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Original Article

# Effects of a group-based aerobic and resistance exercise program on physiological-psychological adaptation in elderly with heart failure

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## ABSTRACT

**Background/Purpose:** Elderly patients with heart failure suffer from many daily activity problems and mental adaptation; however, exercising as a non-medical intervention is not usually recommended by the treatment team. The purpose of the present study was to determine the effects of an aerobic and resistance exercise program on physiological-psychological adaptation in elderly with heart failure.

**Methods:** This study is a randomized, clinical trial design. The study population comprised elderly with heart failure. Sixty male elders were selected using convenience sampling and randomly assigned into intervention and control groups. The group-based aerobic and resistance exercise program was conducted for three months. The psychological health questionnaire was completed both in the pre- and post-intervention period while the 6-Minute Walking Test was assessed in four time intervals.

**Results:** The results showed a significant statistical difference between the two groups' 6-Minute Walking Test and psychological adaptation mean scores ($p < 0.001$). The aerobic and resistance exercise programs improved physiological and psychological adaptation, and diminished "psychological stress" ($p < 0.001$) among the elderlies with heart failure.

**Conclusion:** The findings suggest that a group-based aerobic and resistance exercise program for elderlies with heart failure may contribute to improving their quality of life by improving their physiological capabilities and psychological adaptation. The study's results provide support for the safety and efficacy of group-based aerobic and resistance exercises for elderly patients with heart failure.



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## INTRODUCTION

Heart failure (HF) is the quintessential cardiovascular syndrome of aging with a reduced left ventricular ejection fraction (EF ≤40%) that results from common cardiovascular conditions in older adults in conjunction with age-associated changes in cardiovascular structure and function.[1,2] The incidence and prevalence of HF increase strikingly with age[3] (as the disease prevalence is reported to be 4-8% among the elderly population) and make HF the most common reason for hospitalization among older adults.[1] HF markedly impairs physiological function and quality of life, which results in negative consequences in all domains of patients' activities of daily living, make the patient depressed and anxious[2] and finally, results in less physiological and psychological adaptation.[4-7]

Although HF results in problems in elders' ability to maintain control over their physiological-psychological adaptation, researchers have approved the impact of aerobic and resistance exercise programs on increasing the physiological tolerance and psychological adaptation as HF problems can reduce the adaptive responses among the elderly.[4,7-10] Harris (2012) believes that exercise improves the elderly's physiological tolerance by strengthening heart muscles and facilitating blood pumping.[7] Keteyian (2011) and Tai (2008) have also showed that aerobics improves physiological and psychological adaptation in patients with HF.[11-12] Other studies have approved the efficiency of exercise on decreasing depression symptoms among patients with HF.[4,11,13] Meanwhile, there are some studies which deny the positive effects of exercising on improvements in patients' quality of life.[14,15] However, exercising guidelines and aerobic and resistance exercise programs are not mentioned as effective non-pharmacological interventions by care providers. Little is known about the effects of a structured exercise program on adaptation to chronic illness in elders with HF. Therefore, this study was conducted to determine the effects of a group-based aerobic and resistance exercise program on physiological-psychological adaptation in elderly with HF.

## METHODS

### Design

The present study was a randomized, controlled clinical trial. The study population comprised male elders (≥60 years) with systolic functional class II & III HF disease referred to the echocardiography ward of Imam Sadjad Hospital, Ramsar, Mazandaran province, Iran. Sixty elderly were selected using convenience sampling and divided into the intervention and control groups by block-randomized allocation. The sample residents in odd blocks were selected for the intervention group and even blocks for the control group. The groups were matched for age, educational level, employment, EF, and other variables. The 60 eligible participants were randomized into either the exercise intervention (n=30) or the no exercise intervention (n=30) groups. Participants in the control group received HF care education but no specific exercise instruction. HF care education was taught in both groups routinely. All participants enrolled in this exercise study had their cardiologist's approval prior to participate. All participants were required to demonstrate ability to perform 6-Minute Walking Test (6-MWT) prior to being randomized to the intervention or control group. Any participant who could not demonstrate physiological ability to perform the 6-MWT was not enrolled.

