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Jogging versus Weight Training Combined with Intermittent Fasting for Reducing Body Fat in Overweight Male University Students

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Abstract
Excess body fat among overweight university students is a growing health concern associated with increased metabolic risk and reduced physical well-being. Combining exercise with intermittent fasting (IF) has emerged as a promising strategy to improve body composition. This study examined the effects of jogging with IF and weight training (WT) with IF on body fat reduction in overweight male university students. Using a quasi-experimental pretest-posttest design, 34 participants (aged 19–21 years; BMI > 27 kg/m²) were randomly assigned to jogging + IF (n = 17) or WT + IF (n = 17). Both interventions were performed for four weeks, three to four sessions weekly, during fasting hours before iftar. Body fat was assessed using the InBody test, while dietary compliance was monitored through the Red Secret app. Both groups showed significant reductions in body fat ($p < 0.001$). The jogging + IF group achieved a greater mean reduction (3.52 ± 0.37; 12.96%) than the WT + IF group (3.20 ± 0.23; 11.59%). However, between-group differences were not statistically significant (Welch's $t = -2.039$, $p = 0.052$), although the effect size (Cohen's $d = -0.699$) indicated a moderate-to-large practical difference. Both interventions effectively reduced body fat with comparable overall outcomes.

Keywords: Body fat; intermittent fasting; overweight men; physical exercise

1. Introduction

Overweight is a growing global health concern and a critical precursor to obesity, a condition now classified as a multisystem disease (Garvey & Mechanick, 2020; Sarma et al., 2021). Individuals with overweight status face elevated risks of developing metabolic complications, including insulin resistance, dyslipidemia, hypertension, and cardiovascular disease, which intensify significantly if overweight progresses to obesity (Khalafi et al., 2024). In Indonesia, the prevalence of overweight and obesity continues to rise, with national health data indicating an urgent need for early intervention strategies to prevent this progression (Kementrian Kesehatan RI, 2023; Nugraha, 2022). Therefore, targeting body fat reduction at the overweight stage is essential to mitigating long-term health risks before the onset of obesity-related complications (Harris et al., 2018).

A primary contributor to excess body fat accumulation is energy imbalance resulting from high-calorie diets (Pudjijuniarto et al., 2024) and insufficient physical activity (Cena & Calder, 2020; Conde-Pipó et al., 2024; Khalafi et al., 2024). Physical exercise encompassing aerobic modalities such as jogging and anaerobic modalities such as weight training (WT) has been shown to effectively reduce body fat when combined with dietary regulation (Hita, 2020; Jia et al., 2022; Nugraha et al., 2020; Park et al., 2020; Zouhal et al., 2020). Among dietary strategies, intermittent fasting (IF) has gained considerable attention due to its effectiveness in reducing body weight by more than 5% and improving metabolic health markers in overweight and obese populations (Naous & Achkar, 2023; Varady et al., 2021). Research further confirms that IF is more effective when combined with physical exercise: (Khalafi et al., 2024) demonstrated that combining exercise training with IF yields superior improvements in body composition compared to either intervention alone, while (Gabel et al., 2025) highlighted the synergistic metabolic benefits of this combination.

Although previous studies have demonstrated the beneficial effects of intermittent fasting (IF) and exercise on body composition, evidence directly comparing aerobic and resistance-based exercise under equivalent dietary conditions remains limited (Domaszewski et al., 2020; Khalafi et al., 2024; Naous & Achkar, 2023). Existing research has predominantly investigated aerobic or resistance training separately in combination with IF, making it difficult to determine which exercise modality provides greater benefits for body fat reduction when paired with the same fasting and calorie-restriction protocol. Consequently, the relative effectiveness of these interventions in overweight young men remains unclear, highlighting the need for direct comparative studies to inform evidence-based exercise prescriptions.

Therefore, this study aims to examine the effects of combining aerobic exercise with IF, combining anaerobic exercise with IF, and comparing the effectiveness of both methods in reducing body fat levels among overweight male university students. More specifically, this study focuses on three main research questions, namely: (1) how does the combination of jogging and IF affect body fat levels, (2) how does the combination of WT and IF affect body fat levels, and (3) is there a significant difference in the effect between the combination of jogging + IF and WT + IF in reducing body fat levels?

