

## The Effect of Aerobic Exercise on Lowering the Pulse Rate of Isitirahat in Women Over 40 Years of Age Who Work Indoors

**Regina Safira Patricia\*, Prima Arundani, Dody Taruna, Asami Rietta Kumala**

Universitas Hang Tuah, Indonesia

Email: [reginasafira95@gmail.com](mailto:reginasafira95@gmail.com)\*, [tia.prima.rafi@gmail.com](mailto:tia.prima.rafi@gmail.com), [dody.taruna@hangtuah.ac.id](mailto:dody.taruna@hangtuah.ac.id),  
[asami.rietta@hangtuah.ac.id](mailto:asami.rietta@hangtuah.ac.id)

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### ABSTRACT

This study aims to determine the effect of aerobic exercise on reducing resting heart rate in women over 40 years old who work indoors. This research employed an experimental quantitative design with a one-group pre-test–post-test approach. The sample consisted of 30 women aged over 40 years who worked indoors and met the inclusion criteria. The intervention involved low-impact aerobic exercise performed for four weeks, three times per week, for 30 minutes per session. Resting heart rate was measured before and after the intervention. Data were analyzed using the paired sample t-test after fulfilling the Shapiro–Wilk normality test. The results showed that the average resting heart rate before aerobic exercise was 80.50 bpm and decreased to 73.07 bpm after the intervention. The reduction of 7.43 bpm was statistically significant ( $p = 0.000$ ), indicating cardiovascular adaptations such as increased parasympathetic activity and improved cardiac efficiency. Aerobic exercise has a significant effect on reducing resting heart rate in women over 40 years old who work indoors. Regular aerobic exercise for four weeks is effective in improving cardiac efficiency and cardiovascular fitness.

**Keywords:** Aerobic Exercise, Resting Heart Rate, Women >40 Years, Indoor Workers, Cardiovascular Fitness.

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### INTRODUCTION

Aerobic exercise is a systematic physical activity that uses large muscle groups in a rhythmic and continuous manner, requiring oxygen to produce energy (Dayananda, 2024; Hellsten & Nyberg, 2016; Kashyap, 2023). This type of exercise increases the body's oxygen demand, causing breathing and heart rate to rise steadily during the activity and remain elevated for a certain duration (e.g., brisk walking, jogging, cycling, swimming) (Palar, 2015). Physiologically, aerobic exercise improves the efficiency of the cardiovascular system by increasing stroke volume (the amount of blood pumped per heartbeat) and reducing sympathetic nervous system activation, thereby lowering the resting pulse over time (Kang, 2016). Resting pulse is an important indicator of cardiovascular health; generally, a lower resting pulse indicates greater cardiac efficiency, while a higher resting pulse may suggest increased sympathetic activity and a higher risk of cardiovascular disease (Reimers et al., 2018).

Various studies have shown that regular aerobic exercise can lower the resting pulse through cardiovascular adaptations (Koller et al., 2022; Rivera-Brown & Frontera, 2012). These include enhanced cardiac output, increased stroke volume, and elevated parasympathetic tone, all of which result in a slower resting heart rate. In addition, aerobic exercise decreases sympathetic nervous system activity and increases myocardial efficiency, meaning the heart does not need to beat as quickly to meet tissue oxygen demands. This finding aligns with previous studies reporting significant reductions in resting pulse following several weeks of

*The Effect of Aerobic Exercise on Lowering the Pulse Rate of Isitirahat in Women Over 40 Years of Age Who Work Indoors*

programmed aerobic exercise interventions. Consequently, individuals who regularly engage in aerobic exercise tend to have lower resting pulses than those who are less physically active (Reimers et al., 2018).