### Study participants

Five participants in the exercise intervention group missed two or more program sessions and were excluded from the study. Two participants in the no exercise intervention group were excluded owing to the withdrawal in the end of program implementation. Of the 60 participants eligible for inclusion, 53 (88.33%) completed all follow-up assessments (25 in the exercise intervention group; 28 in the no exercise intervention group) (Figure 1).

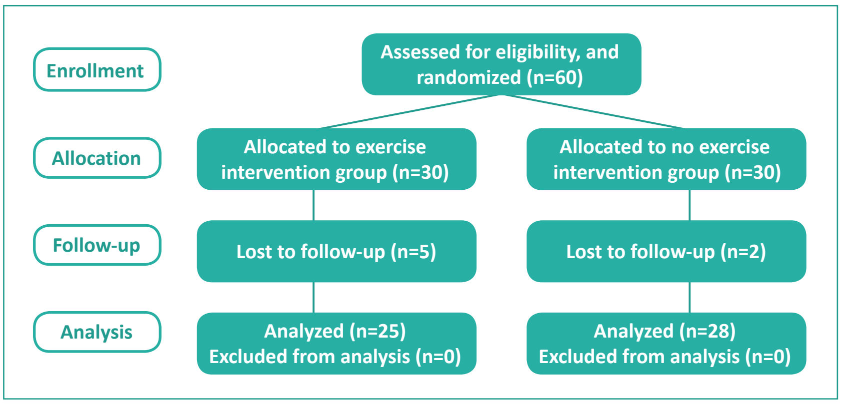
### Inclusion criteria

Inclusion criteria for enrollment in the study were: a) male patients with HF disease according to New York Heart Association (NYHA) Functional Class II & III; b) being 60-74 years old and being diagnosed with systolic HF (EF ≤40%) according to the echocardiographic results (2013 EK07 Madison echocardiography machine made in South Korea with probe No. 3 was used for calculating the EF); c) having the disease for more than six months; d) not having previous coronary artery disease stenosis ≥70% on the cardiac angiogram results; e) not having ventricle arrhythmia requiring anti-arrhythmic medications; f) not having 2nd or 3rd heart block degree; g) having a heart rate >120 bpm; and, h) being able to understand and communicate in Persian language.[7] The Abbreviated Mental Test was used for screening the patient's cognitive impairments and the inclusion criteria for participation was a score of 8 or more.[16]

### Exclusion criteria

Exclusion criteria for enrollment in the study were: a) the inability to exercise and perform regular exercises due to neurologic or orthopedic conditions (i.e., osteoarthritis and skeleton deformities); b) an intervention group participant experiencing problems such as cardiac dysrhythmias, and cardiovascular hemodynamic instability, episodes of chest pain or other cardiac symptoms. during the interventions more than once a week; and c) the patients with fatigue and shortness of breath scores of 5 or more according to the Borg Fatigue Scale. We used the modified Borg scale with values between 0 and 10 for classify the dyspnea and/or fatigue perception of patients.[17]

**Figure 1.** Sampling and flow of subjects through study



### Instruments

The instruments below were used for data collection:

1. The 38-item scale measuring psychological adaptation designed by Veit and Ware (1983) was administered to participants. Two categories ("psychological distress" and "well-being") were divided into six sub-scales including: anxiety, depression, loss of behavioral emotional control, general positive affect, emotional ties, and life satisfaction.[19] This instrument is based on a six-point Likert scale (1=never to 6=always). In this study, the internal consistency as shown by Cronbach's alpha of 0.87 was acceptable and the stability was assessed using the test-retest method. The psychological health questionnaire was completed before and three months after the intervention by both groups.

2. The 6-MWT was used for screening physiological adaptation. Its validity and reliability were acceptable in previous studies.[7,15,19] The 6-MWT was measured at four intervals (pre-intervention, and after the 1st, 2nd and 3rd months of the intervention) in both groups.

### Ethical considerations

All the participants were informed about the purpose of the study and provided their written consent. Participants' personal information was confidential and their privacy respected. The study began as soon as the required approval was received from the Research Ethics Committee of Babol University of Medical Sciences (Reference number: MUBABOL.REC.1395.48), and the study was registered in Iran registry of clinical trials (IRCT2016111630930N1).