2. Method

Design and Participants

This quasi-experimental study was conducted at a university in Bandung, Indonesia. Eligible participants were male university students aged 19–21 years with a body mass index (BMI) > 27 kg/m² that had been maintained for at least six months. Participants were also required to voluntarily register through a Google Form and attend at least 90% of the prescribed training sessions to be included in the final analysis.

A total of 72 students expressed interest in participating. Following eligibility screening, 32 individuals were excluded: 14 were female, 12 had not maintained a BMI > 27 kg/m² for at least six months, and six were younger than 19 years. Consequently, 40 participants met the inclusion criteria and were enrolled in the study. Participants were randomly allocated using a simple randomisation procedure into two intervention groups. Group 1 received a jogging programme combined with intermittent fasting (IF), whereas Group 2 received a weight training (WT) programme combined with IF. Both interventions were conducted for four consecutive weeks. During the intervention period, six participants failed to complete at least 90% of the scheduled training sessions and were excluded from the final analysis. Consequently, data from 34 participants (17 per group) were analysed.

Because this study was exploratory, no a priori sample size or statistical power calculation was performed. The relatively small final sample should therefore be considered a limitation, and the findings should be interpreted with appropriate caution.

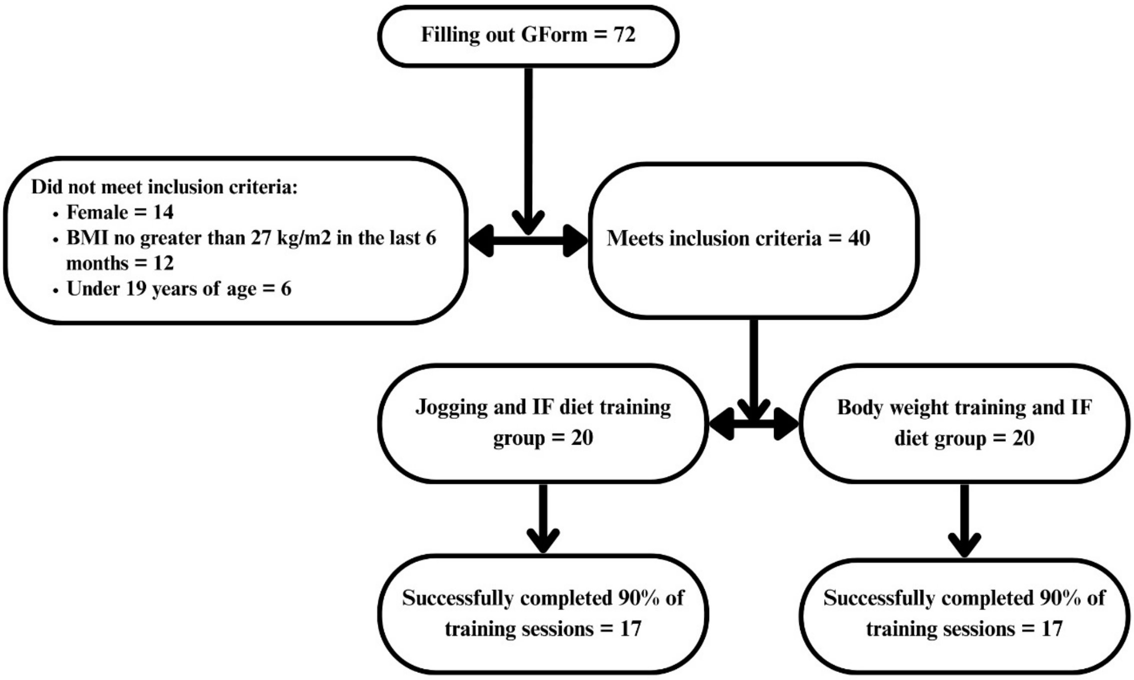

Figure 1. Research Participant Screening Process

Procedure

This study employs a two-group pretest-posttest design. This study will divide participants into two groups: one given aerobic (cardio) exercise and an IF diet, and the other given anaerobic (body weight training) exercise and an IF diet. Before the pretest data collection, participants first fill out a consent form. Participants who agreed and were ready to be sampled in this study then underwent data collection twice, namely at the pretest and posttest. The data was collected using the InBody Test by the researcher, assisted by a laboratory assistant. The time interval between the pretest and posttest data collection was 4 weeks. The research flow is simply illustrated in Figure 2.

