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RESEARCH ARTICLE

# Comparison of the Effect of Aerobic and Resistance Training on Cardiovascular Risk Factors in Parkinson's Women

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**Abstract:**

***Background:***

People with low-mobility are at increased risk for cardiovascular disease. Patients with Parkinson's Disease (PD) are less interested in participating in exercise activities due to the nature of the disease. Regular exercise and physical activity can play protective roles against heart disease by reducing risk factors. This study aimed to compare the effects of aerobic and resistance training on cardiovascular risk factors in women with PD.

***Materials and Methods:***

This quasi-experimental study was carried out on 45 women with PD who were randomly assigned to one of three groups: aerobic, resistance groups, and control group. Before and after training sessions, variables of weight, Body Mass Index (BMI), heart rate at rest state, maximum oxygen consumption, blood pressure, and lipid profiles of participants were measured. Data were analyzed using SPSS software version 21 and Paired Sample t-test, ANOVA and Bonferroni post-hoc test. A significant level of $P \leq 0.05$ was considered.

***Results:***

Demographics of physiological characteristics of subjects was congruent in all three groups in the baseline. After aerobic and resistance training, levels of triglyceride, LDL, total cholesterol, fat percentage, resting heart rate, weight, BMI and systolic blood pressure were significantly decreased ($p<0.05$). This change was more pronounced in the aerobic group; in contrast, variables of maximum oxygen consumption and HDL were meaningfully increased in participants of both experimental groups ($p<0.05$).

***Conclusion:***

The results showed that both types of aerobic and resistance training can reduce the risk factors of cardiovascular disease in women with PD, while the effect of aerobic training on reducing risk factors was more than resistance training.

**Keywords:** Parkinson disease, Resistance training, Aerobic exercise, Cardiovascular diseases, Risk factors, Alzheimer's disease.

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|---|---|---|---|

## 1. INTRODUCTION

Parkinson's Disease (PD) is in the group of degenerative and progressive diseases, and with slowmovement in the Central Nervous System (CNS). In the current century, it is the second common disease of the CNS system after Alzheimer's disease, and is one of the most common causes of disability in old age [1]. PD affects men more than women, and its symptoms are usually manifested in the fifth decade of life. In the United States, this disease is caused by neurodegenerative disease, and annually 60,000 new cases are reported [2, 3]. In Iran, due to the growth of the elderly population relative to the total population, the disease is expected to increase [4].

The two-rings reducing and defective of PD including aging and inactivity may lead to increased complications of the disease and secondary problems for patients [5]. One of these complications is cardiovascular disease, which has increased in recent decades and is considered as one of the main causes of mortality in the world [6]. About forty-six percent of deaths result from chronic diseases, especially in old age [7].

With respect to numerous scientific evidences, inactivity,

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especially in the new age has become a problem that it has been included in the list of cardiovascular risk factors [8]. Previous evidences show that low-mobility life increases the risk of coronary heart disease therefore, sedentary people are twice more likely to suffer from the risk of coronary artery disease than the active people [9]. Several studies have shown that inactivity increases cardiovascular risk factors in people, disrupts the quality of life, and eventually leads to cardiovascular diseases. In a study by Mora *et al.*, the correlations between physical activity and Body Mass Index (BMI) with cardiovascular indices were measured, they concluded lower physical activity and an increase in BMI independently associated with increased Total Cholesterol (TC), Triglyceride (TG) and Low-density lipoprotein cholesterol (LDL-c) [10]. The findings of the Gidding study showed that physical inactivity can cause an increase in cardiovascular risk factors and insulin resistance [11].

In order to cope with this huge and growing problem of human societies, it seems that safer and more appropriate solutions should be discovered, in addition to medication. One of these methods is exercise treatments. Contrary to the previous literature which showed that exercise caused physical stress and negatively affected the heart, recent research findings suggest that physical activity is safe and beneficial even for people with functional impairment and patients with heart failure [12]. Additionally, regular exercise can lead to increased independence for daily activities, prevention of functional disability and dependency on specific situations. Physical activity can be used as a valuable tool in the effective treatment of heart disease symptoms, and improve the functional capacity and the life quality of patients [13, 14].

Because of the nature of the disease, it seems that patients with PD are less interested in participating in exercise activities [15]. One way to help these patients is through exercise. Systematic participation in a physical activity program can help individuals to not only maintain their motor resources but also gain the ability to perform activities in their daily life. On the other hand, regarding the growth of the elderly population in Iran and the possible increase in the number of patients with PD, this study aimed to compare the effect of aerobic and resistance training on cardiovascular risk factors in women with PD.

