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EFFECTS OF AEROBIC EXERCISE PROGRAM FOR 12 WEEKS ON CARDIOVASCULAR HEALTH IN MALE COLLEGE TEACHERS: CHANGES IN BLOOD PRESSURE, HEART RATE, AND LIPID PROFILE

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Abstract

This research aimed to investigate the Effects of the Aerobic Exercise program for 12 weeks on Cardiovascular Health in College Teachers, with a focus on changes in Blood Pressure, heart rate and Lipid Profile in Peshawar, Pakistan. The study recruited 22 volunteers by dividing into two groups, the control and intervention groups, with 11 participants each, with the age between 30 to 55 years. A paired sample t-test was applied to compare the pre and post-test interventions.

Results showed significant improvements in multiple health parameters among both groups, but the intervention group demonstrated more favourable outcomes. The aerobic exercise had a significant effect on cholesterol levels (210.82 mg/cc vs 188.64 mg/cc $p<0.001$), triglycerides (147.91 mg/cc vs 86.64 mg/cc $p<0.001$), LDL (121.45 mg/cc vs 92.91 mg/cc $p<0.001$), and HDL levels (42.55 vs 50.82 $p<0.001$) in the intervention group. In terms of blood pressure and heart rate, the intervention group showed a significant reduction in systolic (129 mmHg vs 108.64 mmHg $p<0.001$), diastolic (82.18 vs 74.09 $p<0.001$), and heart rate (89.73 vs 74.55 bpm $p<0.001$) while the control group

increased. The control and intervention groups showed significant differences in all variables ($p<0.001$) when compared using independent-sample t-tests. These data demonstrated that the 12-week Aerobic Exercise Programme improves cardiovascular health in male college teachers.

Keywords: Aerobic Exercise, Blood Pressure, Heart Rate, Lipid Profile, College Teachers

1. Introduction

Cardiovascular diseases (CVDs) represent a global health challenge of unprecedented magnitude, contributing significantly to morbidity and mortality rates worldwide (Amini, Zayeri & Salehi, 2021). Hypertension, raised pulse, and dyslipidemia are significant gambling factors (Cornelissen & Smart, 2013).

The benefits of aerobic exercise for both normotensive and hypertensive individuals have been established. According to the findings of Cornelissen and Smart (2013), engaging in aerobic exercise has been shown to result in a decrease in systolic as well as diastolic blood pressure (DBP) among those with normal blood pressure, with average reductions of 3.5mmHg and 2.5mmHg, respectively. Furthermore, it is observed that high blood pressure decreased significantly in patients with hypertension. Farahani et al. (2019) evaluated the impact of two months of severe physical activity on Iranian male academics in which the intervention group had considerably lower SBP and DBP than the control group. In a similar vein, Ahmed et al. (2018) found that male Saudi Arabian faculty members who followed a 12-week aerobic exercise program had a significantly decreased SBP and DBP.

Research studies have demonstrated that engaging in aerobic exercise yields beneficial outcomes on blood pressure levels for individuals of both genders. According to recent research conducted by Hong, Cho, and Lee (2022), it has been observed that engaging in both moderate-intensity and high-intensity interval exercises can result in a decrease in blood pressure levels. Barros et al. (2021) observed that high-intensity interval exercise (HIIE) yielded more efficacy in lowering systolic blood pressure in men with prehypertension when compared to moderate-intensity continuous exercise (MICE). Another study by Daimo et al. (2020) revealed that aerobic exercise training exhibited a noteworthy decrease in blood pressure levels among individuals diagnosed with hypertension. Furthermore, Il-Kon and So-Hyung (2019) found that aerobic exercise had an impact on blood pressure among men living with HIV (MLHIV) and was observed to be diminished when compared to individuals without HIV infection. In general, research shows that the blood pressure of male individuals is reduced by participating in regular aerobic exercises. However, it is important to remember that the specific effects of such exercises can depend on several circumstances, including the intensity of the activity and the presence of underlying health issues.