### Intervention

To assess physiological adaptation, participants were asked to walk a specified route for six minutes inside the Imam Sadjad Hospital's sports hallway where the interventions took place. The distance walked was measured then and compared between the groups at the four intervals. The participants were told they could stop, and rest as long or as often as needed. At the end of the timed six minutes, the total distance in meters was recorded for each individual. The 6-MWT began once the needed tools like timer, sphygmomanometer, and emergency trailers were assembled and the patient was prepared. It should be noted that participant capabilities-regardless of group-were checked using the Borg Fatigue Scale before the test.

The intervention group participants were made to walk slowly (aerobic exercises) throughout the 12 weeks, three times per week for 30-minutes while being observed by a coach and the principal researcher (a nurse with 15 years of experience of working in a Cardiac Care Unit). Intervention group participants were instructed as follows: "Before and after exercise do warming-up and cooling-down exercises for 5 to 10 minutes." They were made to walk for 30-minutes after the warm-up exercise. After four weeks, in addition to walking, a resistance exercise program (using a 500 gr Dumbbell; three times per week, for 30-minutes) was implemented until the end of the 12th week. It was recommended that participants rest during the walk if they felt dyspnea and palpitations. Exercises were performed at a specified time (3:00 pm) as there should be a 2-hour time interval between the last meal and exercising. The exercise program was performed at normal room temperature (18-22℃), with sport clothes and shoes.[9] Participants could drink water in case they felt thirsty. To safeguard their security and prevent the onset of any possible health problems (i.e., cardiac dysrhythmias, cardiovascular hemodynamic instability), all training exercise sessions were conducted inside the Imam Sadjad Hospital's sports hallway which was located by the CCU and emergency wards with emergency resuscitation equipment readily available. A cardiologist was present in all the research stages. The 6-MWT was measured at the end of the 1st, 2nd, and 3rd months of the intervention and both the intervention and control group participants were requested to complete the psychological adaptation questionnaire. Finally, physiological and psychological adaptation was compared between the groups.

### Statistical analysis

The data were analyzed using SPSS version 16. Adaptation scores were calculated using the indices including normality tests (Shapiro-Wilk), and the following tests were performed: independent and paired *t*-test, Wilcoxon, U Mann–Whitney, repeated ANOVA, and Bonferroni. The significance level was $p < 0.05$.

## RESULTS

From the sample of 60 elderly patients with systolic HF, 25 participants from the intervention group and 28 from the control group completed the study. Preliminary analyses of variance (ANOVAs) showed that participants in the two conditions did not differ significantly in baseline measures of age, EF, or the time since diagnosis ($p > 0.05$). Participants in the two conditions did not differ significantly in baseline measures of marital status, income, employment, education, functional class of disease, living location, having other diseases, and HF etiology ($p > 0.05$) (Table 1).

The first hypothesis tested found a statistically significant difference in the physiological adaptation mean scores between the intervention and control groups ($p < 0.001$). The ANOVA, tested at the pre- (Time 1), 1st (Time 2), 2nd (Time 3) and the 3rd months of the intervention (post-) (Time 4), showed a statistically significant difference for the intervention group ($p < 0.001$) but was non-significant for the control group ($p = 0.64$) (Figure 2). Pairwise comparisons using the Bonferroni test have shown that the distance-walked mean scores in the time intervals of 1 to 2 (61.56 m), 1 to 3 (112.1 m) and 1 to 4 (132.88 m) were statistically significant ($p < 0.001$) but the same factor for the time intervals of 2 to 3 (50.6 m; $p=0.22$) and 3 to 4 (20.72 m; $p=0.45$) were non-significant (Table 2).