## 2. MATERIALS AND METHODS

### 2.1. Subjects

The present study was a semi-experimental study with pre-test-post-test design and control group. In this study, forty-five women with PD referring to the Neurology clinic of two Hospital Torbat Heydariyeh voluntarily participated. The participants were randomly assigned three groups: aerobic training, resistance training, and control group (fifteen people in each group). Before the training, all subjects stated their written consent in a satisfactory manner. All procedures performed in this study were in accordance with the ethical committee of Torbat Heydariyeh University of Medical Sciences and with the principles of the declaration of Helsinki (1964) and its later amendments or comparable ethical standards.

The criteria for entering the study were to have PD for more than a year, a sedentary lifestyle, and the use of the same drugs at the same dose according to the neurologist. The exclusion criteria included BMI≥ 43 (based on the highest BMI belonging to people capable of exercising), age>70 years, history of brain and cardiovascular diseases, as well as the history of musculoskeletal problems limiting physical activity.

### 2.2. Method of Exercising

#### *2.2.1. Implementation of Resistance Training*

The resistance group training program included a series of resistance exercises that were conducted lasted for 8 weeks, 3 sessions per week, and each session for 60 minutes (Table **1**). In the first session, the basic exercises were explained for subjects, which the principles of course were respected at all meetings. At the beginning of each session, the training sessions included warming (about 10 minutes), the continuing session was followed by performing resistance exercises (about 40 minutes), and at the end of the session, refreshment was followed by a return to the initial state (about 10 minutes).

To familiarize and train the correct implementation of resistance exercises, all subjects fulfilled several sub-maximal repetitions for each movement in the first session. In the next session, to calculate the load intensity of exercise for each subject, a single maximal repeat test was performed for every 6 movements of the exercise program, these movements included: chest press, dumbbell press, triceps pushdown, abdominal crunch, leg press, thigh front, and thigh behind. It is necessary to note that the used weight was not maximized during repetitions. And according to the ability of the subjects, by observing the selected safety points, the Brzycki equation was used for the calculation of one repetition maximum (1RM) [1, 16].

These exercises were done in a circle with 40-60% maximum repetition. Since the participants were not familiar with resistance training and had weak ability, the exercises were started from a very low level and were gradually progressed. In order to comply with the principle of overload, the movement repetition in each session was increased as compared to the previous meeting.

**Table 1. Resistance group training programs.**

| Movements | Set | Repeat | Intensity (One Repetition Maximum) | Number of Exercise Times |
|---|---|---|---|---|
| First and second weeks | 3 | 12-15 | 40-45 | 2-4 |
| Third and fourth weeks | 3 | 10-12 | 45-50 | 2-4 |
| Fifth and Sixth weeks | 3 | 8-10 | 50-55 | 2-4 |
| Seventh and eighth week | 3 | 5-8 | 55-60 | 2-4 |

#### *2.2.2. Implementation of Aerobic Exercise*

For aerobic exercises, the intensity of activity was Heart Rate Reserve (HRR) 50% and its duration was 20 minutes, with 12 minutes on the treadmill and 8 minutes on the Bike Ergometer. The activity on the Bike Ergometer was determined by Revolutions per Minute (RPM). RPM is one of the angular velocity measuring units that express the number of complete turning cycles in a single minute around a constant axis [17]. The subjects initially started with 30 to 40 RPM and each week gradually increased the intensity of their activity. Also, the activity time was added 2 minutes every week, and in the eighth week, it reached 70% HRR and 30 minutes of activity.

The subjects of the control group underwent usual drug treatments during the 8-week training program and only performed routine activities. However, experimental subjects in addition to drug therapy fulfilled 3 sessions of resistance and aerobic exercises for 60 minutes during the 8-week. It should be noted that exercises by adhering to the scientific principles of research were carried out under the supervision of the trainer. The studied physical and physiological variables included weight, BMI, Resting Heart Rate (RHR), maximum oxygen consumption, systolic and diastolic blood pressure, and risk factors of cardiovascular disease such as LDL-C, High-Density Lipoprotein Cholesterol (HDL-C), TC, and TG, their changes were measured and recorded by applying independent variables on subjects for 8 weeks.