As people age, especially women over 40 years old, various physiological changes occur that affect cardiovascular function (Duncan et al., 2023). Women working in indoor environments often exhibit low levels of physical activity due to sedentary job tasks such as prolonged sitting, computer use, and limited movement during work hours. This pattern contributes to reduced cardiorespiratory fitness and may increase the resting pulse. Studies have shown that a sedentary lifestyle is associated with a higher risk of cardiovascular disease, reduced aerobic capacity, and increased resting heart rate. Low physical activity also accelerates the age-related decline in heart function (Hoffmann et al., 2021).

This research gap is significant because understanding the specific response of this demographic to a structured, short-term aerobic program can inform more precise and effective public health recommendations. The urgency of this study is underscored by the rising number of women in the workforce and the global increase in sedentary behavior—both of which elevate cardiovascular risk. Providing evidence-based exercise guidelines for this group is crucial for preventive health efforts. Therefore, this study aims to address the gap by investigating the extent to which a four-week aerobic exercise program can effectively lower the resting heart rate in women over 40 years old who work indoors.

The novelty of this research lies in its focused examination of a homogeneous, yet highly relevant, population: middle-aged women with sedentary indoor jobs. By implementing a standardized, low-impact aerobic exercise intervention over a controlled four-week period, this study seeks to isolate and measure specific cardiovascular adaptations within this group. This targeted approach goes beyond generalized findings to provide actionable insights for a population often overlooked in exercise physiology research. The primary objective is to quantitatively analyze the difference in resting heart rate before and after the intervention.

Age-related factors, hormonal changes, and low physical activity make female indoor workers particularly vulnerable to decreased cardiovascular fitness. Although aerobic exercise has been shown to effectively lower resting pulse, few studies have specifically examined its impact on women over 40 who work indoors. Therefore, this study is essential to determine the extent to which aerobic exercise can reduce resting pulse in women over 40 years old who work indoors, serving as a foundation for developing appropriate exercise recommendations for this demographic.

## **RESEARCH METHODOLOGY**

The design of this study is quantitative experimental with a one group pretest-posttest approach, which is a design that involves one group of subjects who are given treatment without a control group. Subjects will have their resting pulse measured before and after the treatment, without a control group.

### **Research Methods**

This study was conducted by involving 30 women over the age of 40 who work indoors. All participants were given a 4-week aerobic exercise program with a frequency of 3 times per week and a duration of about 30–45 minutes per session.

The resting pulse was measured twice, before the exercise started (pre-test) and after the training program was completed (post-test), using a pulse meter. The results of the pre-test and post-test will be compared to see a decrease in resting pulse after aerobic exercise.

### **1. Data collection**

Primary data is obtained through:

- Filling out questionnaires by respondents before the implementation of aerobic exercise, to find out the characteristics of participants.
- Resting pulse measurements were performed manually by counting pulses per minute in the morning when subjects were in a state of complete rest, either before or after an aerobic exercise intervention.

### **2. Data logging and storage**

All data obtained is recorded manually in an observation sheet, then input into the Microsoft Excel program to facilitate tabulation and processing.

### **3. Data processing and analysis**

Once the data is declared clean and valid, the data processing is carried out with the help of the SPSS (*Statistical Package for the Social Sciences*) program, using appropriate statistical tests (e.g. Wilcoxon test if the data is not normally distributed). Results were analysed to see the difference between resting pulse before and after treatment

## **Data Analysis**

### **Univariate analysis**

Univariate analysis was carried out to describe the characteristics of the research subject and each research variable. The data analyzed univariately include:

- Characteristics of respondents (age, employment status, etc.)
- Resting pulse before and after aerobic exercise

Quantitative data that scales ratios such as resting pulse will be presented in the form of mean, standard deviation, minimum and maximum values. Meanwhile, categorical data is presented in the form of frequency and percentage.

### **Bivariate analysis**

Bivariate analysis was used to look at the effect of aerobic exercise on resting pulse rate changes.

Since the data are paired (pretest and posttest on the same subject), the type of statistical test used adjusts to the data distribution:

- If the data is normally distributed, → use a *paired t-test*
- If the data is not normally distributed, → use the Wilcoxon signed-rank test.