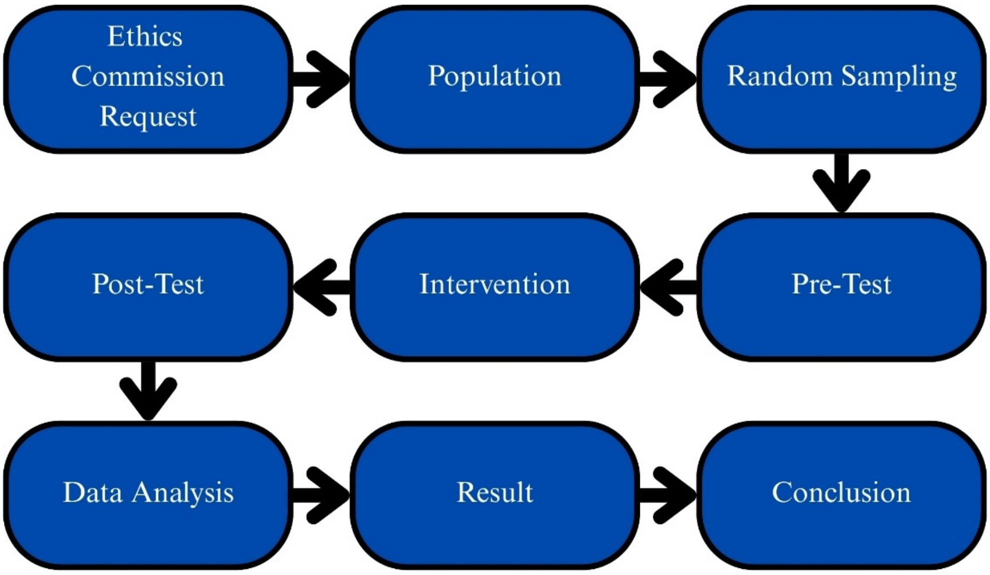

Figure 2. Flow Chart Research

Instrument

Body fat levels were measured using the InBody 270 multi-frequency bioelectrical impedance analysis (BIA) device (Biospace, California, USA). The InBody 270 is a non-invasive, portable body composition analyzer that uses multi-frequency electrical currents through eight contact electrodes across five body segments to estimate body composition parameters, including body fat mass, lean body mass, and total body water. Previous validation studies have confirmed its accuracy and reliability: (Larsen et al., 2021) reported nearly perfect correlations (r = 0.97-0.99) and excellent inter-device reliability (ICC = 0.98-1.00) when compared to dual-energy X-ray absorptiometry (DEXA) as the criterion standard. Similarly, (McLester et al., 2020) demonstrated that InBody analyzers produce high intraclass correlation coefficients (ICC ≥ 0.98 for body fat percentage) and small individual error, supporting their use as a practical surrogate when DEXA is not available. All measurements were conducted by the researcher with assistance from a trained laboratory assistant, following standardized procedures during both the pre-test and post-test assessments. The InBody 270 device is shown in Figure 3.

Figure 3. In Body Test

Exercise Program

The intervention was conducted over four weeks, with participants completing three to four exercise sessions per week. The aerobic exercise programme consisted of jogging with progressive variations, including slow-paced running, interval running, and moderate-distance walking. The resistance exercise programme comprised weight training (WT) using dumbbells and bodyweight exercises, including squats, lunges, push-ups, rows, shoulder presses, crunches, and circuit-based movements such as jumping jacks, mountain climbers, plank jacks, squat jumps, and burpees.

Each training session began with a 5–10-minute warm-up consisting of light cardiovascular activity and dynamic stretching, followed by a 5–10-minute cool-down incorporating static stretching. Exercise intensity and training load were individually adjusted according to each participant's fitness level and progressively increased throughout the intervention to ensure progressive overload while minimising injury risk. Rest days were scheduled between training sessions to facilitate recovery.