**Table 1.** Study sample demographics - Chi Square Analysis

| Variables / Groups | Intervention n | Intervention % | Control n | Control % | p-value* |
|---|---|---|---|---|---|
| **Marital status** | | | | | 0.53 |
| Single | 0 | 0 | 5 | 17.85 | |
| Married | 19 | 76 | 20 | 71.45 | |
| Widow | 6 | 24 | 3 | 10.7 | |
| Total | 25 | 100 | 28 | 100 | |
| **Income level** | | | | | 0.12 |
| Less than the costs | 10 | 40 | 6 | 21.45 | |
| Equal to the costs | 8 | 32 | 20 | 71.45 | |
| More than the costs | 7 | 28 | 2 | 7.1 | |
| Total | 25 | 100 | 28 | 100 | |
| **Employment** | | | | | 0.13 |
| Jobless | 2 | 8 | 3 | 10.7 | |
| Farmer | 2 | 8 | 4 | 14.28 | |
| Worker | 1 | 4 | 5 | 17.85 | |
| Retired | 8 | 32 | 6 | 21.42 | |
| Self-employed | 12 | 48 | 10 | 35.75 | |
| Total | 25 | 100 | 28 | 100 | |
| **Education** | | | | | 0.19 |
| Illiterate | 4 | 16 | 6 | 21.42 | |
| Reading and Writing literacy | 5 | 20 | 7 | 25 | |
| Primary school | 4 | 16 | 9 | 32.14 | |
| High school diploma | 9 | 36 | 6 | 21.42 | |
| College or university | 3 | 12 | 0 | 0 | |
| Total | 25 | 100 | 28 | 100 | |
| **Functional class of disease** | | | | | 0.39 |
| Class II | 17 | 68 | 17 | 60.72 | |
| Class III | 8 | 32 | 11 | 39.28 | |
| Total | 25 | 100 | 28 | 100 | |
| **Living location** | | | | | 0.21 |
| Urban | 17 | 68 | 15 | 53.57 | |
| Rural | 8 | 32 | 13 | 46.43 | |
| Total | 25 | 100 | 28 | 100 | |
| **Having other diseases** | | | | | 0.46 |
| Yes | 20 | 80 | 22 | 78.58 | |
| No | 5 | 20 | 6 | 21.2 | |
| Total | 25 | 100 | 28 | 100 | |
| **HF etiology** | | | | | 0.52 |
| Ischemic | 20 | 80 | 20 | 71.5 | |
| Non-ischemic | 5 | 20 | 8 | 28.5 | |
| Total | 25 | 100 | 28 | 100 | |

The ANOVA showed improvements in the distance-walked mean scores between the 1st (the distance-walked mean difference in the pre-intervention and post-a month after the intervention), 2nd (the two months after the intervention began and post) and 3rd (three months after the intervention began and two months after the intervention) time intervals for the intervention group (p <0.001). Meanwhile, the same subject was not significant for the control group (p=0.36). The independent *t*-test also indicated statistically significant differences between the two groups' distance-walked mean scores in the 1st, 2nd, and 3rd time intervals (p <0.001) (Table 3).

The second hypothesis tested found that the group-based aerobic and resistance exercise program improved psychological adaptation among the elderly with HF. The paired *t*-test showed statistically significant differences in the pre- and post-psychological adaptation mean scores of the intervention group (p <0.001), but was non-significant for the control group (p >0.05). The results of the independent *t*-test found that aerobic and resistance exercises decreased psychological distress among the elderly with HF (p <0.001). The results showed statistically significant differences in anxiety, depression, and low emotional control, before and after the intervention among the intervention group's participants (p <0.001) (Table 4).

The comparison of the well-being subscale, indicated that there were no statistically significant differences for either the intervention group (p=0.37) or control group (p=0.082). Paired *t*-test and Wilcoxon test revealed that there were no statistically significant differences in mean scores for general positive affect and emotional ties for either group (p >0.05). The independent *t*-test and U-Mann-Whitney were conducted to evaluate group differences. The results showed that the exercise program did not improve general positive affect (p=0.31) and emotional ties (p=0.32) in the elderly with HF, but did improve life satisfaction (p=0.013) (Table 4).

