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Comparison of Spinning and Resistance Training on Resistin, Visfatin, Lipid Profile, and Quality of Life in Overweight Women

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A B S T R A C T

The present study aimed to compare the effects of spinning and resistance training on resistin, visfatin, lipid profile, and quality of life dimensions in overweight women. This quasi-experimental study employed a pre-test–post-test design with a control group. From all overweight women (body mass index between 25 and 29.9 kg/m²) in Najafabad, Isfahan, a total of 60 overweight women (aged 20 to 30 years) were purposively selected for participation in the study and were randomly assigned to four groups: spinning training, resistance training, combined training (spinning + resistance), and control. The study consisted of three phases: pre-test, intervention (training), and post-test. Initially, in the pre-test phase, blood sampling was performed after 12 hours of fasting, followed by the completion of the Quality of Life Questionnaire (SF-36) by the participants. After the pre-test phase, the training phase commenced. The training phase lasted for 8 weeks, with three sessions per week conducted in a gym. Forty-eight hours after the completion of the training phase, in the post-test phase, blood sampling was again performed after 12 hours of fasting, and the participants completed the Quality of Life Questionnaire (SF-36) once more. Data were analyzed using paired t-tests, analysis of covariance, and Bonferroni post hoc tests. The results indicated that spinning, resistance, and combined training (resistance combined with spinning) significantly reduced resistin and visfatin levels in overweight women. Combined training had a greater impact than the individual training modalities. Additionally, these training programs improved cholesterol, triglyceride, LDL, and HDL levels, with combined training yielding the most significant effects. The training programs also enhanced physical and psychological quality of life; however, no significant difference was observed between groups in the psychological dimension.

Keywords: *Overweight, Resistin, Visfatin, Lipid Profile, Quality of Life*

1. Introduction

Overweight can be considered a syndrome of the modern world and is one of the most significant health challenges in contemporary society (1, 2). Overweight and obesity are increasing across all age groups and in most developing countries, particularly among women. Predictions indicate that by 2030, approximately half of the world's population will be either obese or overweight (3). Unfortunately, the prevalence of overweight has doubled over the past 30 years, and currently, more than 13% of individuals are classified as overweight (4). Over the past four decades, the number of adults with obesity worldwide has increased more than sixfold, from 100 million in 1975 to

671 million in 2016, while in 2016, 1.3 billion adults (one in four individuals) were considered overweight (4).

Overweight is also recognized as an independent and influential factor affecting quality of life. The World Health Organization (WHO) defines quality of life as individuals' perception of their position in life, considering the cultural and value systems in which they live, as well as their goals, expectations, standards, and priorities (4). Thus, this concept is entirely subjective and varies based on different aspects of individuals' lives. Obesity and overweight impair the quality of life in psychological, social, and physiological dimensions, reducing overall quality of life and increasing functional limitations in affected individuals (5).

Additionally, the lipid profile has long been used as an indicator of cardiovascular diseases. However, studies have shown that some individuals with normal levels of low-density lipoprotein (LDL) and high-density lipoprotein (HDL) still develop cardiovascular diseases. The correlation between high blood cholesterol and triglycerides and decreased HDL with cardiovascular diseases is well-established. The average serum cholesterol levels are rising in developing countries due to increased dietary fat intake and decreased physical activity. Other risk factors, such as diet and obesity, contribute to this trend. A 10% increase in serum cholesterol is associated with a 20–30% increase in the risk of cardiovascular diseases. Therefore, dietary therapy and physical activity are considered effective strategies for reducing fat levels (4, 6).

Nowadays, individuals with overweight conditions seek to improve their lifestyle and physical health through exercise. Among various physical activities, spinning is one of the most popular. Spinning is a form of exercise performed on a modified stationary bike and is often conducted in a group setting with music under the guidance of instructors. This activity, which can be structured as aerobic, resistance, or combined training based on a designed protocol, is highly engaging and can enhance motivation in individuals, helping them sustain the activity over time while benefiting from its positive effects on the cardiovascular system. Spinning exercises are performed at varying intensities, allowing for high-intensity training periods that maximize physiological benefits (7, 8).

However, due to busy lifestyles and the perceived difficulty of exercise, many individuals are reluctant to engage in regular physical activity. Introducing new, exciting, music-accompanied, and group-based exercises such as spinning may encourage participation and facilitate access to its health benefits, including cardiovascular health, fat metabolism improvement, and weight reduction (9).