Research conducted by Cornelissen and Smart (2013) has demonstrated that engaging in aerobic exercise can elicit beneficial impacts on heart rate. Cardiovascular disease patients may experience a reduction of heart rate of approximately 5 beats per minute (bpm) following aerobic exercise. Research studies have shown that doing aerobic exercise can have positive effects on heart rate variability (HRV) and resting heart rate. According to a recent study by Li, Lyu, and Zhang (2022), implementing a 16-week aerobic exercise intervention resulted in notable enhancements in heart rate variability (HRV). Specifically, for the fast heartbeat part, the variability of the time between heartbeats increased, while the proportion of slow heartbeat to fast heartbeat power decreased. Kang, Kim, and Ko (2016) conducted a study which revealed that engaging in aerobic exercise has led to a notable reduction in resting heart rate and sympathetic activity, particularly during daylight periods. Importantly, the researchers observed that blood pressure remained unaffected by this exercise intervention. Furthermore, Perez-Quilis et al. (2017) conducted a study that showed that aerobic exercise can help improve resting heart rate and stiffness of the arteries in individuals diagnosed with metabolic syndrome. However, there are different opinions on how aerobic exercise affects heart rate and blood pressure control (Shiotani et al., 2009).

Lipid profiles, which are important indicators of cardiovascular health, have shown promising effects from aerobic exercise. According to Cornelissen and Smart (2013), doing aerobic exercises can increase HDL and lower LDL. Research studies have demonstrated that engaging in aerobic exercise can yield beneficial outcomes on blood lipid profiles. Many studies have shown that doing aerobic exercise can lower total cholesterol, triglycerides, and LDL levels while increasing HDL levels (Yun et al., 2023; Yamada et al., 2022; Amalia et al., 2022). These improvements were observed in various populations, including older adults (Doewes et al., 2023), transgender men (Mousavi, Heidarianpour & Tavassoli, 2022), and government employees. Moreover, it has been observed that aerobic exercise can effectively reduce insulin resistance and enhance lipid profiles in those who do not smoke as well as those who do smoke. It is imperative to acknowledge that the impact of aerobic exercise on blood lipid profiles may exhibit variability contingent upon parameters like age, health status, and gender.

Male college teachers in Peshawar between the ages of 30 and 55 who participate in regular aerobic exercise benefit from numerous cardiovascular health benefits. The findings show that a 12-week vigorous activity program can prompt huge upgrades in circulatory strain, heart rate, and lipid profile. By taking part in aerobic exercise workouts, male college teachers can diminish their gamble of cardiovascular sickness and further develop their general prosperity. This population's cardiovascular health and quality of life may benefit from encouraging and implementing regular aerobic exercise programs.

2. Methodology

2.1 Participants

This study recruited 22 male college teachers aged 30 to 55 years from Govt. Degree Colleges, in Peshawar, Pakistan, using a convenient sampling method.

