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RESEARCH ARTICLE

Effects of a Six-Week Aerobic Exercise Training Program on Lipid Profiles in Sedentary Women

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Abstract
This study investigated how a six-week training program involving aerobic exercise affected the lipid profile of women who were sedentary. Using the pre-test post-test model, 36 sedentary female volunteers aged 18-29 years participated in the study. After the participants had fasted overnight, healthcare professionals took blood samples from them both before and after the training program in a clinical setting. Measurements were taken of triglyceride, high-density lipoprotein (HDL), low-density lipoprotein (LDL), and total cholesterol. The data obtained was subjected to a paired-samples test using the SPSS 22.0 statistical program to compare the values before and after training. Effect sizes (Cohen's d) were used to clarify the levels of comparison. Statistically significant differences were seen in blood lipid levels (triglycerides, HDL, LDL, and total cholesterol) between pre- and post-training assessments ($p < 0.05$). This study found that a six-week aerobic exercise program significantly increased HDL cholesterol levels by 15.8% (from 46.66 mg/dL to 54.05 mg/dL, $p = 0.000$) and decreased LDL cholesterol levels by 15.7% (from 96.72 mg/dL to 81.52 mg/dL, $p = 0.000$) in sedentary women. The study adds to the growing body of evidence suggesting that aerobic exercise programs, such as spinning, can significantly improve lipid profiles in sedentary women, potentially reducing their risk of cardiovascular disease. Future research should incorporate control groups to strengthen these findings.

Keywords
Aerobic, Exercise, Lipid Metabolism

INTRODUCTION

Although the fact that technology is now available to almost everyone in their daily lives makes it possible to accomplish many tasks more easily, it has also led to reduced amounts of physical activity. Many health problems occur due to lack of exercise, especially as we age. These include obesity and cardiovascular disease, which develop due to excessive fat and weight gain. Exercise is the most effective factor in reducing these diseases (Goodyear et al., 2021).

Regular exercise can benefit the heart by positively affecting lipid and lipoprotein levels. It is known that exercise reduces total cholesterol, serum triglyceride and low-density lipoprotein (LDL) cholesterol and at the same time increases high-density lipoprotein (HDL) cholesterol. In particular, aerobic exercise not only changes lipoprotein concentrations quantitatively, but also causes positive changes in lipoprotein subgroups (Öğe, 2019; Assunçãovd, 2017). The value of regular physical exercise for aging healthily and its preventive effects on chronic diseases are indisputable (Costa, 2018).

Studies show that moderate-intensity regular exercise and long-term exercise positively affect lipid metabolism. Exercise increases HDL levels while decreasing blood levels of total cholesterol, LDL and triglycerides. In addition to these changes in blood lipid levels, it is well known that high blood pressure and diseases associated with obesity

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also decrease with exercise (Lemura & Amdreacci, 2000; Fox, Smith, & Jones, 1999; Karagöz, 2016). Due to its contributions towards health, exercise is a fundamental factor in improving individuals' quality of life. In recent years, a great deal of attention has been focused on the positive impact on metabolic health of aerobic exercise. Having a sedentary lifestyle, taking insufficient exercise and a lack of physical activity can cause a number of health problems, including lipid metabolism (Dunstan et al., 2012; Mozaffarian et al., 2011; Barranco et al., 2019).

Lipid metabolism is an important biochemical mechanism that includes the processes of synthesis, transportation and storage of fats in the body. The levels of LDL and HDL play a critical role when assessing cardiovascular disease risk (Mohr et al., 2014; Rossi et al., 2016). In this context, understanding how aerobic exercise affects the lipid profile is important for protecting and improving cardiovascular health.

Spinning is an aerobic exercise accompanied by music that can be performed for fun as well as weight loss purposes and that intense stimulates various muscle groups (Caria et al., 2007; Tortop et al., 2010; Uzun, 2016). It is a form of high-intensity cardiovascular activity and is widely used for conditioning. Spinning classes involve taking part in dynamic exercise routine on special bikes and is performed in groups. It is thus positive effects on lipid metabolism are well established (Huang et al., 2022).

This research investigated how a six-week aerobic exercise program (spinning) applied to sedentary women affected lipid metabolism. It was thought that this study would shed light on these specific effects.