One of the most metabolically active endocrine organs in individuals with obesity and overweight is adipose tissue. Research has demonstrated that adipose tissue not only serves as a long-term energy storage site but also secretes numerous bioactive molecules, known as adipokines, that regulate physiological processes such as inflammation, energy homeostasis, and immune function (10). These adipokines play a crucial role in adipose tissue development and significantly influence glucose metabolism in various tissues, contributing to systemic energy balance. Different adipokines are secreted by adipose tissue, including adiponectin, resistin, and visfatin (11-13).

Resistin is a peptide hormone that is elevated in individuals with obesity. It is closely linked to the development of atherosclerotic lesions, which are caused by disruptions in glucose and lipid metabolism (14). Another adipokine secreted by adipose tissue is visfatin, which has been identified as a pre-B cell colony-enhancing factor or nicotinamide phosphoribosyltransferase (Nampt) (15). Studies have reported a positive correlation between circulating visfatin levels and obesity-related conditions (11). Visfatin is associated with subcutaneous and visceral fat mass, as well as blood lipid profiles (16, 17). Evidence suggests that visfatin synthesis increases with obesity, and some findings indicate that visfatin contributes to the development of metabolic syndrome (8).

Additionally, some studies have shown that resistin expression is linked to elevated serum fatty acids, increased triglyceride levels in muscle, impaired skeletal muscle glucose metabolism, and glucose intolerance (6, 8, 11, 18). The present study aims to compare the effects of spinning and resistance training on resistin, visfatin, lipid profiles, and quality of life dimensions in overweight women.

2. Methods and Materials

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2.1. Study Design and Participants

This quasi-experimental study, approved under the ethics code IR.IAU.NAJAFABAD.REC.1402.210, was conducted with overweight women from Najafabad using a simple random sampling method. Participants were aged between 20 and 30 years with a body mass index (BMI) greater than 30 kg/m². Inclusion criteria required participants to be overweight and in good health, to have not participated in sports classes in the past six months, to have refrained from using any weight-control supplements or medications, and to not be in menopause. Exclusion criteria included irregular participation in the training programs, the use of medications, or unwillingness to continue in the study. Among the selected women, 60 participants who met the inclusion criteria were chosen and randomly assigned into four groups: 15 participants in the spinning exercise group, 15 in the resistance training group, 15 in the combined spinning and resistance training group, and 15 in the control group.

To assess biochemical variables, 5 milliliters of blood were drawn from each participant's antecubital vein between 8:00 and 9:00 AM. Blood samples were centrifuged at 3,000 rpm for 10 minutes, and the serum was separated and stored in microtubes at -70°C for later analysis.

2.2. Measure

2.2.1. Resistin Measurement

Resistin levels were measured using a CUSABIO BIOTECH laboratory kit from China, with a sensitivity of 0.08 ng/mL (13, 15).

2.2.2. Visfatin Measurement

Visfatin levels were assessed using a CUSABIO laboratory kit from China, with a sensitivity of 0.1 ng/mL (12).

2.2.3. Lipid Profile Measurement

The lipid profile, including high-density lipoprotein (HDL), total cholesterol (TC), triglycerides (TG), and low-density lipoprotein (LDL), was measured using Pars Azmoon kits manufactured in Iran. Blood samples were collected before the intervention and 48 hours after the completion of the training program. Blood was drawn from both the experimental and control groups in a fasting state in the morning, with a volume of 5 cc collected per participant.

Additionally, body weight and height were measured using a Seca medical scale from Germany and a measuring tape. Waist-to-hip ratio was determined by measuring the waist circumference at the level of the navel and the hip circumference at its widest point. BMI was calculated by dividing body weight (kg) by height squared (m²). Lean body mass and fat mass were assessed using skinfold thickness measurements at two sites (triceps and calf) with a Yagami caliper from Japan, which had a measurement sensitivity of 0.5 mm.

For triceps skinfold measurements, the midpoint of the right upper arm was marked while the participant's arm was positioned perpendicular to the forearm. The skinfold was grasped between the thumb and forefinger, and participants were instructed to keep their arms relaxed. The skinfold thickness was then measured using the caliper.

For the calf skinfold measurement, participants positioned their right leg so that the angle between the femur and the tibia was 90 degrees. The thickest part of the calf was identified, marked, and measured using the caliper. After obtaining skinfold measurements at the triceps and calf, body fat percentage was estimated using the two-site Lohman equation. At the end of the intervention period, all anthropometric measurements were repeated under the same conditions.

2.2.4. Quality of Life Assessment

Quality of life dimensions were evaluated using the standardized SF-36 questionnaire, which measures eight dimensions: general health, physical functioning, bodily pain, role limitations due to physical health problems, social functioning, vitality, mental health, and role limitations due to emotional problems. Each dimension is scored from 0 to 100, with higher scores indicating better quality of life. The validity and reliability of the Persian version of this questionnaire have been confirmed (19, 20).