## **RESULTS AND DISCUSSION**

### **Resting pulse measurement results before and after aerobic exercise**

This experimental research was conducted on women over 40 years old who worked in an indoor environment with a total of 30 respondents. All respondents followed a 30-minute aerobic exercise program, 3 times per week, for a period of 4 weeks.

Respondents were then grouped based on the measurement stage, namely:

*The Effect of Aerobic Exercise on Lowering the Pulse Rate of Isitirahat in Women Over 40 Years of Age Who Work Indoors*

1. Kelompok Pre-test

This group consisted of all respondents before being given aerobic exercise treatment. At this stage, the initial measurement of the resting pulse rate is carried out as an initial measurement.

2. Post-test Group

This group consisted of all the same respondents after following an aerobic exercise program over a 4-week period. Resting pulse measurements were performed again to assess changes after the intervention.

Based on the results of pre-test and post-test measurements, it is known that there is a difference in the average resting pulse rate. The measurement data was then analyzed using the Paired Sample T-Test to determine the effect of aerobic exercise on lowering resting pulse in women over 40 years of age who worked indoors.

**Table 1.** Average resting pulse before and after aerobic exercise

Measurement Stage	N	Red	Standard Deviation	Minimum	Maximum
Before aerobic exercise (Pretest)	30	80,50	5,19	68	89
After aerobic exercise (Post-test)	30	73,07	4.68	62	80

Table 1. indicates that the average resting pulse rate before aerobic exercise is 80.50 bpm with a standard deviation of 5.198 bpm. After following a four-week aerobic exercise program, the average resting pulse decreased to 73.07 bpm with 4.68 bpm.

This average decrease of 7.43 bpm indicates an improvement in physiological conditions which indicates an increase in the efficiency of the heart's work due to regular aerobic exercise.

**Paired sample test results of resting pulse t-test**

Based on the results of the Shapiro-Wilk normality test, the pre-test and post-test data had significance values of 0.23 and 0.16 respectively ( $p > 0.05$ ) which showed that the data was normally distributed. Therefore, the analysis was continued using the Paired Sample T-Test.

The results of the Paired Sample T-Test showed a value of Sig.(2-tailed) = 0.000 < 0.05, which means that there was a significant difference between resting pulse before and after aerobic exercise.

**Table 2.** Results of the paired sample t-test resting pulse test

Data	Red	t	df	Sig(2-tailed)	Remarks
Pretest -Posttest	7,43	33,29	29	0,000	Meaningifikan

A significance value (Sig.2-tailed) of 0.000 < 0.05 indicates a significant difference between resting pulse before and after aerobic exercise. An average difference of 7.433 bpm showed that regular aerobic exercise was able to lower resting pulse.

## **DISCUSSION**

### **Effect of aerobic exercise on decreased resting pulse**

A decline in resting pulse indicates an increase in cardiovascular efficiency, where the heart can pump the same volume of blood at a lower pulse frequency. Consistent aerobic exercise can also improve the balance of the autonomic nervous system by increasing parasympathetic activity and decreasing sympathetic nerve activity. This condition enhances vagal tone, resulting in a lower and more stable resting heart rate. The results of this study align with previous findings showing that physical exercise can significantly lower resting pulse by an average of 4.7%, or approximately 3.3 beats per minute. This decreasing effect was greater in individuals with a higher initial pulse and remained significant in the middle to older age group (Reimers, Knapp, & Reimers, 2018).

Other studies have also shown that ten weeks of aerobic exercise in adults and the elderly with cardiovascular disorders can reduce resting heart rates from 77.33 bpm to 72.41 bpm ( $p < 0.001$ ). The decrease is attributed to increased cardiac efficiency, enhanced parasympathetic nerve activity, and reduced sympathetic activity, which help balance the autonomic system and improve hemodynamic function.