An ANOVA was used to evaluate the effect of demographic variables on the participants' physiological-psychological adaptation after the intervention. Pairwise comparisons using Bonferroni tests have shown that the effect of age, disease duration, marital status, income level, living location, HF etiology, employment, and functional class of disease on physiological adaptation was not statistically significant (p >0.05); but the effect of EF, educational level, and having other diseases was statistically significant (p <0.05). However, the patients with lower educational level, living in rural areas, and having less EF were less affected by the exercise program in physiological adaptation point of view. In addition, the age, time since diagnosis, marital status, income level, living location,

**Table 2.** Pairwise comparisons of 6MWT in 4-time points in intervention group

| Time intervals | | Mean Difference±Standard Deviation | 95% Confidence Interval for Difference[a] | | p-value* |
|---|---|---|---|---|---|
| | | | Lower Bound | Upper Bound | |
| 1 | 2 | -61.56±5.15 | 50.92 | 72.19 | <0.001 |
| | 3 | -112.1±10.3 | 9.89 | 13.34 | <0.001 |
| | 4 | -132.88±11.65 | 10.88 | 15.69 | <0.001 |
| 2 | 1 | 61.56±5.15 | 50.92 | 72.19 | <0.001 |
| | 3 | -50.6±8.07 | 33.93 | 67.26 | 0.22 |
| | 4 | -71.32±9.67 | 51.35 | 91.28 | <0.001 |
| 3 | 1 | 112.1±10.3 | 9.89 | 13.34 | <0.001 |
| | 2 | 50.6±8.07 | 33.93 | 67.26 | 0.22 |
| | 4 | -20.72±2.7 | 15.13 | 26.3 | 0.45 |
| 4 | 1 | 132.88±11.65 | 10.88 | 15.69 | <0.001 |
| | 2 | 71.32±9.67 | 51.35 | 91.28 | <0.001 |
| | 3 | 20.72±2.7 | 15.13 | 26.3 | 0.45 |

[a]Adjustment for multiple comparisons: Bonferroni; *The mean difference is significant at the 0.05 level.

**Table 3.** 6-MWT mean scores differences in the 3-times intervals for the intervention and control groups

| Groups | Mean Difference And Standard Deviation (m) | | | p-value* |
|---|---|---|---|---|
| | The 1st Time Interval | The 2nd Time Interval | The 3rd Time Interval | |
| Intervention | 61.56±25.76 | 50.60±40.37 | 20.72±13.52 | P <0.001 |
| Control | 1.57±7.5 | 0.78±9.85 | 1.42±4.53 | P=0.36 |
| p-value* | p <0.001 | p <0.001 | p <0.001 | - |

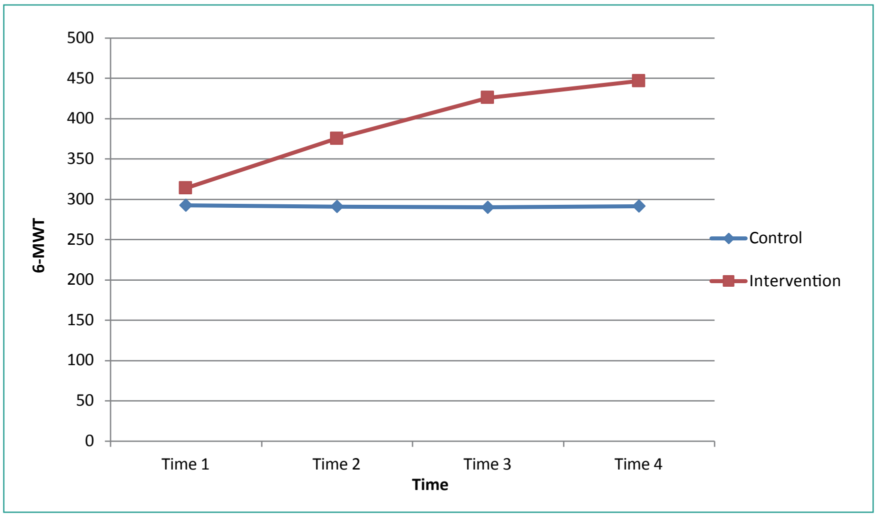
*The mean difference is significant at the 0.05 level.