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2.3. Intervention

2.3.1. Spinning Training

In this study, the spinning training consisted of group cycling sessions accompanied by music, classified as an aerobic exercise, all performed under the supervision of a coach. The difference between a spinning bike and a traditional stationary bike lies in the resistance levels, high-speed gear rotations, wheel resistance, and body position during cycling, which impose varying physiological stresses on the body. Participants in the spinning group engaged in an eight-week training program with three sessions per week. The training protocol began with a 10-minute warm-up (light cycling, stretching, and breathing exercises) at 40% of heart rate reserve, followed by a 30-minute workout that progressively increased in intensity and duration based on the principle of overload (adding two minutes to the duration each week and increasing intensity by 5% every two weeks). By the eighth week, sessions lasted 40 minutes at 65% of the target heart rate. Each session concluded with a five-minute cooldown, including walking and stretching exercises (7, 8, 21).

2.3.2. Resistance Training

The resistance training in this study was performed using a circuit training format. After a 10–15 minute warm-up, participants completed exercises at the following stations: bench press, leg press, lat pulldown, leg extension, seated row, triceps pushdown, and biceps curl using a barbell. In the first and second weeks, participants trained at 65% of their one-repetition maximum (1RM) in the first round and 70% in the second and third rounds. Rest intervals between exercises were 30 seconds, and between sets, participants engaged in active recovery (walking) for two minutes. In the third, fourth, and fifth weeks, the number of sets increased to four, each consisting of eight exercises, with intensity set at 65% in the first round, 70% in the second, and 75% in the third and fourth rounds. Each session concluded with a 10-minute cooldown. To maintain progressive overload, participants' 1RM was recalculated every three weeks (22). One-repetition maximum was estimated using an indirect method and the Brzycki formula (23).

2.4. Data Analysis

Data were analyzed using descriptive and inferential statistics. In the descriptive analysis, frequency distribution tables, central tendency measures, and dispersion indices were used. In the inferential analysis, the Shapiro-Wilk test was employed to assess the normality of the data. Independent and paired t-tests, as well as analysis of covariance (ANCOVA), were conducted. The Bonferroni post-hoc test was used for within-group comparisons. Statistical analyses were performed using SPSS software version 24 at a 95% confidence level, with a significance threshold of 0.05.

3. Findings and Results

The mean and standard deviation of age, height, weight, BMI, body fat percentage, and WHR of participants in different groups are presented in tables below.

Table 1

Mean and Standard Deviation of Background Variables of Participants

Variable	Group	N	Mean	SD	One-Way ANOVA
Age (years)	Spinning + Resistance Training	15	24.06	3.43	F = 1.37, p = 0.261
	Spinning Training	15	25.86	3.44	
	Resistance Training	15	26.46	3.94	
	Control	15	25.33	2.55	
Height (cm)	Spinning + Resistance Training	15	162.46	7.45	F = 0.07, p = 0.972
	Spinning Training	15	161.93	5.54	
	Resistance Training	15	163.13	7.29	
	Control	15	162.80	8.08	

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Table 2

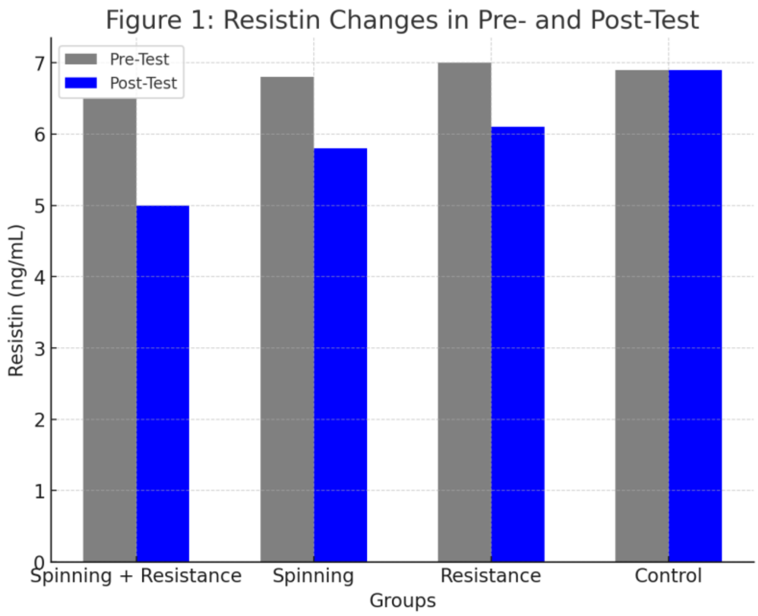
Mean and Standard Deviation of Background Variables of Participants