2.2 Inclusion Criteria

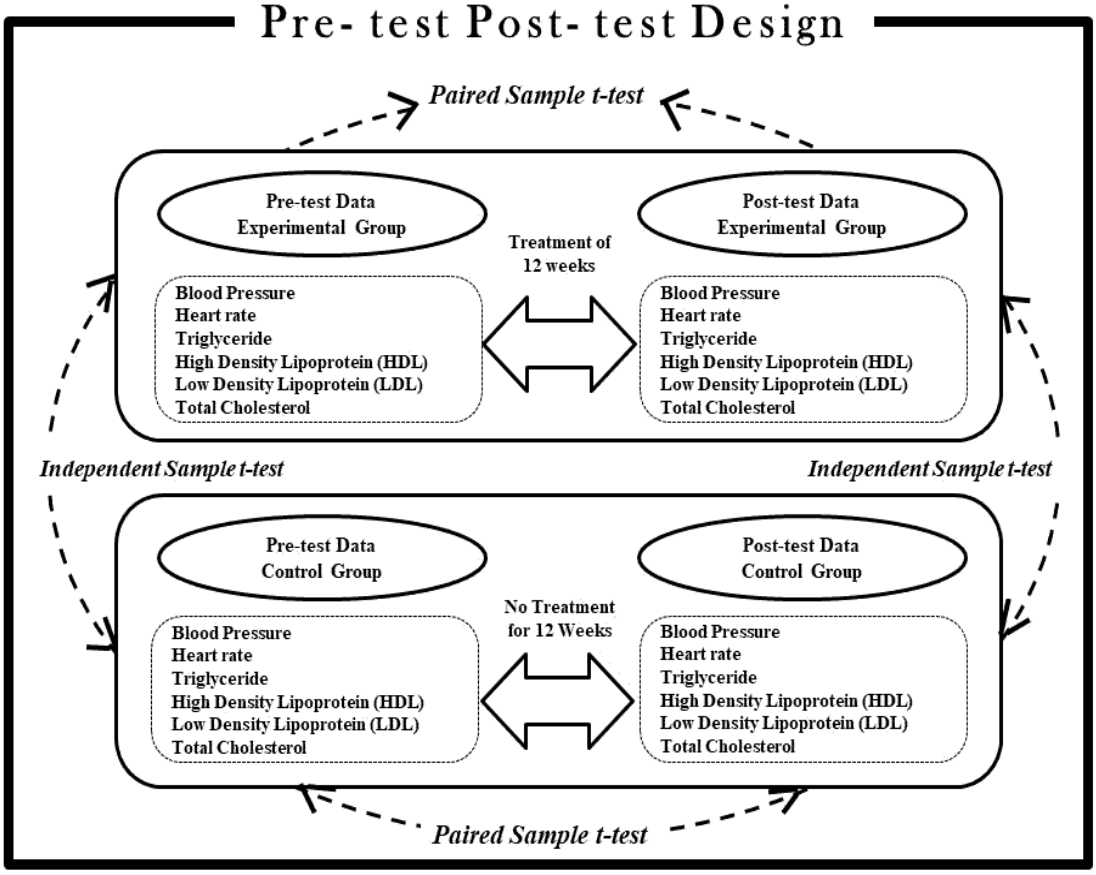
Male college teachers between the ages of 30 and 55 years, with no history of cardiovascular disease (CVD) or other chronic illnesses and a sedentary lifestyle. The inclusion criteria for the study required participants to demonstrate a voluntary commitment to engage in a 12-week aerobic exercise regimen.

2.3 Exclusion Criteria

Participants having any chronic illness or CVD, any medical condition that could potentially interfere with the study (e.g., diabetes, thyroid disorders), a history of musculoskeletal injury that may prevent participation in exercise, or regular engagement in moderate or vigorous exercise (>150 minutes per week) were excluded from the study.

