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Effectiveness of Strength Training and Cardio on Body Fat Reduction

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Keywords

cardio; stregth; fat loss

Abstract

Increasing public awareness of healthy lifestyles has encouraged more people to engage in physical activity, particularly exercise programs aimed at reducing body fat. However, there is still debate regarding which type of exercise is more effective for improving body composition. This study aimed to analyze and compare the effectiveness of strength training and cardio training on body fat reduction among members of Bodyhaus Gym in Semarang. This research employed a quantitative experimental approach using a pre-experimental one-group pretest–posttest design. The sample consisted of 30 gym members who were participating in a weight-loss program. Data were collected through body composition measurements using a Body Composition Analyzer, including body fat percentage, body weight, Body Mass Index (BMI), and muscle mass before and after a one-month training program conducted four times per week. The data were analyzed using the Shapiro–Wilk normality test followed by nonparametric tests, including the Wilcoxon Signed Rank Test and Mann–Whitney U Test. The results showed that both strength training and cardio training significantly affected body fat reduction. Cardio training was more effective in reducing body weight, BMI, and body fat percentage, whereas strength training was more effective in increasing muscle mass. In conclusion, both training methods contribute to improving body composition, but each provides different physiological adaptations depending on the training objectives.

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INTRODUCTION

The healthy lifestyle movement has gained increasing attention among Indonesian society in recent years, particularly since the emergence of the COVID-19 pandemic. The pandemic situation encouraged people to pay greater attention to personal health through various preventive behaviors such as regularly washing hands, maintaining environmental hygiene, paying attention to nutritional intake, and increasing physical activity through exercise. These behavioral changes indicate a growing public awareness of the importance of maintaining health as part of efforts to improve body immunity and overall quality of life. Several studies have shown that during the pandemic there was an increase in clean and healthy living practices, including exercise habits, sunbathing, and efforts to maintain a more balanced diet (Andriarsi, 2020). In addition, other surveys indicate that most people have the intention to maintain a healthy lifestyle even after the pandemic ends, such as reducing sleep deprivation, improving dietary patterns, and increasing regular physical activity (Suliana, 2022).

Awareness of a healthy lifestyle is not only related to disease prevention but also represents a long-term investment in maintaining quality of life. A healthy lifestyle includes various positive habits consistently practiced in daily life, such as consuming balanced nutritious foods, engaging in regular physical activity, maintaining adequate body hydration, managing stress, and having sufficient rest. The implementation of these habits plays an important role in maintaining the balance of physiological body functions, including energy metabolism and body composition. However, although public awareness regarding the importance of healthy living has increased, its implementation has not been fully consistent across all groups of society. Some individuals have already adopted healthy habits regularly, while others remain at the level of conceptual awareness without consistent application in their daily lives (Zahro et al., 2022).

One indicator of increasing public awareness of health is the growing participation in sports and physical activity. Exercise has become an important part of a healthy lifestyle because it can improve physical fitness, enhance cardiovascular function, and help maintain an ideal body composition. Data from the Indonesian Central Bureau of Statistics show that the percentage of Indonesians who exercised within the past week continues to increase, although participation levels still vary across regions. Various types of physical activities popular among the public include walking, running, cycling, yoga, pilates, and fitness training at gyms. The motivation for exercising is generally related to maintaining health and regulating body weight to remain within an ideal range (Annur, 2023).

Along with the increasing public interest in exercise, fitness centers or gyms have become one of the facilities widely used to achieve fitness goals and reduce body fat. Modern gyms generally provide various exercise equipment that supports comprehensive fitness programs, ranging from cardiovascular machines such as treadmills and elliptical trainers to resistance training areas with dumbbells and barbells. In addition, many fitness centers also provide group exercise classes and personal trainer services that help members design exercise programs tailored to their individual fitness goals. This combination of facilities makes gyms an effective training environment to improve fitness and support the process of body fat reduction.

In the context of body fat reduction programs (fat loss), two of the most commonly used training methods are cardiovascular exercise and strength training. Cardiovascular exercise, or cardio, is a form of physical activity that increases heart and lung activity continuously, thereby increasing energy expenditure and calorie burning. Meanwhile, strength training is a form of exercise that uses weights or resistance to increase muscular strength and muscle mass. An increase in muscle mass through strength training can improve the Basal Metabolic Rate (BMR), which is the amount of energy the body requires at rest to maintain basic physiological functions. With an increased BMR, the body is able to burn more calories even when not performing physical activity.

Although both training methods are widely used in body fat reduction programs, the relative effectiveness between cardio and strength training remains an interesting topic to study, particularly within the context of commercial fitness centers with diverse member characteristics. One fitness center that has experienced an increase in membership is Bodyhaus Fitness, located in Sampangan District, Semarang City. This fitness center began operating in August 2025 and currently has approximately 150 active members aged between 19 and 45 years. Based on preliminary observations, most members aim to reduce body fat and improve body composition; however, the training programs implemented tend to focus more on cardiovascular exercises rather than strength training.