Variable	Group	N	Mean	SD	One-Way ANOVA
Weight (kg)	Spinning + Resistance Training	15	71.93	6.63	F = 0.16, p = 0.918
	Spinning Training	15	71.53	5.69	
	Resistance Training	15	73.13	5.19	
	Control	15	72.20	7.84	
BMI (kg/m²)	Spinning + Resistance Training	15	27.21	1.24	F = 0.15, p = 0.930
	Spinning Training	15	27.25	1.36	
	Resistance Training	15	27.50	1.50	
	Control	15	27.19	1.54	
Body Fat %	Spinning + Resistance Training	15	31.06	4.31	F = 0.51, p = 0.675
	Spinning Training	15	32.06	5.33	
	Resistance Training	15	33.20	3.44	
	Control	15	32.33	5.60	
WHR	Spinning + Resistance Training	15	0.95	0.05	F = 0.15, p = 0.925
	Spinning Training	15	0.94	0.07	
	Resistance Training	15	0.93	0.05	
	Control	15	0.94	0.07	

Resistin levels in overweight women significantly decreased in all training groups compared to the control group ($p < 0.05$). Additionally, results showed that resistin levels in overweight women significantly decreased following combined spinning and resistance training compared to spinning alone ($p = 0.033$) and resistance training alone ($p = 0.002$), with mean differences of 1.43 and 1.89 ng/mL, respectively. However, no significant difference was found between the spinning and resistance training groups ($p > 0.05$). The mean changes in resistin levels in overweight women during the pre-test and post-test phases across training groups are shown in Figure 1.

Figure 1

Mean Changes in Resistin Levels During the Pre-Test and Post-Test Phases in Study Groups



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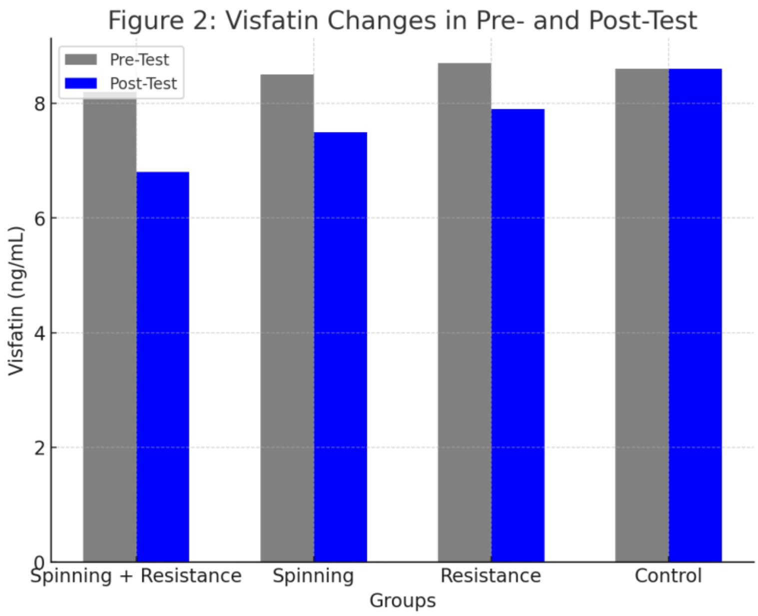
Visfatin levels in overweight women significantly decreased in all training groups compared to the control group ($p < 0.05$). Additionally, results showed that visfatin levels significantly decreased following combined spinning and resistance training compared to spinning alone ($p = 0.007$) and resistance training alone ($p < 0.0001$), with mean differences of 1.28 and 2.36 ng/mL, respectively. However, no significant difference was found between the spinning and resistance training groups ($p > 0.05$). The mean changes in visfatin levels in overweight women during the pre-test and post-test phases across training groups are shown in Figure 2.

Figure 2

Mean Changes in Visfatin Levels During the Pre-Test and Post-Test Phases in Study Groups



HDL levels in overweight women significantly increased in all training groups compared to the control group ($p < 0.05$). Additionally, results showed that HDL levels significantly increased following combined spinning and resistance training compared to spinning alone ($p = 0.033$) and resistance training alone ($p = 0.002$), with mean differences of 8.31 and 8.46 mg/dL, respectively. However, no significant difference was found between the spinning and resistance training groups ($p > 0.05$). The mean changes in HDL levels in overweight women during the pre-test and post-test phases across training groups are shown in Figure 3.