#### *2.2.3. Measurement Tools*

The measurement tools in this study included strip meter, stadiometer model seca 208 with 1% cm accuracy, seca portable scale with a precision of 1% kg, treadmill test on treadmill device model technology made in Italy for measurements of aerobic capacity, Barometer model omron made in Vietnam was used for measuring blood pressure and heart rate monitor model H6 made in Finland was used to measure the heart rate, and the kit of Pars test Com. was used to measure blood lipids.

To determine blood lipids after 8-10 hours of fasting at 8 am (48 hours before physical activity and 48 hours after the end of exercise), blood samples of individuals were taken in an open arch for determining the level of cholesterol, LDL, HDL. The measurements of cholesterol and TG were done using the colorimetry method, and the variables of LDL and HDL were measured using colorimetry-direct method, by the Hitachi 912 device Roche Com. made in Germany.

#### *2.2.4. Statistical Analysis*

The quantitative data including age, height, weight, and *etc.* were expressed as mean and standard deviation (M±SD). The normality of data was confirmed by Kolmogorov-Smirnov test. Data analysis was performed using SPSS software version 21. The Paired Sample t-test was used to differenciate between two measurements pre-test and post-test in each of the groups. Because the comparison of three groups means that the one-way analysis of variance (ANOVA) was utilized, and the Bonferroni posthoc test was also used to detect differences between groups in the studied variables. A significant level of $p \leq 0.05$ was considered.

## 3. RESULTS

Table **2** shows the comparison of demographic variables of subjects including age, height, weight, and BMI before the study. Based on ANOVA, there was no significant difference between the mean of the demographic characteristics of subjects in all the three groups. Table **3** exhibits a comparison of physiological variables and lipid profiles, such as TG, TC, LDL-C and HDL-C between the experimental groups (aerobic and resistance training) and control group before the study. ANOVA Analysis also showed no significant difference between the mean of physiological characteristics and lipid profile of subjects in all three groups ($P>0.05$). Therefore, all three groups were congruent comparing the mean of intra-group and inter-group differences of the studied variables in the studied groups is presented in Table **4**. The results of Paired Sample t-test indicated that variables of weight ($P<0.001$), BMI ($P=0.01$), body fat percentage (BFP) ($P=0.01$), heart rate ($P=0.01$), maximum oxygen consumption ($P<0.001$), LDL ($P=0.01$), HDL ($P<0.001$), and TC ($P=0.01$) in patients with PD significantly declined in aerobic group trained for eight weeks. Also, after eight weeks of resistance training compared with the baseline, maximum oxygen consumption ($P=0.01$) and HDL ($P<0.04$) significantly diminished in Parkinson's patients. There was no significant difference between the mean of TG in PD patients in studied groups after aerobic and resistance training compared to baseline. This difference was also not significant in the control group ($P>0.05$).

The results of ANOVA test showed that there were significant differences between variables of weight ($P=0.007$), BMI ($P=0.02$), body fat percentage ($P<0.001$), heart rate ($P<0.001$) maximum oxygen consumption ($P<0.001$), HDL ($P<0.001$), and TC ($P<0.001$) among studied groups; while no significant difference was observed between LDL and TG variables among studied groups ($P>0.05$), as shown in Table **4**.

A comparison of Bonferroni post-hoc test between studied groups in Parkinson's patients is shown in Table **5**. On applying statistical analysis, results revealed that there are significant differences between the mean of heart rate, oxygen consumption, systolic and diastolic blood pressure, fat percentage, HDL, and TC in experimental groups in compared control group (all $P< 0.05$). BMI of aerobic exercise group was significantly different from the control group ($P=0.02$) and there was also a significant difference between the weight of subjects with aerobic training in comparison to resistance training and control groups ($P<0.05$).

**Table 2. Comparison of the mean and standard deviation of physical characteristics of subjects in studied groups before study.**

| Variable | Aerobic Exercise | Resistant Exercise | Control Group | F | p-value |
|---|---|---|---|---|---|
| Age (years) | 49.6±33.49 | 49.6±20.27 | 49.7±53.07 | 0.13 | 0.94 |
| Height (cm) | 161.6±97.9 | 161.4±12.51 | 160.5±25.8 | 1.08 | 0.36 |
| Weight (kg) | 85.7±80.87 | 85.7±2.89 | 85.7±60.06 | 0.04 | 0.99 |