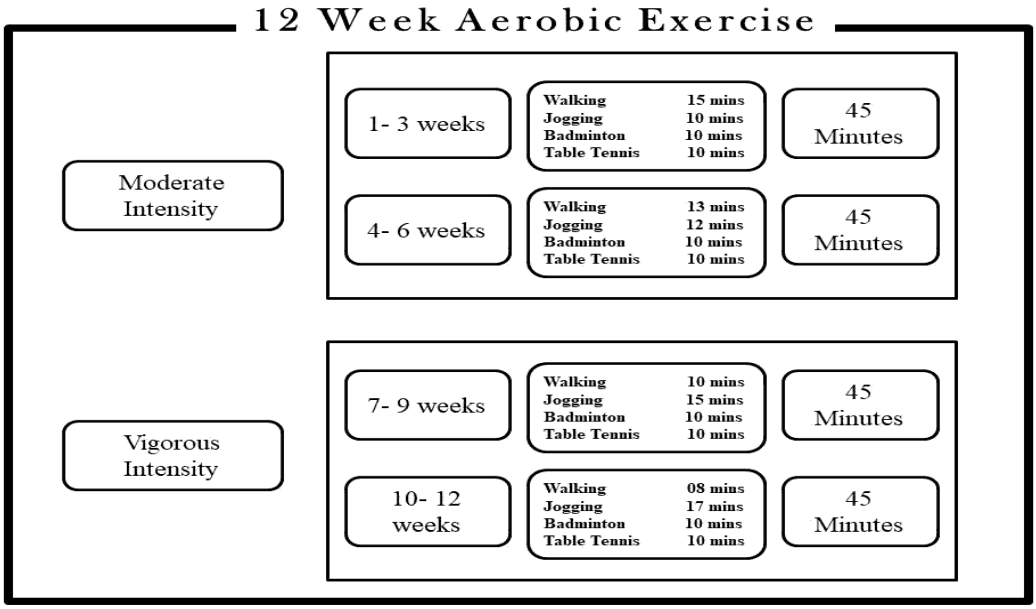
2.4 Study Design

This study used a control and intervention group having 11 participants in each group. At the start of the study, the researchers took measurements of the participants' lipid profile levels, heart rate, and blood pressure. Each group had 11 participants. Those in the control group did not use the intervention program.



2.5 Interventional Group

The 12-week aerobic exercise program for the intervention group participants included five sessions per week for a total of 45 minutes. The exercise program included walking, jogging, and playing badminton and table tennis games, with intensity gradually increasing from moderate to vigorous over the 12 weeks.



2.6 Pre-Test of all Participants

At the start of the study, an experienced laboratory technician drew 5 ml of blood from all participants on an empty stomach in the morning. We used the Hitachi 719 machine to measure the amounts of triglycerides, high-density lipoprotein, low-density lipoprotein, and total cholesterol in the body. The OEM automatic blood pressure monitor with model number YQ-XEY3 was used to measure blood pressure and heart rate.

2.7 Post-Test of All Participants

After the successful completion of the 12-week intervention period, we measured the control and intervention groups again. The measurements of height and weight were obtained in the metric system, with kilograms used for weight and meters used for height. These measurements were taken using a stadiometer to measure height and a digital weight machine to assess weight. The BMI was calculated using the traditional formula.

3. Data Analysis

For the analysis of data SPSS version 25 software was used. The difference between the control and intervention groups was evaluated by the independent sample t-test. While the differences between the pre-test and post-test were carried out by applying the paired sample t-test.

4. Results

The participants' descriptive statistics are presented in Table 1:

Groups	N	Minimum Age	Maximum Age	Mean Age	Standard Deviation
Control Group	11	30	54	42	1.414
Intervention Group	11	32	55	43.51	.707

Table 2 presents the anthropometric data of both the control and intervention groups:

Parameters	Control Group (Mean ± SD)	Intervention Group (Mean ± SD)	P Value
Age	42 ± 1.41	43.51 ± 0.70	0.143
Height (Inches)	62.84 ± 1.70	63.88 ± 2.34	0.121
Weight (Kg)	72.21 ± 4.92	74.82 ± 5.47	0.509
BMI (kg/m2)	28.56 ± 2.32	29.54 ± 2.36	0.508

Table 2 shows the anthropometric measurements for both groups.