LDL levels in overweight women significantly decreased in all training groups compared to the control group ($p < 0.05$). Additionally, results showed that LDL levels significantly decreased following combined spinning and resistance training compared to spinning alone ($p = 0.031$) and resistance training alone ($p = 0.032$), with mean differences of 14.73 and 14.68 mg/dL, respectively. However, no significant difference was found between the spinning and resistance training groups ($p > 0.05$). The mean changes in LDL levels in overweight women during the pre-test and post-test phases across training groups are shown in Figure 4.

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Figure 3

Mean Changes in HDL Levels During the Pre-Test and Post-Test Phases in Study Groups

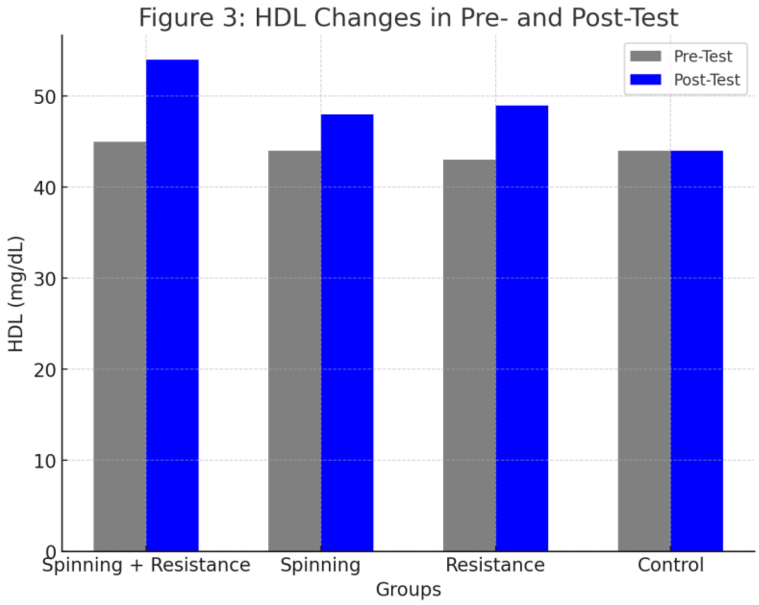
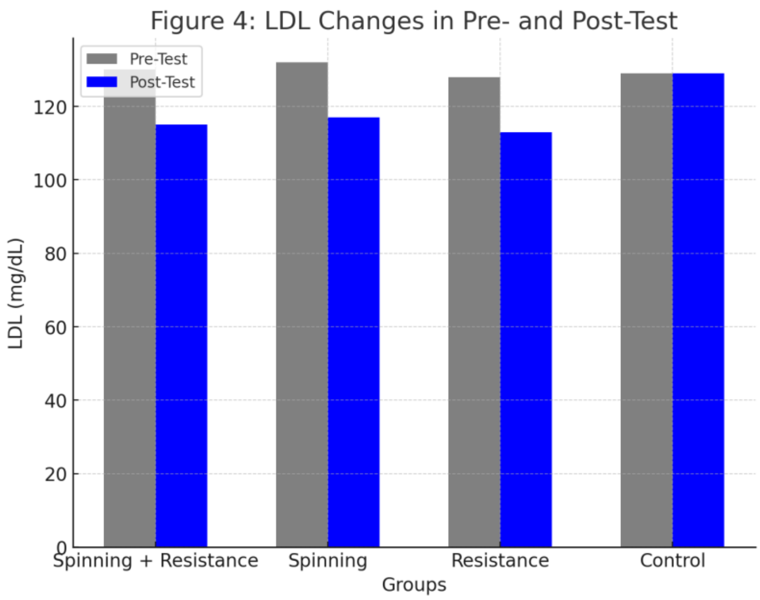


Figure 4

Mean Changes in LDL Levels During the Pre-Test and Post-Test Phases in Study Groups



The triglyceride (TG) levels in overweight women significantly decreased in all training groups compared to the control group ($p < 0.05$). Additionally, the results showed that TG levels in overweight women significantly decreased following combined spinning and resistance training compared to spinning alone ($p = 0.031$) and resistance training alone ($p = 0.012$), with mean differences of 12.03 mg/dL and 13.38 mg/dL, respectively. However, no significant difference was found between the spinning and resistance training groups ($p > 0.05$). The mean changes in TG levels in overweight women during the pre-test and post-test phases across training groups are shown in Figure 5.