*(Table 2) contd.....*

| Variable | Aerobic Exercise | Resistant Exercise | Control Group | F | p-value |
|---|---|---|---|---|---|
| BMI (kg/m$^2$) | 29.2±20.34 | 28.2±25.09 | 27.1±86.79 | 0.91 | 0.45 |
| Fat (%) | 31.3±52.28 | 30.2±64.76 | 31.3±71.74 | 0.41 | 0.75 |

**Table 3. Comparison of the mean and standard deviation of physiological characteristics and lipid profile of subjects in studied groups before.**

| Variable | Aerobic Exercise | Resistant Exercise | Control Group | F | P-value |
|---|---|---|---|---|---|
| Heart rate (bpm) | 77.73±8.06 | 77.73±6.74 | 79.06±9.54 | 0.36 | 0.78 |
| maximal oxygen consumption (ml/kg/min) | 19.67±6.47 | 20.48±5.92 | 18.96±5.16 | 0.84 | 0.48 |
| Triglyceride (mg/dl) | 139.6±51.3 | 142.8±41.56 | 145.18±44.6 | 0.25 | 0.86 |
| Cholesterol (mg/dl) | 275.57±28.23 | 268.57±23.6 | 276.73±33.4 | 0.36 | 0.78 |
| LDL (mg/dl) | 128.67±27.69 | 123.2±24.43 | 125.2±27.48 | 0.13 | 0.95 |
| HDL (mg/dl) | 39.2±9.1 | 38.66±5.99 | 38.73±7.25 | 0.18 | 0.91 |

**Table 4. Intra-group and inter-group differences for comparing the mean of the studied groups.**

| Variable | Group | Test State | | Intra-Group | | Between Groups | |
|---|---|---|---|---|---|---|---|
| | | Before | After | t | P-value | F | P-value |
| Weight (kg) | Aerobic | 85.8±7.88 | 83.83±8 | 4.612 | 0.001 | 5.642 | 0.007 |
| | Resistant | 85.73±7.9 | 85.49±7.7 | 0.702 | 0.49 | | |
| | Control | 85.6±7.07 | 85.83±6.5 | -0.345 | 0.74 | | |
| BMI (kg/m$^2$) | Aerobic | 29.03±2.35 | 28.35±2.29 | 4.437 | 0.01 | 4.631 | 0.02 |
| | Resistant | 28.2±2.09 | 28.18±2.08 | 0.68 | 0.51 | | |
| | Control | 27.87±1.79 | 27.94±1.61 | -0.369 | 0.72 | | |
| Fat (%) | Aerobic | 31.52±3.28 | 28.65±4.31 | 4.437 | 0.01 | 14.966 | 0.001 |
| | Resistant | 30.65±2.77 | 29.75±3.41 | 0.68 | 0.51 | | |
| | Control | 31.71±3.74 | 34.69±3.71 | -0.369 | 0.72 | | |
| Heart rate (bpm) | Aerobic | 78.73±10.63 | 71.67±10.63 | 4.437 | 0.01 | 14.916 | 0.001 |
| | Resistant | 76.73±6.74 | 74.33±8.43 | 1.102 | 0.29 | | |
| | Control | 79.06±9.54 | 86.47±8.73 | -3.382 | 0.004 | | |
| maximal oxygen consumption (ml/kg/min) | Aerobic | 19.68±3.39 | 23.68±3.41 | -7.407 | 0.001 | 35.844 | 0.001 |
| | Resistant | 20.49±3.92 | 21.64±3.94 | -2.921 | 0.01 | | |
| | Control | 18.71±5.16 | 16.34±4.96 | 3.362 | 0.05 | | |
| LDL (mg/dl) | Aerobic | 128.67±27.7 | 118.33±26.86 | 4.437 | 0.01 | 1.16 | 0.32 |
| | Resistant | 123.2±24.43 | 117.93±16.99 | 1.102 | 0.29 | | |
| | Control | 125.2±29.49 | 124.93±22.19 | -3.382 | 0.004 | | |
| HDL (mg/dl) | Aerobic | 39.2±9.1 | 42.27±9.32 | -5.193 | 0.001 | 18.935 | 0.001 |
| | Resistant | 38.67±5.99 | 42.6±7.07 | -2.227 | 0.04 | | |
| | Control | 38.73±7.26 | 33.27±5.78 | 3.034 | 0.009 | | |
| Cholesterol (mg/dl) | Aerobic | 275.57±28.23 | 250.83±37.22 | 4.143 | 0.01 | 14.252 | 0.001 |
| | Resistant | 268.57±23.61 | 260.17±29.51 | 1.102 | 0.29 | | |
| | Control | 276.73±33.4 | 301.63±30.13 | -3.205 | 0.006 | | |
| Triglyceride (mg/dl) | Aerobic | 139.6±51.31 | 135.87±41.61 | 0.823 | 0.42 | 1.037 | 0.36 |
| | Resistant | 142.8±41.56 | 138.93±23.73 | 0.421 | 0.68 | | |
| | Control | 153.2±44.6 | 155.47±48.27 | -1.081 | 0.3 | | |
| Systolic blood pressure (mmHg) | Aerobic | 137.5±98.31 | 115.12±7.1 | 5.185 | 0.000 | 18.319 | 0.001 |
| | Resistant | 144.8±9.4 | 120.1±5.2 | 2.153 | 0.001 | | |
| | Control | 123.2±10.6 | 130.2±8.62 | 3.045 | 0.001 | | |
| Diastolic blood pressure(mmHg) | Aerobic | 82.10±4.5 | 52.3±2.21 | 4.215 | 0.001 | 15.056 | 0.001 |
| | Resistant | 80.7±4.82 | 61.4±2.56 | 3.143 | 0.002 | | |
| | Control | 70.1±5.05 | 72.3±6.75 | 3.012 | 0.001 | | |