Table 3: Paired Samples T-Tests for the control and intervention groups:

Variables	Control Group (Mean ± SD)			Intervention Group (Mean ± SD)		
	Pre-Test	Post-Test	P Value	Pre-Test	Post-Test	P Value
Cholesterol (mg/cc)	210.82±12.78	214.82±11.09	<0.006	247.55±3.61	188.64±2.11	<0.001
Triglycerides (mg/cc)	147.91±5.19	151.82±4.66	<0.001	118.82±4.44	86.64±3.04	<0.001
HDL	44.18± 2.31	42.55± 2.50	<0.003	42.27±2.68	50.82± 2.40	<0.001
LDL	113.36±4.08	121.45±6.75	<0.001	120±3.31	92.91±2.66	<0.001
Systolic BP (mmHg)	127±1.94	129±2.06	<0.017	128.27±1.79	108.64±1.80	<0.001
Diastolic BP (mmHg)	79.73±1.67	82.18±1.53	<0.001	78.18±1.83	74.09±2.21	<0.001
Heart Rate	84.27±2.53	89.73±2.10	<0.001	88.18±3.06	74.55±2.87	<0.001

Table 3 shows that both the control and intervention groups improved various health indices. The intervention group's mean cholesterol and triglycerides levels significantly decreased from 247.55 mg/cc to 188.64 mg/cc ($p < 0.001$) and from 118.82 mg/cc to 86.64 mg/cc ($p < 0.001$) respectively. The control group experienced a significant increase in cholesterol levels, from 21.82 mg/cc to

214.82 mg/cc ($p < 0.006$) along with a significant increase in triglyceride levels, from 147.91 mg/cc to 151.82 mg/cc ($p < 0.001$).

This study found that intervention group HDL values significantly increased from 42.27 mg/cc to 50.82 mg/cc ($p<0.001$). while the control group's HDL levels decreased from 44.18 to 42.55 mg/cc ($p=0.003$). The intervention group showed a significant decrease in low-density lipoprotein (LDL) values, from 120 mg/cc to 92.91 mg/cc ($p<0.001$). In comparison, a significant increase was seen in LDL levels, from 113.36 mg/cc to 121.45 mg/cc ($p<0.001$) in the control group.

Additionally, the systolic blood pressure of the control group was significantly increased from 127 to 129 mmHg ($p<0.0017$), while a significant reduction was seen in the intervention group, from 128.27 to 108.64 mmHg ($p<0.0001$). A substantial decrease was seen in diastolic blood pressure (from 78.18 to 74.09 mmHg, $p < 0.001$) in the intervention group, while the control group showed an increase (from 79.73 to 82.18 mmHg, $p < 0.001$).

In summary, the intervention group demonstrated a significant decrease in their heart rate, from 88.18 beats per minute (bpm) to 74.55 bpm, while the control group showed an increase from 84.27 bpm to 89.73 bpm, $p<0.001$. The findings illustrate the effectiveness of the intervention in enhancing several health indicators among the participants in the intervention group.

Table 4: Independent Samples T-Test for Control and Intervention Group:

Parameters	CG (Mean ±SD)	IG (Mean ±SD)	P Value
Cholesterol (mg/cc)	214.84 ± 11.09	188.64 ± 2.11	<0.001
Triglycerides (mg/cc)	151.82 ± 4.66	86.64 ± 3.04	<0.001
HDL	42.55 ± 2.50	50.82 ± 2.40	<0.001
LDL	121.45 ± 6.75	92.91 ± 2.66	<0.001
Systolic BP (mmHg)	129 ± 2.06	108.64 ± 1.80	<0.001
Diastolic BP (mmHg)	82.18 ± 1.53	74.09 ± 2.21	<0.001
Heart Rate	89.73 ± 2.10	74.55 ± 2.87	<0.001

Table 4 shows an independent sample t-test which compares the control group and intervention group in various variables. The intervention group had a significant decrease of 188.64 mg/cc ($p < 0.001$) in cholesterol levels, whereas the control group had 214.84 mg/cc. The mean value of the triglycerides was 86.64 mg/cc in the intervention group compared to the control group's 151.82 mg/cc ($p < 0.001$).

The intervention group showed a higher level of HDL of 50.82 mg/cc, while the control group showed a lower level of HDL of 42.55 mg/cc ($p<0.001$).

A significant increase was seen in the mean LDL levels of 121.45 mg/cc in the control group. Whereas a significant decrease was seen in mean LDL levels to 92.91 mg/cc ($p < 0.001$) in the intervention group.