**Table 4.** Scores of the psychological adaptation and the related sub-scales

| Psychological Adaptation Sub-scales | Groups | Mean±Standard Deviation | | p-value* | Mean Difference | p-value* |
|---|---|---|---|---|---|---|
| | | Pre-intervention | Post-intervention | | | |
| **Anxiety** | Control | 21.16±6.36 | 6.88±4.17 | P <0.001 | -14.28±8.36 | p <0.001 |
| | Intervention | 15.46±3.85 | 15.57±3.31 | p=0.41 | 0.89±5.71 | |
| **Depression** | Control | 18.84±3.14 | 7.16±1.49 | P <0.001 | -11.68±3.85 | p <0.001 |
| | Intervention | 13.14±2.75 | 13.92±1.2 | p=0.15 | 1.21±4.33 | |
| **Low emotional control** | Control | 41.56±9.6 | 22±8.69 | P <0.001 | -19.56±16.57 | p <0.001 |
| | Intervention | 35.6±4.86 | 34.25±7.67 | p=0.41 | -1.35±9.81 | |
| **Psychological distress** | Control | 36.04±11.73 | 81.56±18.11 | P <0.001 | -45.52±27.03 | p <0.001 |
| | Intervention | 63.75±10.76 | 64.21±7.62 | p=0.26 | -3.46±16.02 | |
| **General positive affect** | Control | 27.68±11.66 | 27.92±5.67 | P=0.52 | -0.24±9.49 | p=0.31 |
| | Intervention | 39.1±9.16 | 34.96±6.81 | p=0.061 | -4.14±11.2 | |
| **Emotional ties** | Control | 5.68±1.31 | 4.84±2.26 | p=0.12 | -0.84±2.62 | p=0.32 |
| | Intervention | 5.53±1.64 | 5.28±0.71 | p=0.42 | -0.25±1.62 | |
| **Life satisfaction** | Control | 1.76±0.43 | 2.32±1.1 | p=0.013 | 0.56±1.04 | p <0.001 |
| | Intervention | 2.39±1.63 | 2.38±0.72 | P=0.2 | -0.1±1.7 | |
| **Well-being** | Control | 35.9±6.67 | 33.84±2.79 | p= 0.37 | -2.08±11.52 | p=0.46 |
| | Intervention | 47.03±9.6 | 44.64±6.83 | p=0.082 | -2.39±11.41 | |
| **Psychological adaptation** | Control | 88.12±21.75 | 140.26±20.83 | p=0.034 | 46.88±37.64 | p <0.001 |
| | Intervention | 126.82±15.07 | 124.53±16.96 | p=0.13 | -9.28±23.53 | |

*The mean difference is significant at the 0.05 level.

**Figure 2.** Mean scores of 6-MWT in 4-times points




and the HF etiology were among the factors that did not significantly change the psychological adaptation ($p > 0.05$) while the elderly with less EF, retired, and those who have other diseases are less affected by the exercise program in psychological adaptation point of view ($p < 0.05$).

## DISCUSSION

Overall, the attrition rate was within an acceptable range at 11.66% a strength of the current study-which is well under 5.6% and 20% in similar studies.[7,15,20] It might have resulted from the group-based exercise sessions in the current study as opposed to the individual-based interventions reported in the other studies.

The results indicate that the distance-walked mean scores between the 1st and 2nd time interval changed significantly among the intervention group's participants but not for the 3rd time interval, despite the increase in the distance walked in comparison to the previous interval; the distance-walked mean score difference was almost 2.5 times less than the 1st and the 2nd time interval. These findings are similar to Harris's (2012) study. The distance-walked mean score was 56.70 m for the intervention and 31.13 m for the control group during 1-2 months after the intervention began in Harris's study.[7] On the one hand, the difference in distance-walked mean score among the control group participants could be due to the difference in the methods applied; on the other hand, Harris's control group participants had light walking programs where heart rehabilitation programs are among the therapeutic interventions for HF patients. Meanwhile, there are few heart rehabilitation centers in Iran and the heart rehabilitation programs are not regularly recommended for the HF patients.