**Table 5. Comparing the Bonferroni post hoc test between studied groups in Parkinson's patients.**

| Variable | Group I | Group J | Mean Difference (I-J) | P-value |
|---|---|---|---|---|
| Weight (kg) | Aerobic | Resistant | -1.729 | 0.04 |
| | | Control | -2.188 | 0.008 |
| BMI (kg/m$^2$) | Aerobic | Control | -0.66 | 0.02 |
| Fat (%) | Aerobic | Control | -5.896 | 0.001 |
| | Resistant | Control | -4.159 | 0.002 |
| Heart rate (bpm) | Aerobic | Control | -14.572 | 0.001 |
| | Resistant | Control | -10.532 | 0.001 |
| maximal oxygen consumption (ml/kg/min) | Aerobic | Control | 6.514 | 0.001 |
| | Resistant | Control | 3.784 | 0.001 |
| HDL (mg/dl) | Aerobic | Control | 12.703 | 0.001 |
| | Resistant | Control | 9.376 | 0.001 |
| Cholesterol (mg/dl) | Aerobic | Control | -50.015 | 0.001 |
| | Resistant | Control | -35.973 | 0.002 |
| Systolic blood pressure (mmHg) | Aerobic | Control | -10.564 | 0.001 |
| | Resistant | Control | -4.526 | 0.002 |
| Diastolic blood pressure (mmHg) | Aerobic | Control | -9.376 | 0.001 |
| | Resistant | Control | -2.246 | 0.000 |

## 4. DISCUSSION

Since the main emphasis of rehabilitation programs is on exercise and physical activity, the present study was designed for evaluating and comparing the effects of aerobic and resistance training on cardiovascular risk factors in women with Parkinson's . In order to prevent any possible injury during training, all exercises were performed under the supervision of a trainer. The results of this study exhibited that 8 weeks of resistance and aerobic training reduced the levels of LDL, TG, TC, fat percentage, RHR, weight and BMI, and also increased HDL and oxygen consumption, which indicates the importance of exercise and physical activity in protecting the health and treatment of Parkinson's patients. According to the results, aerobic training had a significant effect on reducing cardiovascular risk factors compared with resistance training which is consistent with the findings of Taheri *et al.* [18]. They showed that aerobic training is effective in reducing TC levels. Also, Mogharnasi and Bagheri observed the significant effects of aerobic and resistive exercises on the reduction of blood cholesterol levels [14]. In addition, Soori *et al.* indicated that resistance and endurance training significantly reduced cholesterol and TG levels in the aerobic and resistance groups [19]. Yavari *et al.* showed the positive effects of aerobic, resistance and hybrid exercises on blood glucose control and cardiovascular risk factors, and stated that exercises are effective in reducing TG levels and body fat percentages [20]. However, the results of the studies by Nayebifar *et al.* and Hosseini [21, 22], were not consistent with the findings of this study. In their study, there was no relationship between exercise and lipid profile. The probable cause of this inconsistency was related to the severity and the type of exercises. In order to reduce the plasma TG, the duration of exercise should be long, although in some cases, lessening TG is also affected by the severity of exercise. TG reduction is likely due to an increase in lipoprotein lipase activity of muscle capillaries [23]. Furthermore, the effect of exercise on the concentration of plasma TG depends on concentration prior to the activity. Individuals with low levels of TG did not show significant changes in exercise activity, while plasma TG in subjects with high concentrations significantly reduced [24]. Moderate-intensity exercises are needed to maximize the benefits of improving blood fat levels. On the other hand, LDL levels in the study by Saadatnia *et al.* showed that aerobic and resistance training had decreasing effects on the half-lives of apolipoproteins and lipoproteins [25]. Similar results were found by Baharloo *et al*. which showed that exercise has positive effects in lowering the LDL levels [26].