A significant difference was seen in systolic blood pressure of 108.64 mmHg in the intervention group and 129 mmHg in the control group ($p < 0.001$).

This study found that the intervention group had a mean diastolic pressure of 74.09 mmHg, compared to the 82.18 mmHg ($p < 0.001$) in the control group. Ultimately, a notable divergence in heart rate was observed when comparing the two respective cohorts. In particular, the average heart rate recorded for the experimental group was 74. 55 bpm, which demonstrated a statistically significant decrease relative to the control group's mean of 89. 73 bpm ($P<0001$).

5. Discussion

This study examined how an aerobic exercise program for 12 weeks affected blood pressure, heart rate and lipid profile factors like Cholesterol, Triglycerides, HDL and LDL. The study specifically focused on male college teachers between the ages of 30 and 55 who were employed at Govt Degree Colleges, in Peshawar. Two cohorts were established, specifically an intervention cohort and a control cohort, comprising 11 participants each, resulting in a combined total of 22 participants.

During both the pre-and post-intervention phases, the participants' cardiovascular parameters, including blood pressure, heart rate, and lipid profile, were assessed to determine their effectiveness. Cardiovascular disease (CVD) is a major global health concern, with hypertension, elevated heart rate, and dyslipidemia being significant risk factors. The purpose of the study was to explore the effects of aerobic exercise for 12 weeks in the intervention group on blood pressure, heart rate, and lipid profiles among male college teachers aged 30 to 55 years. The findings of the study revealed that the intervention group improved in various cardiovascular indicators more than the control group. The results enforce that aerobic exercise can help improve heart health.

5.1 Improvements in Lipid Profiles:

The significant improvement in lipid profiles seen in the intervention group was one of the study's key findings. The levels of cholesterol, triglycerides, and LDL cholesterol significantly decreased, whereas high-density lipoprotein (HDL) levels were increased. These modifications are in line with current research, which emphasizes the beneficial effects of aerobic exercise on blood lipid profiles. Studies by Yamada et al. (2022) and Yun et al. (2023) have repeatedly shown that it lowers levels of LDL, triglycerides, and total cholesterol while simultaneously raising levels of HDL. These findings align with prior research, as shown by Zafiropoulos et al. (2019), who also observed a reduction in total cholesterol levels, and by Amini et al. (2021), who documented a decrease in triglycerides. In addition, these studies found that having more HDL in the body helps with breaking down fats and is good for the heart because it lowers the chances of having heart disease (Mousavi et al., 2022). Of particular significance is the reduction in LDL levels within the intervention group, as lowering LDL cholesterol stands as a central objective in preventing cardiovascular disease, as emphasized by Doewes et al. (2022). The improvements in lipid profiles observed in this study imply a decreased risk of CVD among male college teachers who participate in regular aerobic exercise.

5.2 The Reduction of Blood Pressure and Heart Rate

According to the results of the study, a significant decrease in systolic and diastolic blood pressure and heart rate was seen in the intervention group. This study confirms aerobic exercise' widely known benefits for blood pressure and heart rate regulation. This is important because even small reductions in systolic blood pressure can greatly lower the risk of cardiovascular problems (Hong et al., 2022). The intervention group revealed a significant decrease in systolic blood pressure. The observed reduction in systolic and diastolic blood pressure in the intervention group represents a clinically meaningful improvement and underscores the potential benefits of aerobic exercise in managing hypertension (Daimo et al., 2020). Moreover, Their findings indicated that a 12-week aerobic exercise regimen yielded noteworthy decreases in both blood pressure and heart rate. These findings show that doing aerobic exercise can be a good way to control high blood pressure and lower the risk of heart problems.