The increase in the distance walked after the beginning of resistance exercises was another finding which corresponds to other studies' results.[7,21,22] Anagnostakou (2011) and Mandic (2012) have accepted the role of resistance exercise and its preference to aerobic exercise in increasing physiological adaptation.[19,21,23] However, the preference of resistance exercises over aerobic exercise in increasing the physiological adaptation tolerance has not been supported in some literature.[23-26]

Aging-related changes (i.e., physiological, mental, and social) often decrease physiological capabilities of the elders with HF.[1,27] However, we expected to have lower distance-walked scores in comparison to other studies and the results were different from what we expected. It might have resulted from the intervention method-exercise done in groups, and not individually-which differs from home-based exercises reported in the mentioned research.[7,9,21-26]

The results showed that an aerobic and resistance training exercise program improved psychological adaptation. The positive effects of exercising on anxiety, depression, aggressive behaviors, mental stress, and public health have also been accepted.[26-32] Furthermore, in Chien's (2008) study, the role of aerobic and resistance exercises on HF patients' quality of life have been rejected. Chien believes that non-adherence could be the cause of less improvement in quality of life with home-based programs. Development of strategies to improve exercise adherence and to reduce barriers to home exercise in people with HF should be investigated as a possible means to increase the effectiveness of home-based exercise on quality of life.[15]

The results have shown that aerobic and resistance exercises can decrease psychological distress as they have no effect on well-being among the elderly with HF. Such findings are consistent with other literature.[6,13] Dinas (2011) concluded that aerobics is more effective than therapeutic interventions for treating depression among patients with HF.[33] In the Levie's (2008) study, after exercising and heart rehabilitation, the prevalence of depression and anxiety fell by 17% and 69%, respectively, in patients with HF.[31] Gowans (2001) and Arent (2000) have also shown that exercising has a greater impact on patient's depression symptoms and preventing mental health problems than other recreational activities. They believe that exercising has a greater effect on elderly in comparison to younger patients.[34,35]

The results have shown that aerobic and resistance exercises improve emotional control among elderly with HF. This finding is similar to Gowans' (2001). Exercising has reduced the anxiety level, led to better moods, and lowered emotional control; but has no impact on emotional ties in Gowan's study.[34] Anderson (2013) believes that interventions like exercising improve self-efficiency, overcoming the thoughts and negative emotions as well as decreasing anxiety.[32] Therefore, safe and low-cost interventions like aerobic and resistance exercises should be utilized for improving the quality of life of patients with HF, since lower emotional and behavioral controls, and social isolation and psychological problems of medical nature limit the patient in this regard.[28,37]

The results have shown that aerobic and resistance exercises program have no impact on well-being among elderly with HF. Considering that the elderly often experience challenges to emotional control above and beyond those typically experienced by younger adults, it is logical, particularly when taking into account the physiological and psychological declines that often accompany aging, to assume that exercise might be even more important for mood improvement in the elderly than it is in younger populations. Studies with longer training protocols produce the greatest improvements in mood. In addition, although the elderly respond to training in a fashion similar to the younger population, the magnitude of the response is often lower. Also, it is possible to say that mood differences do have an influence on the exercising intervention's efficiency on well-being.[35] Gowans (2001) has also found exercising to be effective on emotional control but inefficient in emotional ties.[34]

In addition to declines in physiological performance with the passage of time, as individuals progress beyond 60 years of age there also tends to be an increased prevalence of mood disturbance (i.e., increased negative affect and decreased positive affect). There are some studies regarding the positive role of exercising on the elderly's mood but some others dispute it. Such disparities might have resulted from the differences in applied research methods, exercising protocol, physiological fitness, and the elderly's mood structure. Elderly certainly experience more severe mood changes as they lose their physiological capabilities by aging in comparison to the younger people. Resistance exercises can help the older generation improve their psychological condition by improving their well-being and physiological capabilities.[35]

### Strengths

The findings can lead healthcare professionals and clinical nurses to provide evidence-based interventions for elderly patients with HF.

### Weaknesses

The shortage of the elderly with diastolic HF forced us to concentrate on patients with systolic HF. Therefore, future research comparing the efficiency of aerobic and resistance exercises on the elderly with functional class IV, and diastolic HF is recommended.

### Study Limitations

There are a few limitations that must be noted. Assessing the role of exercise on EF in the intervention group's participants was not possible as well as comparing the EF of the two groups was impractical and the intervention time was too short for further surveys.

## CONCLUSION

This study's results provide support for the safety and efficacy of group-based aerobic and resistance exercises for elderly patients. Therefore, the findings can lead healthcare professionals and clinical nurses to provide evidence-based interventions for elderly patients with HF.

## CONFLICTS OF INTEREST STATEMENT

All contributing authors declare no conflicts of interest.

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