period of time of conducting the study (6 months). The only center (Armed Forces Institute of Cardiology, AFIC) was used to gather the data. The cultural and societal aspects were not favorable to patient enrollment and voluntary participation to attend the training program.

The research that is conducted in the future should focus on expanding the size of the sample in order to check whether treatment is significant in treating fatigue and dyspnea. Research of longer periods (6-12 weeks) is required to witness improved results on QOL, fatigue, and dyspnea. They should initiate educational programs and counseling to create awareness of the advantages of cardiac rehabilitation in patients of coronary heart disease. There is need to conduct larger studies to assess symptom response to exercise.

CONCLUSION

This paper hypothesizes that a mix of aerobic and resistance interval training would be useful to enhance the quality of life among individuals with myocardial infarction (MI). Nevertheless, dyspnea and fatigue with the introduction of resistance training do not seem to be significantly different than aerobic interval training. However, it is important to mention that even a rather short-term (4 weeks) training program showed quality of life, fatigue, and dyspnea improvement, which points to the possibility of the positive effect of early exercising-based rehabilitation on MI patients.

REFERENCES

Diseases c. Cardiovascular diseases (CVDs). 2017.

Roebuck A, Furze G, Thompson DR. Health-related quality of life after myocardial infarction: an interview study. Journal of advanced nursing. 2001;34(6):787-94.

Norekvål TM, Wahl AK, Fridlund B, Nordrehaug JE, Wentzel-Larsen T, Hanestad BR. Quality of life in female myocardial infarction survivors: a comparative study with a randomly selected general female population cohort. Health and Quality of Life Outcomes. 2007;5(1):58. rehabilitation. C. Cardiac rehabilitation. n.d.

Brown N, Melville M, Gray D, Young T, Munro J, Skene A, et al. Quality of life four years after acute myocardial infarction: short form 36 scores compared with a normal population. Heart. 1999;81(4):352-8.

Kokkinos P, Sheriff H, Kheirbek R. Physical inactivity and mortality risk. Cardiology research and practice. 2011;2011.

Thomas RJ, Balady G, Banka G, Beckie TM, Chiu J, Gokak S, et al. 2018 ACC/AHA clinical performance and quality measures for cardiac rehabilitation: a report of the American College of Cardiology/American Heart Association Task Force on Performance Measures. Journal of the American College of Cardiology. 2018;71(16):1814-37.

S.A B. Aerobic exercise in subacute stroke improves cardiovascular health and physical performance.

Snoek JA, Van Berkel S, Van Meeteren N, Backx FJ, Daanen HA. Effect of aerobic training on heart rate recovery in patients with established heart disease; a systematic review. PloS one. 2013;8(12).

Elliott. Interval training versus continuous exercise in patients with coronary artery disease: a meta-analysis.

Shepherd SO, Wilson OJ, Taylor AS, Thøgersen-Ntoumani C, Adlan AM, Wagenmakers AJ, et al. Low-volume high-intensity interval training in a gym setting improves cardio-metabolic and psychological health. PloS one. 2015;10(9).

quinn e. Interval Training Workouts Build Speed and Endurance.

Hong H-R, Jeong J-O, Kong J-Y, Lee S-H, Yang S-H, Ha C-D, et al. Effect of walking exercise on abdominal fat, insulin resistance and serum cytokines in obese women. Journal of exercise nutrition & biochemistry. 2014;18(3):277.

Ross R, Hudson R, Stotz PJ, Lam M. Effects of exercise amount and intensity on abdominal obesity and glucose tolerance in obese adults: a randomized trial. Annals of internal medicine. 2015;162(5):325-34.

Miyamoto-Mikami E, Sato K, Kurihara T, Hasegawa N, Fujie S, Fujita S, et al. Endurance training-induced increase in circulating irisin levels is associated with reduction of abdominal visceral fat in middle-aged and older adults. PloS one. 2015;10(3).

Ennour-Idrissi K, Maunsell E, Diorio C. Effect of physical activity on sex hormones in women: a systematic review and meta-analysis of randomized controlled trials. Breast Cancer Research. 2015;17(1):139.

Wallace LS, Rogers ES, Bielak K. Promoting physical activity in the family practice setting. American family physician. 2003;67(6):1199.