In this study, a significant correlation was observed between physical activity and HDL levels, which is similar to the results of Askari *et al.* and Maggio *et al.* [27, 28]. They found that exercise can be effective in increasing HDL levels. In addition, Resaland *et al.* [29] showed a significant positive relationship between exercise and HDL levels. All of these studies have been associated with an increase in HDL levels, which is in agreement with the results of this study. However, the results of our study were inconsistent with the findings of Azizi et al., and Rahmani-Nia *et al.* [30, 31]. Azizi *et al.* investigated the relationship between physical activity level and cardiovascular risk factors in male students, and Rahmani-Nia *et al.* studied the effects of exercise on serum leptin and risk factors for coronary heart disease. Regular physical activity can be effective for the cardiovascular system, blood pressure, body fat percentage, and body fitness. Therefore , Abdi *et al.* found that aerobic exercises had effects on body composition and plasma levels of Insulin-like growth factors and their binding proteins, and likewise, BMI, lipid percentage, weight, waist-to-hip ratio after 8 weeks of aerobic training and maximum oxygen consumption in experimental group were significantly increased [32]. Furthermore, Attarzadeh Hoeini *et al.* observed that aerobic exercises can increase capacity and respiratory coordination, especially in muscles of exhalation by enriching lung's capacity and volume. Exercise can improve lung function and increase oxygen consumption [33].

Here, heart rate and blood pressure of the control group were significantly higher at the end of the study, which may be due to the possible effects of medications [34, 35]. The results of the study by Najaran and colleagues showed that levodopa may have possible effects to cause or worsen the autonomic nervous system dysfunction in some patients [34]. Also, Kazemi and Rafatpanah observed the paradoxical effects of some drugs on blood pressure in the PD [35].

Based on the results, exercise can be effective in controlling systolic and diastolic blood pressure. In a study conducted by Rahimian *et al.* A 16-session aerobic exercise program with a six-week diet was considered, in which diastolic, systolic, and mean arterial pressures were reduced to 8.5mmHg, 20mmHg, and 12mmHg, respectively. Moreover, the maximum oxygen consumption was improved to 5.7ml/kg/min [36, 37]. In the present study, systolic blood pressure was significantly decreased in both aerobic and resistance groups compared to the control group. Diastolic blood pressure was also changed in aerobic and resistance groups, but this change was not significant. In the control group, diastolic blood pressure was almost constant. Johansen demonstrated that aerobic exercises were effective in reducing and controlling the blood pressure of kidney patients [38]. The results of Smeltzer *et al.* indicated a decrease in systolic blood pressure in hypertensive patients with physical activity [39]. Nonetheless, the results of studies by Myers *et al.* and Rafati *et al.* [40, 41] did not conform with this study. They found that exercise does not have an effect on blood pressure control.

This research was conducted by a small sample size on women referred to the clinic with respect to financial and time resources, which are limitations of the study.

## CONCLUSION

The results showed that both types of aerobic and resistance training can reduce the risk factors of cardiovascular disease in women with PD. However, the effect of aerobic training on reducing risk factors was more than resistance training. Therefore, exercise can be effective as a therapeutic option in reducing the risk factors of cardiovascular disease and it is recommended along with medical treatment.

## ETHICAL APPROVAL AND CONSENT TO PARTICIPATE

This research was approved by the Ethics Committee at the Torbat Heydariyeh University of Medical Sciences (Code Number IR.THUMS.REC.1397.0021).

## HUMAN AND ANIMAL RIGHTS

No animals/humans were used for studies that are the basis of this research.

## CONSENT FOR PUBLICATION

Informed consent was obtained from all participants.

## AVAILABILITY OF DATA AND MATERIALS

The data that support the findings of this research are available from corresponding author upon request with permission from Ethics Committee of THUMS.

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## CONFLICT OF INTEREST

The authors declare no conflict of interest, financial or otherwise.

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