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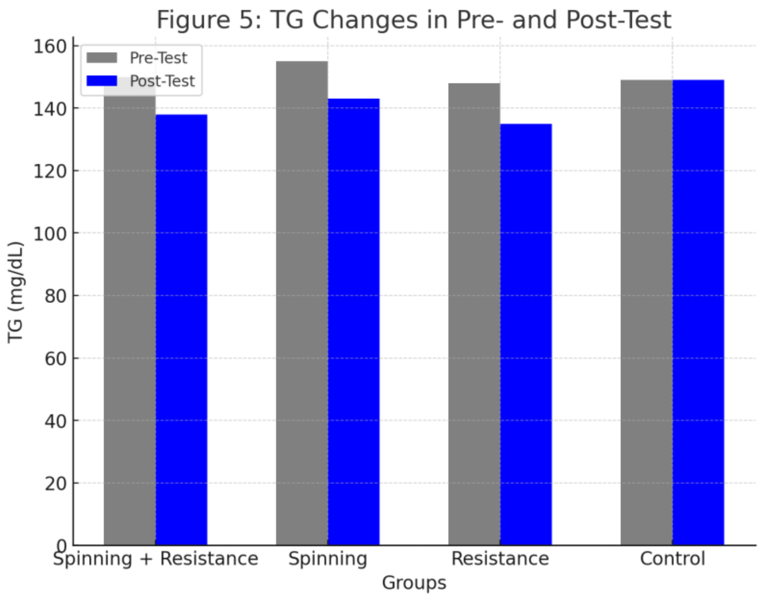
Figure 5

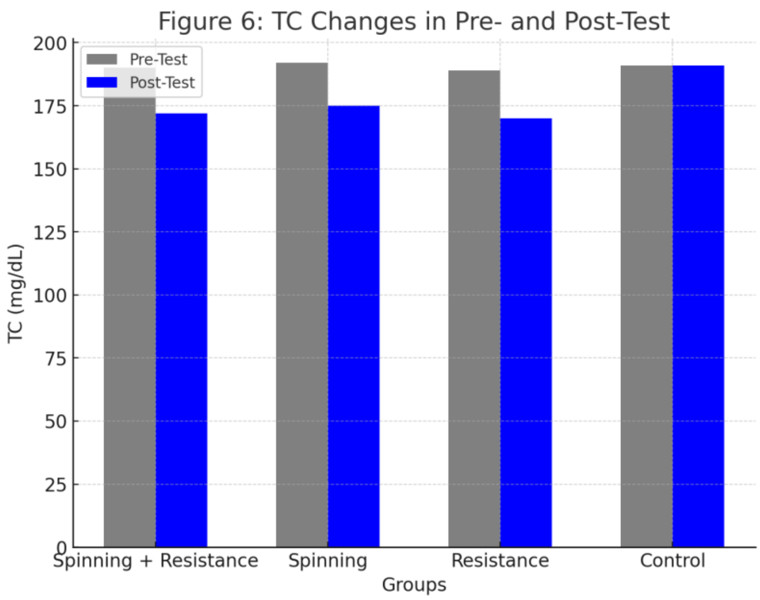
Mean Changes in TG Levels During the Pre-Test and Post-Test Phases in Study Groups



Total cholesterol (TC) levels in overweight women significantly decreased in all training groups compared to the control group ($p < 0.05$). Additionally, the results showed that TC levels in overweight women significantly decreased following combined spinning and resistance training compared to spinning alone ($p = 0.033$) and resistance training alone ($p = 0.010$), with mean differences of 18.46 mg/dL and 21.30 mg/dL, respectively. However, no significant difference was found between the spinning and resistance training groups ($p > 0.05$). The mean changes in TC levels in overweight women during the pre-test and post-test phases across training groups are shown in Figure 6.

Figure 6

Mean Changes in TC Levels During the Pre-Test and Post-Test Phases in Study Groups



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The physical health dimension of quality of life in overweight women significantly improved following spinning and resistance training ($p < 0.0001$). Additionally, the physical health dimension of quality of life in overweight women significantly improved following spinning training ($p < 0.0001$) and resistance training ($p = 0.003$). The mean changes in the physical health dimension of quality of life in overweight women during the pre-test and post-test phases across training groups are shown in Figure 7.

Figure 7

Mean Changes in the Physical Health Dimension of Quality of Life During the Pre-Test and Post-Test Phases in Study Groups