MATERIALS AND METHODS

This case study followed ethical standards and permission to carry out the study was received from the Istanbul Aydın University [09/2023]. The participants provided their informed consent through a "volunteer form" which explained the details of the research, its risks and benefits, the confidentiality of the participants and their rights. The research followed the principles laid down in the Declaration of Helsinki. Priority was placed on the well-being and rights of the participants when designing the study, and the necessary procedures were put in place to ensure confidentiality.

Participants

The study included 36 sedentary women (mean $_{age}$= 24.58±3.53; mean $_{height}$=166.08±3.21; mean $_{weight}$= 64.77±3.04; mean $_{bmi}$= 24.31±2.51) who had no health problems and who regularly attended a private sports center in Çorum province. A bioelectrical impedance analyzer (TANITA TC-418, USA) was employed to measure the participants' weight and percentage of fat. No specific nutritional program was followed by the participants for the study's duration. To ensure standardized metabolic conditions, participants were instructed to adhere to a 12-hour overnight fast prior to the spinning exercise session and subsequent blood lipid profile measurements.

Procedure

Before the research, the participants were asked if they had any health problems. Those with a history of cardiovascular disease, those with chronic diseases and those using continuous medication were not included. Furthermore, those participants who stated that they had done regular aerobic exercise in the last year were excluded. After these individuals had been removed from the study, the pretest data of 50 female participants were initially collected. However, 14 of these were excluded from the study because they did not complete the entire exercise program. Finally, the pre- and post-test measurements of 36 female participants were used for the statistical evaluation of the research.

Data Collection Tools

The participants engaged in 40 minutes of spinning exercises three times each week for a total of six weeks. Before and after these exercises they attended a pre-determined health facility in the morning after an overnight fast for blood measurements, which were taken on by qualified professionals in a clinical setting.

Blood Lipids Measurement

Blood samples were stored in the cold chain until a complete blood count was performed. LDL, HDL, total cholesterol and triglyceride values were obtained by measuring complete blood counts with a Beckman Coulter NGOS device (Turgut and Soylu, 2021).

Exercise Program

During the spinning exercises, high-tempo music was played and spinning movements were performed by an experienced trainer according to the speed of the music (Duda at al., 2014). The following training protocol was applied:

Table 1. Exercise Protocol

Exercise	Duration
Warm-up	10 min.
Spinning Bike Exercise	40 min. (40-70% of max HR) (Yoon et al., 2017).
Cool-down	10 min.
Stretching	5 min.

Statistical Analysis

In analyzing the data, descriptive statistics (mean and standard deviation) and the paired samples t test were employed using the SPSS 22.0 package program. In order to uncover the differences between the pre- and post-test values, the dependent groups t test (paired sample t test), which is one of the parametric tests, was employed. Effect sizes (Cohen's d) were used to compare pre- and post-test findings: (<0.20 = insignificant; 0.20–0.59 = small; 0.6–1.19 = moderate; 1.2–1.99 = large; ≥2.0 = very large) (Hopkins et al., 2009; Turgut & Soylu 2021). The margin of error was determined as 0.05.

RESULTS

Table 2. Participants' Physical Characteristics

	N	x̄±SD
Age (years)	36	24.58±3.53
Height (cm)	36	166.08±3.21
Weight (kg)	36	64.77±3.04
BMI (kg/m²)	36	24.31±2.51

Table 3. Differences Between the Average Weight, Fat Percentage and Blood Parameter Values of the Participants Before and After Spinning Exercises

Measurement	N	Pre-test (mean)	Post-test (mean)	t	P	Cohen *d*	Effect
Weight (kg)	36	67.83±3.74	61.72±4.50	8.20	0.000**	1.47	Large
Fat Percentage	36	31.66±1.89	24.77±3.74	9.52	0.000**	2.32	Very Large
Triglyceride (mg/dl)	36	105.11±6.06	83.00±6.62	10.83	0.000**	3.48	Very Large
HDL (mg/dl)	36	46.66±3.93	54.05±2.61	-9.31	0.000**	2.21	Very Large
LDL (mg/dl)	36	96.72±2.66	81.52±3.39	31.08	0.000**	4.98	Very Large
Total Cholesterol (mg/dl)	36	163.86±6.76	138.08±3.04	20.13	0.000**	4.91	Very Large

DISCUSSION

This research investigated how a six-week spinning exercise program for sedentary women affected fat metabolism. The results showed that the program had a positive effect on the women's blood lipid levels (triglycerides, cholesterol, HDL and LDL). These findings demonstrate that there are clear, positive changes in lipid profile from aerobic exercise and match those of other research (Thompson et al., 2002; Kelley et al., 2005).