All exercise sessions were performed during the fasting period and completed before iftar (the evening meal used to break the fast). In addition to the exercise intervention, participants followed an intermittent fasting (IF) protocol combined with a daily energy restriction of 300–500 kcal below their estimated energy requirements. Individual energy requirements were calculated using the Harris–Benedict equation to estimate basal metabolic rate (BMR) (Figure 4), after which the prescribed caloric deficit was applied. Adherence to the dietary protocol was monitored throughout the intervention using the Red Secret mobile application.

$$BMR = 66.5 + (13.75 \times \text{weight (kg)}) + (5.003 \times \text{height (cm)}) - (6.75 \times \text{age (years)})$$

Figure 4. Harris Benedict Equation for calculating BMR in men

Statistical Analysis

The data obtained in this study were first analyzed descriptively to describe the initial characteristics of each variable studied. After that, normality tests (Shapiro-Wilk) were conducted as a prerequisite for parametric statistical analysis, and homogeneity of variances was assessed using Levene's test. If the data met the normality assumption, the analysis was continued with a paired sample t-test to determine significant differences between the pretest and posttest results in each group. Furthermore, to determine the difference in mean results between groups, an independent sample t-test was used on the posttest data. When the assumption of equal variances was violated (Levene's test $p < 0.05$), Welch's t-test (equal variances not assumed) was applied. The significance level was set at $\alpha = 0.05$ ($p < 0.05$) for all statistical tests. Effect sizes were calculated using Cohen's d to assess the practical significance of the findings. Additionally, the mean difference and percentage change were computed to evaluate the magnitude and relative proportion of body fat reduction within each group.

3. Result

Based on the results of descriptive analysis (Table 1), it can be seen that the average body fat level in the jogging group before treatment was 27.18 with a standard deviation of 1.21, then decreased to 23.65 with a standard deviation of 1.33 after treatment. This shows a fairly consistent decrease in body fat levels after the jogging exercise intervention combined with IF. In the WT group, the average body fat level before treatment was 27.62 with a standard deviation of 0.69, then decreased to 24.42 with a standard deviation of 0.79 after treatment. These data show that both jogging and WT combined with IF diets equally reduce body fat levels in overweight men.

The Shapiro-Wilk normality test showed that all data, both in the jogging and WT groups, had a significance value above 0.05 ($p > 0.05$) (Table 1). This value indicates that the distribution of data in all groups, both pre-test and post-test, was normally distributed. However, Levene's test for equality of variances indicated that the assumption of homogeneity was violated for both the pretest ($p = 0.019$) and posttest ($p = 0.025$) data. Consequently, the independent t-test results were interpreted using the "equal variances not assumed" (Welch's t-test) output.

Table 1. Descriptive statistic, normality test and homogenity

Group	N	Min	Max	Mean ± SD	Shapiro-Wilk	Levene's test
Ex pre group 1	17	24.8	29.1	27.18 ± 1.21	0.78	0.019
Ex pre group 2	17	26.4	28.7	27.62 ± 0.69	0.545	
Ex post group 1	17	21.5	26	23.65 ± 1.33	0.398	0.025
Ex post group 2	17	22.9	25.5	24.42 ± 0.79	0.298	

The descriptive analysis results show that the mean difference (Table 2) in the Jogging group has a higher average (3.52 ± 0.37) than the WT group (3.20 ± 0.23), corresponding to a percentage change of 12.96% and 11.59%, respectively. The range of mean difference values in the Jogging group was between 3.00 and 4.20, while in the WT group it was between 2.80 and 3.70. These findings indicate that, on average, the jogging group experienced a greater absolute and proportional reduction in body fat compared to the WT group, although both groups showed consistent improvement, as reflected in the relatively small standard deviation.

Table 2. Descriptive statistics of mean difference and percentage change

Group	N	Minimum	Maximum	Mean ± SD	Percentage Change
Jogging	17	3	4.2	3.52 ± 0.37	12.96
Weight training (WT)	17	2.8	3.7	3.20 ± 0.23	11.59

The results of the Welch's independent t-test (Table 3) showed no statistically significant difference between the two groups in the post-test (t = -2.039, df = 26.130, p = 0.052). Although the jogging group (23.65 ± 1.33) achieved a lower post-test body fat level and a greater mean reduction (3.52) compared to the WT group (24.42 ± 0.79; mean reduction = 3.20), this difference did not reach statistical significance at the α = 0.05 level. The effect size analysis revealed a Cohen's d of -0.699, indicating a medium-to-large practical effect, suggesting that the observed difference may hold practical relevance despite not achieving statistical significance.