5.3 Heart Rate:

The study also examined heart rate variability (HRV) and resting heart rate as markers of cardiovascular health. The research showed that there were improvements in the way the heart's rate varied, as seen by an increase in certain measures called high-frequency and standard deviation of NN intervals. These changes suggest enhanced cardiac autonomic function, which is associated with improved cardiovascular health.

The observed reduction in heart rate in the intervention group is indicative of improved cardiovascular fitness, increased stroke volume, and enhanced cardiac efficiency (Perez-Quilis et al., 2017). In a study by Kang, Kim, and Ko (2016), they found that doing aerobic exercise resulted in both lowering the heart rate and activity of the sympathetic system. This underscores the beneficial impact of exercise on the control of heart rate. Nevertheless, it is crucial to recognize the presence of divergent findings about the modulation of heart rate and management of blood pressure, as

highlighted by Shiotani et al. (2009). This implies that additional investigation is required to completely grasp these effects and the mechanisms that drive them.

5.4 Conclusion and Implications:

This study provides compelling evidence that a 12-week aerobic exercise program leads to significant improvements in multiple cardiovascular parameters, including lipid profiles, blood pressure, and heart rate, among male college teachers. The data indicates that engaging in regular aerobic exercise serves as a viable approach to mitigate cardiovascular risk and improve cardiovascular well-being within this particular demographic.

Regular aerobic exercise consistently mitigates these risk factors. Physical exercise is essential for preventing and managing heart problems. It helps with things like cholesterol levels, blood pressure, and heart rate. Some studies have found that exercise can make a big difference in these areas (Stadler et al., 2021; Ward et al., 2019).

The implications of this research extend beyond male college teachers to a broader context. Cardiovascular disease remains a global health challenge affecting individuals from diverse backgrounds and professions. The study's findings highlight the significance of advocating for regular aerobic exercise as a fundamental component of a comprehensive strategy aimed at preventing and controlling cardiovascular disease. Promoting daily physical activity and exercise is crucial to enhancing cardiovascular health and reducing cardiovascular disease. The World Health Organization recommends regular exercise to maintain health and reduce the risk of chronic diseases (World Health Organization, 2004).

The results of this study support the recommendations made by reputable institutions like the American Society for Preventive Cardiology (Franklin et al., 2022) and the World Health Organization (2020). These organisations emphasize that physical activity has a significant effect on cardiovascular well-being. However, it is imperative to acknowledge that the individual's reactions to physical activity might differ depending on various circumstances, including age, health status, and gender. Therefore, personalized exercise prescriptions and ongoing monitoring may be necessary to optimize the cardiovascular benefits of aerobic exercise for each individual.

5.5 Future Research Directions

Future research in this area should delve into several critical aspects:

- **Long-term Effects:** Investigate the enduring impact of aerobic exercise on cardiovascular health. Long-term follow-up studies could shed light on whether the observed benefits are sustained over an extended period.
- **Mechanisms:** Explore the mechanisms underlying the observed improvements in cardiovascular parameters. Understanding the physiological processes responsible for these changes could provide insights into potential therapeutic targets.
- **Real-World Application:** Conduct studies that mimic real-world scenarios to assess exercise adherence and its impact on cardiovascular health. These studies can help bridge the gap between controlled research settings and practical recommendations for individuals.
- **Population Diversity:** Include larger and more diverse populations to generalize findings across different demographic groups. This will ensure that exercise recommendations are inclusive and effective for a wide range of individuals.
- **Gender Consideration:** Given that responses to exercise can vary by gender, future research should explore the gender-specific effects of aerobic exercise on cardiovascular health.

In summary, the findings given in this study provide support for the proposition that aerobic exercise can be a potent strategy in combating cardiovascular disease. These findings offer hope for improved cardiovascular health and a higher quality of life for individuals worldwide. As the field of exercise physiology progresses and our comprehension of its effects on cardiovascular health

deepens, we approach a forthcoming era in which preventative interventions assume a pivotal position in mitigating the worldwide prevalence of cardiovascular disease.

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