Based on preliminary data obtained from body composition measurements of members participating in weight-loss programs, most members fall into the overweight and obesity categories. This condition indicates that excess body fat remains a dominant issue despite the increasing public awareness of exercise. Therefore, an appropriate and evidence-based training approach is needed to help fitness center members achieve their body fat reduction goals more effectively.

Based on the description above, this study aims to analyze and compare the effectiveness of strength training and cardio exercise on body fat reduction among members of Bodyhaus Fitness in Semarang City. The results of this study are expected to provide scientific contributions to the development of more effective fitness training programs, particularly in the context of commercial fitness centers, and to serve as a reference for trainers and sports practitioners in designing optimal training programs for body fat reduction

METHODS

This study employed a quantitative approach with an experimental design to determine the effect of exercise interventions on changes in body composition. The research design applied was a pre-experimental design using a two-group pretest–posttest model. Through this design, changes occurring after the intervention could be analyzed by comparing measurement results before and after the exercise intervention. The study was conducted at Bodyhaus Fitness, located at Jalan Papandayan No. 2H, Wonotingal, Gajahmungkur District, Semarang City, Central Java.

The population of this study consisted of all active members of Bodyhaus Fitness who participated in a weight loss program. The research sample consisted of 30 members, selected based on characteristics relevant to the research objectives, namely individuals who were undergoing a body fat reduction program. The research subjects then followed a training program for one month with a training frequency of four sessions per week. The training program consisted of two exercise approaches, namely the cardiovascular exercise group and the strength training group. The cardio exercise was performed in the form of circuit training, involving several movements such as battle rope, kettlebell swing, medicine ball slams, burpees into plate, step-up, mountain climber, Russian twist, and treadmill exercise for 20 minutes. Meanwhile, the strength training program included exercises using machines and free weights such as leg press, chest press, shoulder press, lat pulldown, bicep curl, tricep pushdown, and crunch, performed in three sets of 12 repetitions for each exercise.

The data used in this research were quantitative data obtained from body composition measurements before and after the intervention. The main research variable was body fat percentage, while supporting variables included body weight, height, Body Mass Index (BMI), and muscle mass. The data sources consisted of primary data and secondary data. Primary data were obtained directly through pretest and posttest measurements using a Body Composition Analyzer. Secondary data were obtained from gym membership documents, training program records, and scientific literature relevant to the research topic. Data collection techniques were carried out through direct measurement and documentation methods. The measurement method was used to obtain body composition data of the research subjects, while documentation was used to record the identity of the subjects and the implementation of the training program during the research period.

Data analysis was conducted using IBM SPSS Statistics version 25. The initial stage of analysis was the normality test using the Shapiro–Wilk test to determine whether the research data were normally distributed. If the significance value was greater than 0.05, the data were considered normally distributed and the analysis could proceed using parametric statistics.

Conversely, if the significance value was less than 0.05, the data were considered not normally distributed and therefore analyzed using nonparametric statistics. After checking the statistical assumptions, hypothesis testing was carried out using two analytical approaches. To determine the changes before and after the intervention, the Wilcoxon Signed Rank Test was used when the data were not normally distributed, while the Mann–Whitney U Test was used to determine differences between the two treatment groups. The selection of these analytical methods was conducted systematically based on the results of the prerequisite statistical tests, ensuring that the research findings were analyzed validly and could be scientifically justified.

RESULTS AND DISCUSSION

This study involved 30 respondents who were divided into two treatment groups, namely the Strength Training group and the Cardio Training group, each consisting of 15 participants. The variables observed in this study included body weight (BW), Body Mass Index (BMI), body fat, and muscle mass measured before and after the intervention.

Table 1. Characteristics Of Research Subjects

Variabel	Strength Training (N=15) (Mean ± Sd)	Cardio Training (N=15) (Mean ± Sd)
Age (Year)	28.7 ± 6.5	31.4 ± 7.1
Height (Cm)	162.3 ± 6.1	171.8 ± 7.3
Weight Pretest (Kg)	69.9 ± 7.9	91.4 ± 11.2
Bmi Pretest	26.8 ± 1.2	32.1 ± 3.1
Body Fat Pretest	0.365 ± 0.04	0.355 ± 0.06
Muscle Mass Pretest (Kg)	40.8 ± 6.7	57.3 ± 10.8

Table 1 shows the baseline characteristics of respondents before the exercise intervention was administered. The cardio training group had a higher average body weight and BMI compared to the strength training group.

Table 2. Comparison Of Pre-Test And Post-Test Values.