In addition, the paired sample t-test showed a significant decrease in body fat within each group after the intervention (Table 3). In the jogging group, the average body fat level decreased from 27.18 ± 1.21 to 23.65 ± 1.33 (t = 39.443, p < 0.001), with a very strong pre-post correlation (r = 0.962, p < 0.001). Similarly, the WT group showed a decrease from 27.62 ± 0.69 to 24.42 ± 0.79 (t = 56.259, p < 0.001), also with a very strong pre-post correlation (r = 0.959, p < 0.001). The effect sizes for both paired comparisons were very large (Cohen's d = 9.566 for jogging; Cohen's d = 13.645 for WT), confirming that both exercise methods combined with IF are highly effective in reducing body fat levels.

Table 1. Hypothesis test

Test	Group / Stage	Pre-test Mean ± SD	Post-test Mean ± SD	t	df	p (two-tailed)	Cohen's d
Welch's Independent t-Test	Jogging vs WT (Post)	-	23.65 ± 1.33 vs 24.42 ± 0.79	-2.039	26.13	0.052	-0.699
Paired t-Test	Jogging	27.18 ± 1.21	23.65 ± 1.33	39.443	16	< 0.001	9.566
Paired t-Test	WT	27.62 ± 0.69	24.42 ± 0.79	56.259	16	< 0.001	13.645

4. Discussion

Jogging Combined with IF for Body Fat Reduction

The results of the study show that jogging combined with intermittent fasting (IF) significantly reduced body fat levels in the participant group (p < 0.001), with an average decrease from 27.18 ± 1.21 to 23.65 ± 1.33. These findings confirm that aerobic activities such as jogging are effective in mobilizing and oxidizing body fat, especially when combined with metabolic conditions influenced by fasting. During fasting, glucose levels and glycogen reserves in the body are relatively low, causing the body to switch more quickly to fat oxidation as its primary energy source. This mechanism is known as metabolic switching, where the body utilizes free fatty acids and ketones in conditions of energy deficit (Mattson et al., 2018).

Previous studies also support these findings. For example, a study by (Moro et al., 2016) found that combining intermittent fasting with aerobic exercise can increase fat-free mass and significantly reduce body fat mass compared to aerobic exercise alone. Additionally, (Kazeminasab et al., 2024) reported that moderate-intensity aerobic exercise, such as jogging, effectively improves body composition, reduces body mass index (BMI), and improves lipid profiles in adults. (Varady et al., 2021) also emphasized that IF plays an important role in creating a calorie deficit without reducing metabolic function, so when combined with physical exercise, it will have a synergistic effect on reducing body fat. Thus, the combination of jogging and IF not only results in more significant body fat reduction but also improves the metabolic health, insulin sensitivity, and cardiovascular capacity of participants.

Weight Training with IF for Body Fat Reduction

WT combined with intermittent fasting (IF) also showed a significant reduction in body fat levels ($p < 0.001$), with an average change from 27.62 ± 0.69 to 24.42 ± 0.79. Although WT is primarily known as an exercise for increasing muscle mass, in the context of IF, this exercise has been shown to have a dual effect: reducing fat mass while maintaining or even increasing fat-free mass. The main mechanism underlying this is an increase in resting energy expenditure (REE) due to muscle adaptation to resistance, so that the body burns more energy even at rest (Phillips & Winett, 2010). Additionally, under fasting conditions, increased activity of growth hormone and norepinephrine further accelerates lipolysis, which in turn facilitates fat oxidation during and after WT sessions.