Huang et al. (2022) stated that it would be possible to use a 10-week HIIT spinning bike exercise program as a complementary treatment to alleviate chronic diseases, suggesting it be employed to improve the health of women within the framework of an educational health plan (Biçer and Kaldırımcı, 2010) applied aerobic and aerobic + weight exercises for one hour, three days a week for three months to 30 sedentary women whose average age was 41.8 years. They stated that HDL cholesterol increased significantly due to this program. Two studies found a notable decrease in

body fat percentage and weight in university students who participated in regular folk dance practice over a period of 12 weeks (Ünveren, 2006; Turğut et al., 2019). Furthermore, HDL cholesterol was also seen to increase in the current study.

Chavarrias et al. (2019) systematically reviewed previous studies on the benefits of spinning exercises. They observed that these exercises made positive contributions to the lipid profile in women. This review supports the findings obtained in this study. Kyrolainen et al. (2018) reached a similar conclusion in their study, observing a significant increase in the lipid profile HDL parameter levels in women who had undertaken spinning exercises. This shows that aerobic exercise can improve cardiovascular health by increasing HDL cholesterol levels. In addition, the adjusted effects on LDL cholesterol levels are also noteworthy. LDL cholesterol is a key marker linked to the possibility of cardiovascular disease (Smith et al., 2011). Sixteen weeks of aerobic exercise improved blood lipids, while there was also a positive change in and the antioxidant function in this study, which corresponded with prior results showing a decrease in blood lipids and positive effects on the ROS and MDA as a result of regular aerobic exercise (Devries et al., 2008). A review of the literature found that engaging in aerobic exercises regularly over a period of 16 weeks had positive effects in terms of physical condition, blood variables and body composition; these effects were noticeably larger in the group practicing spinning exercises than in the general cycling group. This echoes results that found that more energy is consumed by spinning than by cycling at the same intensity (THR, 40%-65%) (Dandanell et al., 2017). The results obtained in the current study lead to the conclusion that aerobic exercise is effective in reducing LDL cholesterol levels. This highlights how aerobic exercise can play a role as one aspect of a strategy to limit the risk of developing cardiovascular disease.

In another study conducted on women aged 35-40, it was observed that a spinning exercise program was also effective in reducing disorders related to metabolic diseases by reducing the serum asprosin level in overweight women (Nakhaei et al., 2022). These findings, demonstrating the positive effects of spinning, are in accordance with those of the current study.

Conclusion

Given the results of this study and other research with similar training protocols investigating the effects of aerobic exercise on females of different age groups, it can be said that such exercise is a significant factor in terms of preventing cardiovascular disease. This research found that a six-week aerobic exercise program (spinning) performed by sedentary women had positive effects on lipid metabolism. In accordance with these findings, it can be recommended that sedentary individuals take part in intensive spinning training as a strategy to improve parameters (cholesterol, triglycerides, HDL, LDL) that pose a risk to cardiovascular health. It was not possible to form a control group in the present study because it was difficult to monitor whether young female subjects were not exercising and were maintaining an inactive lifestyle. This is the main limitation of the study. For this reason, it is important to create control groups in future studies designed to assess what impact aerobic exercise has on lipid metabolism.

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Conflicts of Interest

The authors have no conflicts of interest to declare.

Ethical Statement

The research was conducted in strict accordance with the principles found in the Declaration of Helsinki. The safety and well-being of the participants were prioritized during the design and implementation of the study and measures were taken to ensure data confidentiality. Permission to conduct the study was obtained from the Ethics Committee of Istanbul Aydın University at the board meeting dated 2023/09 and numbered 05-10-2023. All participants provided their informed consent in writing. The consent form detailed the study's procedures, potential risks and benefits, data confidentiality measures, and participants' rights.

Author Contributions

Study Design, E.B.; Data Collection, EB, AF and IPW; Statistical Analysis, EB, AF and IPW; Data Interpretation, EB, AF and IPW; Manuscript Preparation, EB, AF and IPW; Literature Search, EB, AF and IPW. All the authors agreed on the final draft of the manuscript before submitting it for publication.

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