Variables	Group	Pre-Test (Mean ± Sd)	Post-Test (Mean ± Sd)	Change (%)
Weight (Kg)	Strength Training	69.9 ± 7.9	69.5 ± 7.8	-0.5
	Cardio Training	91.4 ± 11.2	86.4 ± 10.3	-5.5
Bmi	Strength Training	26.8 ± 1.2	26.6 ± 1.5	-0.7
	Cardio Training	32.1 ± 3.1	29.4 ± 2.9	-8.4
Body Fat	Strength Training	0.365 ± 0.04	0.362 ± 0.04	-0.8
	Cardio Training	0.355 ± 0.06	0.331 ± 0.06	-6.7
Muscle Mass (Kg)	Strength Training	40.8 ± 6.7	41.8 ± 7.1	+2.4
	Cardio Training	57.3 ± 10.8	56.9 ± 10.5	-0.7

The results of the descriptive analysis show that both groups experienced changes in body composition after the exercise intervention. The cardio training group experienced greater reductions in body weight (-5.5%), BMI (-8.4%), and body fat (-6.7%) compared to the strength training group. Conversely, the strength training group showed an increase in muscle mass (2.4%). The calculation of the percentage change indicates that cardio training is more effective in reducing body weight, BMI, and body fat. In contrast, strength training is more effective in increasing muscle mass.

Data normality testing can be seen in **table 3.**

Table 3. Results Of The Normality Test.

Variables	Group	Shapiro-Wilk		Description
		Statistic	Sig.	
Weight (Kg)	Strength Training	0.448	0.000	Not Normal
	Cardio Training	0.735	0.001	Not Normal
Bmi	Strength Training	0.871	0.035	Not Normal
	Cardio Training	0.954	0.594	Not Normal
Body Fat	Strength Training	0.841	0.013	Not Normal
	Cardio Training	0.919	0.188	Normal
Muscle Mass (Kg)	Strength Training	0.972	0.889	Normal
	Cardio Training	0.523	0.000	Not Normal

The normality test using the Shapiro–Wilk test showed that not all variables had a significance value of $\rho > 0.05$, indicating that the data were not normally distributed. Therefore, the hypothesis analysis used the non-parametric Mann–Whitney test.

The hypothesis testing in this study was conducted to determine whether there were significant differences between the strength training group (Group 1) and the cardio training group (Group 2) on the variables studied. Based on the results of the previous normality test, the research data indicated that the data distribution did not fully meet the assumption of normality; therefore, parametric analysis could not be optimally applied. Consequently, hypothesis testing was conducted using the Mann–Whitney test, a non-parametric statistical method used to compare two independent groups. This test aims to determine whether there is a difference in the median between the two treatment groups. The results of the Mann–Whitney test analysis are presented in the following table.

Table 4. Differences In Changes In Body Composition Between Groups

Variables	Cardio (Mean±Sd)	Strength Training (Mean±Sd)	U	Z	P
Weight	-0.61 ± 1.82	-5.41 ± 0.73	14.000	-4.092	0.00
Bmi	-0.27 ± 1.34	-3.01 ± 1.89	21.500	-3.778	0.00
Body Fat	-0.003 ± 0.003	-0.024 ± 0.005	0.000	-4.678	0.00
Muscle Mass	1.27 ± 0.38	-0.86 ± 1.31	0.000	-4.671	0.00

The results of the analysis indicate that there are significant differences between the two training groups in terms of changes in body composition. The change in body weight showed a value of $U = 14.000$, $Z = -4.092$, with $\rho = 0.000$ ($\rho < 0.05$). Similarly, for the BMI variable, the results showed $U = 21.500$, $Z = -3.778$, and $\rho = 0.000$, indicating a significant difference in changes between the cardio and strength training groups.

For the body fat variable, the analysis results showed $U = 0.000$, $Z = -4.678$, with $\rho = 0.000$, while for the muscle mass variable, the results showed $U = 0.000$, $Z = -4.671$, with $\rho = 0.000$. The significance values lower than 0.05 for all variables indicate that there are meaningful differences between the two training methods in terms of body composition changes.

Overall, these results indicate that the type of exercise performed produces different effects on changes in body weight, BMI, body fat, and muscle mass in the research sample. Thus, it can be concluded that cardio training and strength training have different levels of effectiveness in influencing body composition changes, so the selection of exercise type can be adjusted according to the desired training objectives, such as reducing body fat or increasing muscle mass.

The results of this study indicate that cardio training and strength training both influence changes in body composition. Descriptive analysis shows that the cardio training group experienced greater reductions in body weight, BMI, and body fat, whereas the strength training group demonstrated greater increases in muscle mass. These findings indicate that different types of exercise produce different physiological adaptations in body composition (An, Su, & Meng, 2024; Liu, Li, Lu, & Zhu, 2024).