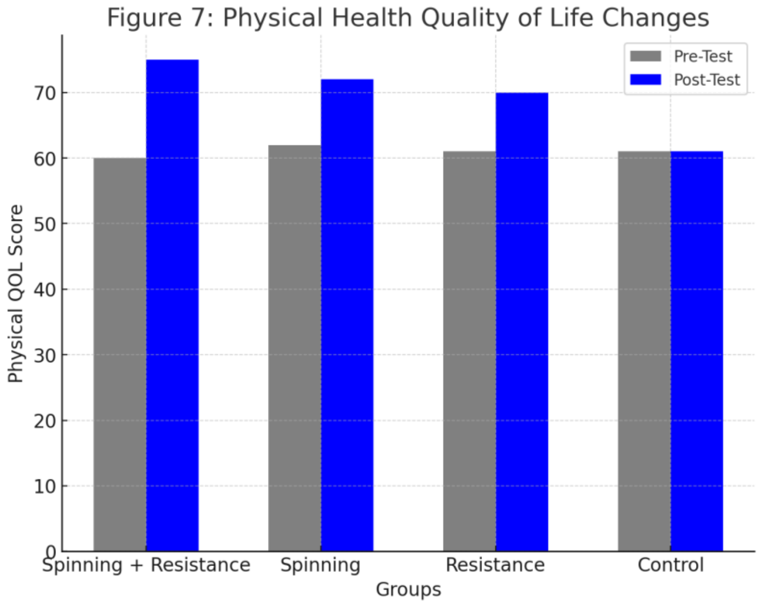
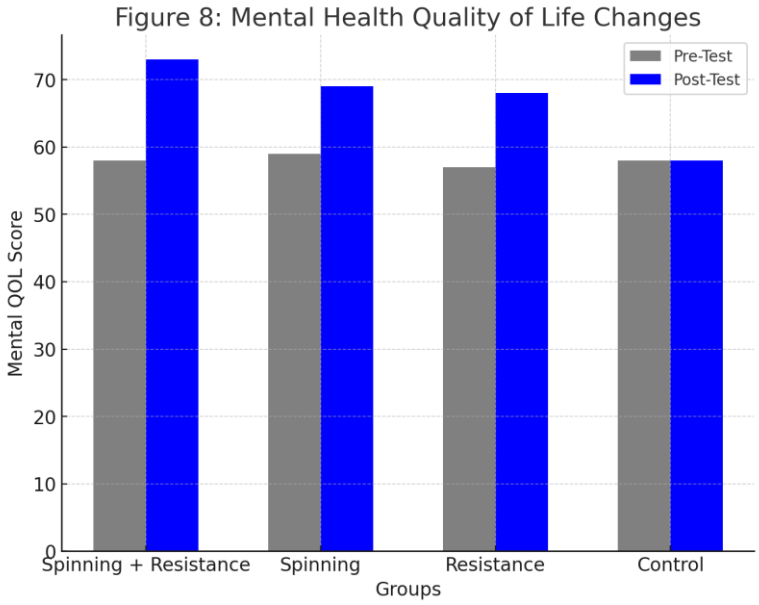


Figure 8

Mean Changes in the Mental Health Dimension of Quality of Life During the Pre-Test and Post-Test Phases in Study Groups



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The mental health dimension of quality of life in overweight women significantly improved following spinning and resistance training ($p < 0.0001$). Additionally, the mental health dimension of quality of life in overweight women significantly improved following spinning training ($p = 0.020$) and resistance training ($p = 0.014$). The mean changes in the mental health dimension of quality of life in overweight women during the pre-test and post-test phases across training groups are shown in Figure 8.

4. Discussion and Conclusion

This study aimed to compare the effects of spinning and resistance training on resistin, visfatin, lipid profile, and quality of life dimensions in overweight women. The results were analyzed separately for each dependent variable based on the different interventions.

The findings demonstrated that eight weeks of resistance training significantly reduced resistin levels in overweight women. These results align with previous studies indicating that resistance training can effectively lower resistin levels. Similarly, Abdollahi et al. (2020) found that resistance training decreased serum resistin and visfatin levels in elderly women with metabolic syndrome (11).

The potential mechanisms underlying this effect include the impact of physical activity on insulin levels, which inhibits lipolysis, and the activation of the sympathetic nervous system, which increases the release of epinephrine and norepinephrine, leading to enhanced lipolysis (5). Vafaei and Gholami (2019) found no significant changes in plasma resistin levels following eight weeks of resistance training in obese elderly women, despite reductions in insulin resistance and body fat percentage (24). These inconsistencies may be due to differences in training duration, intensity, modality, and participant characteristics. Additionally, this study found that eight weeks of spinning training significantly reduced resistin levels in overweight women. Since no previous studies have directly examined the effect of spinning on resistin, the results were compared with studies investigating aerobic training effects. Ali Nia and Moein (2018) found that aerobic exercise combined with a high-fat diet improved levels of adiponectin, leptin, and resistin (18). Similarly, Rezaei Manesh and Amiri Farsani (2019) demonstrated that aquatic aerobic training decreased apelin and resistin levels, improving blood glucose control in men with type 2 diabetes. Furthermore, Fathi et al. (2018) reported that eight weeks of aerobic training significantly reduced serum resistin levels in middle-aged inactive women (14). However, some studies have found no significant changes in resistin levels following aerobic training. Sarami et al. (2019) observed no effect of a ten-week aerobic training program on resistin levels in diabetic mice (15).