The findings of this study demonstrate that performing aerobic exercise three times per week for four weeks produces a measurable effect on reducing resting pulse in women aged 40–58 years who work in indoor environments. The physiological adaptations observed include improved cardiac efficiency, better autonomic balance, increased tissue oxygen capacity, and enhanced overall cardiovascular fitness. Therefore, aerobic exercise is an effective form of physical activity to maintain heart health and improve physical fitness in women aged 40 years and above.

### **Differences in Resting Pulse Before and After Aerobic Exercise**

Before participating in the exercise program, the average resting pulse of the respondents was 80.50 beats per minute. After four weeks of aerobic exercise performed three times per week, the average value decreased to 73.07 beats per minute. The t-test results showed  $p < 0.05$ , indicating a statistically significant difference between pre- and post-exercise conditions. The decrease of 7.43 beats per minute suggests that measurable physiological changes occurred in the participants' cardiovascular systems within four weeks. These changes demonstrate that regular aerobic exercise improves the efficiency of cardiac function. After adapting to the exercise load, the heart can meet oxygen demands with a lower resting pulse (Reimers et al., 2018).

When viewed on a weekly basis, most respondents experienced a decrease in resting pulse from the second to the fourth week, indicating a gradual adaptation to aerobic activity. Some participants showed a faster decline in the third week, while others remained stable; these variations may depend on differences in initial fitness levels, sleep quality, and daily activity patterns. The results are consistent with findings from previous research showing that three weeks of low-impact aerobic exercise produced physiological adaptations in women aged 45–60 years in Batu Bara Regency. A reduction in physical symptoms, accompanied by better blood circulation and stable body functions, was also linked to a lower resting heart rate. Furthermore, a meta-analysis of postmenopausal women reported that regular aerobic exercise lowered the resting heart rate by an average of 3.08 beats per minute and improved autonomic balance (Huynh et al., 2024).

*The Effect of Aerobic Exercise on Lowering the Pulse Rate of Isitirahat in Women Over 40 Years of Age Who Work Indoors*

Thus, it can be concluded that there is a significant difference in resting pulse values before and after aerobic exercise. An average decrease of 7.43 beats per minute indicates increased cardiac efficiency and improved cardiovascular fitness in women aged 40–58 years who work in indoor environments.

### **Implications of the Research Results**

The results of this study show that regular aerobic exercise positively affects resting pulse reduction in women aged 40–58 years who work in indoor environments. A lower resting pulse reflects improved cardiac efficiency and physiological adaptation to regular aerobic activity (Kang et al., 2016). These findings contribute to the field of exercise physiology by confirming that moderate-intensity aerobic exercise over four weeks effectively enhances cardiovascular function in middle-aged women (Reimers et al., 2018). Moreover, the results reinforce the understanding that light to moderate physical activity plays a crucial role in maintaining fitness and heart function stability in individuals over 40 years old.

Practically, this study's findings can serve as the foundation for implementing fitness programs for women working indoors. Regular aerobic exercise with consistent duration and frequency has been proven to lower resting pulse and enhance heart health without disrupting daily work routines. Therefore, these findings are expected to encourage individuals and institutions to adopt physical activities, such as aerobic exercise programs, in workplaces or at home as preventive measures against cardiovascular diseases and to improve the quality of life of middle-aged women.

### **CONCLUSION**

As a suggestion for future research, it is recommended that subsequent studies employ a stronger experimental design, such as a randomized controlled trial with a control group, to more definitively establish causality and rule out potential confounding factors. Future investigations should also consider implementing a longer intervention period to evaluate the long-term effects and sustainability of the observed adaptations. Additionally, incorporating more direct physiological measurements—such as heart rate variability to assess autonomic nervous system function or echocardiography to evaluate structural cardiac changes—would provide a deeper understanding of the underlying mechanisms. Finally, conducting follow-up assessments after the completion of the program would be valuable for determining the duration of the training effects and for informing recommendations on maintaining cardiovascular fitness in this population.

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