These findings are supported by research from (Ashtary-Larky et al., 2021), which reported that combining IF with resistance training is more effective than a non-IF diet in reducing body fat percentage while maintaining muscle mass. Similar results were shown by (Tinsley et al., 2019), who found that individuals undergoing resistance training within a time-restricted feeding pattern experienced significant fat mass reduction while maintaining muscle strength. A recent study by (Dai et al., 2025) also showed that integrating IF with resistance training consistently reduces visceral fat, a major risk factor for metabolic diseases, thus providing long-term benefits for cardiometabolic health. Thus, the combination of WT and IF is not only effective for reducing body fat but also has the advantage of maintaining a healthy body composition, particularly in preserving muscle mass, which is often lost in weight loss interventions based solely on aerobic exercise or strict dieting.

Comparison of the Effectiveness of Jogging + IF and Weight Training + IF on Body Fat Reduction

The results of this study indicate that both Jogging + IF and WT + IF were effective in significantly reducing body fat levels ($p < 0.001$ in each group). However, a comparison between groups using Welch's independent t-test revealed no statistically significant difference in post-test body fat levels ($t = -2.039$, $df = 26.130$, $p = 0.052$). Welch's correction was applied because Levene's test indicated unequal variances between the two groups ($p = 0.025$).

Descriptively, the jogging group demonstrated a greater mean reduction in body fat (3.52 ± 0.37) compared to the WT group (3.20 ± 0.23), corresponding to percentage changes of 12.96% and 11.59%, respectively. Furthermore, the jogging group achieved a lower post-test body fat level (23.65 ± 1.33) compared to the WT group (24.42 ± 0.79). Although these differences did not reach statistical significance, the effect size analysis (Cohen's $d = -0.699$) indicated a medium-to-large practical effect, suggesting that the observed difference may be meaningful in practical terms and warrants further investigation with larger sample sizes.

This pattern can be explained by the distinct physiological mechanisms underlying each exercise modality. Jogging as an aerobic activity tends to increase acute energy expenditure through calorie burning during the activity, thus providing a direct and immediate effect on energy deficit. Conversely, WT provides an additional effect in the form of an increase in basal metabolic rate (BMR) through the formation and maintenance of muscle mass, so that even though energy expenditure during exercise may be lower than jogging, the long-term effects on metabolism are more prominent (Bellicha et al., 2021; Stavres et al., 2018; Yu et al., 2021).

Previous studies support these differences in characteristics. (Lafontant et al., 2025) in a systematic review stated that aerobic and resistance interventions, both when combined with a diet such as IF, are effective in reducing body fat, although the mechanisms are different: aerobic dominates through direct energy burning, while resistance dominates through increased post-exercise metabolism. (Tinsley & La Bounty, 2015) also emphasize that IF combined with resistance training is superior in preserving muscle mass and reducing visceral fat compared to aerobic exercise alone. Therefore, these findings reinforce the argument that no single method is absolutely superior; rather, both methods are comparably effective, and strategic choices can be tailored to individual goals. For individuals focused on rapid calorie burning and improving cardiovascular fitness, the combination of Jogging + IF may be more relevant. Meanwhile, for those aiming to reduce fat while preserving muscle mass and enhancing basal metabolism, WT + IF may be the more appropriate choice.

5. Conclusion and Recommendation

This study concluded that the combination of IF with physical activity, both aerobic (jogging) and anaerobic (WT), effectively reduced body fat levels significantly in overweight men ($p < 0.001$ for both groups), with no statistically significant difference between the two methods ($p = 0.052$). Although the jogging group showed a slightly greater mean reduction (3.52 vs. 3.20) and percentage change (12.96% vs. 11.59%), the between-group difference did not reach statistical significance, indicating that both approaches are comparably effective. Nevertheless, the medium-to-large effect size (Cohen's $d = -0.699$) suggests potential practical relevance that merits further investigation. These findings confirm that a strategy combining diet management with physical exercise can be a practical approach to body composition management. However, given the limitations of the study, such as the small sample size ($n = 34$) without a priori power analysis, the short intervention duration of four weeks, and subjects limited to young overweight men, further research is recommended to expand the population to include diverse age groups, genders, and health statuses, extend the intervention duration, and add physiological analyses such as hormone profiles, energy metabolism, and changes in muscle mass. Thus, future research results are expected to provide a more comprehensive understanding and strengthen the scientific basis for the application of IF combined with various types of physical exercise as an effective strategy for body fat management and improved metabolic health.

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Conflict of interest

The authors declare that there are no conflicts of interest regarding the publication of this study.

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