Donnelly JE, Blair SN, Jakicic JM, Manore MM, Rankin JW, Smith BK. American College of Sports Medicine Position Stand. Appropriate physical activity intervention strategies for weight loss and prevention of weight regain for adults. Medicine and science in sports and exercise. 2009;41(2):459-71.

Warburton. Effectiveness of high-intensity interval training for the rehabilitation of patients with coronary artery disease.

FitzGerald SJ, Barlow CE, Kampert JB, Morrow JR, Jackson AW, Blair SN. Muscular fitness and all-cause mortality: prospective observations. Journal of Physical Activity and Health. 2004;1(1):7-18.

Pollock ML, Franklin BA, Balady GJ, Chaitman BL, Fleg JL, Fletcher B, et al. Resistance exercise in individuals with and without cardiovascular disease: benefits, rationale, safety, and prescription an advisory from the committee on exercise, rehabilitation, and prevention, council on clinical cardiology, American Heart Association. Circulation. 2000;101(7):828-33.

Levinger I, Bronks R, Cody DV, Linton I, Davie A. Resistance training for chronic heart failure patients on beta blocker medications. International journal of cardiology. 2005;102(3):493-9.

Maiorana A, O'Driscoll G, Cheetham C, Collis J, Goodman C, Rankin S, et al. Combined aerobic and resistance exercise training improves functional capacity and strength in CHF. Journal of Applied Physiology. 2000;88(5):1565-70.

McCARTNEY N. Role of resistance training in heart disease. Medicine & Science in Sports & Exercise. 1998;30(10):S396-S402.

Mandic S, Myers J, Selig SE, Levinger I. Resistance versus aerobic exercise training in chronic heart failure. Current heart failure reports. 2012;9(1):57-64.

Gary RA, Cress ME, Higgins MK, Smith AL, Dunbar SB. Combined aerobic and resistance exercise program improves task performance in patients with heart failure. Archives of physical medicine and rehabilitation. 2011;92(9):1371-81.

Laoutaris ID, Adamopoulos S, Manginas A, Panagiotakos DB, Kallistratos MS, Doulaptsis C, et al. Benefits of combined aerobic/resistance/inspiratory training in patients with chronic heart failure. A complete exercise model? A prospective randomised study. International journal of cardiology. 2013;167(5):1967-72

Rasekaba T, Lee A, Naughton MT, Williams TJ, Holland AE. The six-minute walk test: a useful metric for the cardiopulmonary patient. Internal medicine journal. 2009;39(8):495-501

Höfer S, Lim L, Guyatt G, Oldridge N. The MacNew Heart Disease health-related quality of life instrument: a summary. Health and quality of life outcomes. 2004;2(1):3

Kang K, Gholizadeh L, Inglis SC, Han H-R. Interventions that improve health-related quality of life in patients with myocardial infarction. Quality of Life Research. 2016;25(11):2725-37.

Kendrick. Usefulness of the modified 0-10 Borg scale in assessing the degree of dyspnea in patients with COPD and asthma

Cornish AK, Broadbent S, Cheema BS. Interval training for patients with coronary artery disease: a systematic review. European journal of applied physiology. 2011;111(4):579-89

Arthur HM, Gunn E, Thorpe KE, Ginis KM, Mataseje L, McCartney N, et al. Effect of aerobic vs combined aerobic-strength training on 1-year, post-cardiac rehabilitation outcomes in women after a cardiac event. Journal of rehabilitation medicine. 2008;39(9):730-5

Dor-Haim H, Barak S, Horowitz M, Yaakobi E, Katzburg S, Swissa M, et al. Improvement in cardiac dysfunction with a novel circuit training method combining simultaneous aerobic-resistance exercises. A randomized trial. PloS one. 2018;13(1).

Oka RK, De Marco T, Haskell WL, Botvinick E, Dae MW, Bolen K, et al. Impact of a home-based walking and resistance training program on quality of life in patients with heart failure. The American journal of cardiology. 2000;85(3):365-9.

Slimani M. the effects of physical training on quality of life, aerobic capacity, and cardiac function in older patients with heart failure: A Meta-Analysis.

Karen H. depressiojn anxiety and quality of life scores in seniors after an endurance exercise program.