The greater reduction in body weight, BMI, and body fat in the cardio training group can be explained by energy metabolism mechanisms during aerobic exercise. Moderate to high-intensity cardiorespiratory exercise increases oxygen utilization by muscles, thereby enhancing fat oxidation as an energy source (Huang, Li, Liu, & Zhou, 2023). During aerobic activity, the body increases the mobilization of free fatty acids from adipose tissue through lipolysis, stimulated by catecholamine hormones such as epinephrine and norepinephrine (Yan, Xu, Chen, et al., 2025). Regular aerobic exercise is effective in reducing body fat mass through increased energy expenditure and enhanced fat oxidation (Khalafi et al., 2025).

In addition to increased energy expenditure during exercise, cardio training increases post-exercise energy expenditure through the mechanism of Excess Post-Exercise Oxygen Consumption (EPOC). EPOC reflects the body's need to restore physiological conditions to homeostasis after exercise, maintaining higher oxygen consumption for processes like ATP and phosphocreatine resynthesis, lactate oxidation, and normalization of body temperature and hormonal activity. This elevated post-exercise metabolism contributes to weight loss and body fat reduction (LaForgia, Withers, & Gore, 2006; Xie, Gu, Li, Zhang, & Hei, 2025).

Conversely, the strength training group experienced greater increases in muscle mass compared to the cardio training group. This aligns with physiological adaptations to resistance exercise, which stimulates skeletal muscle hypertrophy through mechanical tension and activation of molecular pathways such as mTOR, enhancing muscle protein synthesis (Schoenfeld, 2010; Westcott & Smith, 2022). Strength training also increases myofibril size and number, motor unit recruitment, and satellite cell activity, collectively improving lean muscle mass and basal metabolic rate (Cheng, Ma, & Bo, 2024; Rodrigues & Oliveira, 2025).

The difference in adaptation is also related to dominant energy systems: cardio uses aerobic metabolism for fat oxidation, whereas strength training relies on anaerobic systems like ATP-PC and glycolysis to promote neuromuscular adaptations and muscle hypertrophy (Willis et al., 2012; Noh, Seo, & Park, 2024). Research confirms aerobic exercise is more effective for reducing fat mass, while resistance training improves muscle mass and strength (Lentejas, Sandoval, Evangelista, Buenaluz-Sedurante, & Velayo, 2024).

Hypothesis testing using the Mann–Whitney test indicated significant differences between the groups across all body composition variables, supporting that exercise type produces different effects on body composition (Al-Mhanna et al., 2024; Hays, Azar, Kang, Tinsley, & Wijayatunga, 2025). Therefore, exercise selection should align with individual goals: aerobic training for fat loss and resistance training for muscle gain. Combined programs may offer optimal outcomes, providing improvements in metabolic health, fat reduction, and lean mass accrual (An, Su, & Meng, 2024; Liu, Li, Lu, & Zhu, 2024; Rodrigues & Oliveira, 2025).

CONCLUSION

Based on the results of the study examining the effects of strength training (a resistance exercise aimed at increasing muscular strength and muscle mass) and cardio training (a cardiovascular exercise that increases heart rate and energy expenditure to improve endurance and fat oxidation) on changes in body composition among Bodyhaus Gym members, it can be concluded that both types of exercise contribute to reductions in body fat, although with different adaptive characteristics. Strength training has been shown to reduce body fat percentage while simultaneously increasing muscle mass, representing a physiological adaptation to resistance exercise that contributes to improved metabolism and overall body composition. Meanwhile, cardio training demonstrates greater effectiveness in reducing body weight, Body Mass Index (BMI), and body fat percentage, as it increases energy expenditure and calorie burning during physical activity. Comparative analysis also shows significant differences in effectiveness between the two training methods, where cardio training is more effective for weight loss and body fat reduction, while strength training is more effective for increasing muscle mass. Therefore, the selection of exercise methods should be adjusted according to the fitness goals to be achieved.

Based on these findings, it is recommended that fitness trainers and gym management design more structured and evidence-based exercise programs by considering a combination of cardio and strength training to optimize body fat reduction programs. In addition, for gym members and the general public who aim to improve body composition, the selection of exercise types should be aligned with the desired training goals. Future researchers are encouraged to develop further studies with larger sample sizes, longer intervention durations, and consideration of additional variables such as dietary patterns and training intensity, in order to obtain a more comprehensive understanding of the effectiveness of various exercise methods in body fat reduction programs. The authors would like to express their gratitude to Bodyhaus Gym for providing support as a research sponsor and for offering facilities and access to gym members, enabling this research to be conducted successfully. The authors also extend their appreciation to Hijrah Maulidiah Afifah, as the supervising lecturer, for her guidance, suggestions, and academic supervision throughout the research process and the completion of this study. Furthermore, the authors appreciate all Bodyhaus Gym members who willingly participated in this study, as well as other parties who provided both direct and indirect support during the research process and the preparation of this article.

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