The results indicated that eight weeks of resistance training significantly reduced visfatin levels in overweight women. This finding is consistent with Bahram et al. (2020), who found that ten weeks of resistance training significantly decreased plasma visfatin levels in obese adolescents. Similarly, Abdollahi et al. (2020) demonstrated that resistance training reduced serum visfatin levels in elderly women with metabolic syndrome (11). Lee et al. (2019) also found that three months of resistance training decreased visfatin levels and improved insulin resistance in obese individuals (25).

This study also found that eight weeks of spinning training significantly reduced visfatin levels in overweight women. Although no direct studies on spinning and visfatin were found, research on aerobic training supports these findings. Erdem et al. (2019) reported that a six-week lifestyle modification program, including aerobic exercise and dietary adjustments, significantly reduced plasma visfatin levels in patients with metabolic syndrome (17). Additionally, Shang et al. (2020) found that six weeks of swimming reduced plasma visfatin levels and improved insulin sensitivity in obese mice (26).

The findings revealed that eight weeks of resistance training significantly improved the lipid profile in overweight women, reducing total cholesterol, triglycerides, and LDL while increasing HDL levels. This result aligns with Moradian et al. (2019), who reported that eight weeks of circuit resistance training decreased lipid levels and enhanced vascular flexibility (27). Similarly, Haji Nia et al. (2020) found that high-intensity resistance training improved lipid profile markers in overweight and obese individuals (28).

Additionally, this study demonstrated that spinning training significantly improved lipid profiles in overweight women, reducing total cholesterol, triglycerides, and LDL while increasing HDL levels. These findings are consistent

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with Yamaner et al. (2020), who observed significant lipid profile improvements after a six-week spinning program in sedentary women. Similarly, Ratajczak et al. (2021) reported that 12 weeks of spinning training significantly reduced metabolic risk factors, including dyslipidemia.

Finally, combined resistance and spinning training resulted in the most significant improvements in lipid profiles. This result aligns with Pashaee et al. (2020), who found that combined high-intensity interval training and resistance training produced superior effects on weight loss and lipid profiles in overweight and obese middle-aged women (29).

The findings indicated that both spinning and resistance training significantly improved the physical and mental health dimensions of quality of life in overweight women. These results are consistent with Huang et al. (2019), who found that high-intensity interval training on a spinning bike enhanced health-related quality of life in women (7).

The combined training approach also led to the most significant improvements in quality of life. This may be due to the physiological and psychological benefits of both training modalities, including enhanced mood, reduced anxiety, and increased self-perception of physical capabilities.

This study has some limitations. First, dietary intake was not strictly controlled, which may have influenced the observed changes in body composition and metabolic markers. Second, the sample size was relatively small, limiting the generalizability of the findings to broader populations. Third, this study did not include long-term follow-up assessments to determine whether the effects persisted over time.

Future studies should incorporate larger sample sizes and more diverse populations to improve the generalizability of findings. Additionally, research should explore the long-term effects of different training protocols on metabolic and psychological health outcomes. Further studies should also investigate the underlying physiological mechanisms responsible for changes in resistin, visfatin, and lipid profiles in response to various exercise interventions.

Healthcare professionals and fitness trainers should consider incorporating both spinning and resistance training in exercise programs for overweight individuals, as this combination appears to produce the most beneficial effects on metabolic health and quality of life. Exercise interventions should be designed with progressive intensity adjustments to maximize physiological adaptations while ensuring adherence and motivation. Lastly, integrating structured exercise programs into lifestyle modification strategies may be an effective non-pharmacological approach for managing obesity and its associated health risks.

Authors' Contributions

M. M. conceptualized the study, designed the methodology, and led participant recruitment. E. E. supervised the exercise interventions and contributed to data collection and analysis. J. B. B. was responsible for biochemical assessments, including blood sampling and lipid profile measurements. H. Z. performed statistical analyses, interpreted the results, and contributed to manuscript preparation. All authors participated in manuscript drafting, critically reviewed the content, and approved the final version of the study.

Declaration

In order to correct and improve the academic writing of our paper, we have used the language model ChatGPT.

Transparency Statement

Data are available for research purposes upon reasonable request to the corresponding author.

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Declaration of Interest

The authors report no conflict of interest.

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Ethical Considerations

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The study protocol adhered to the principles outlined in the Helsinki Declaration, which provides guidelines for ethical research involving human participants. This study is approved under the ethics code IR.IAU.NAJAFABAD.REC.1402.210, was conducted with overweight women from Najafabad using a simple random sampling method.

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