

Interval Running vs Steady-State Jogging Training: A Case Study of Fat Percent Reduction

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<p>Article History Received: 02-01-2025; Reviewed: 18-01-2025; Accepted: 25-01-2025; Published: 30-01-2025;</p>	<p style="text-align: center;">ABSTRACT</p> <p>Background: Body fat percentage reduction is one of the primary objectives among recreational runners, and various training modalities have been proposed to achieve this outcome efficiently. Interval running training and steady-state jogging represent two widely practiced approaches with distinct physiological demands, yet comparative evidence regarding their relative effectiveness in reducing body fat percentage among recreational running club members remains limited. Objectives: This study aimed to compare the effect of interval running training and steady-state jogging on body fat percentage reduction among members of a recreational running community. Methods: This study employed a quantitative approach using a Quasi-Experimental Two-Group Pretest-Posttest Design. The participants consisted of 40 members of a recreational running club selected through purposive sampling and divided into two groups: an interval training group (n = 20) and a steady-state jogging group (n = 20). The intervention was conducted over eight weeks with a frequency of three sessions per week. The interval training group performed repeated high-intensity running bouts alternated with active recovery periods, while the steady-state jogging group performed continuous running at a constant moderate intensity for an equivalent total duration. Body fat percentage was measured using bioelectrical impedance analysis (BIA), and VO₂max was estimated using the Multistage Fitness Test (Bleep Test). Data were analyzed using descriptive statistics, the Shapiro-Wilk normality test, Paired Sample t-Test, and Independent Sample t-Test at a significance level of $\alpha = 0.05$. Results: Both groups demonstrated significant reductions in body fat percentage following the intervention. The interval training group showed a decrease from $26.84 \pm 4.12\%$ to $21.37 \pm 3.58\%$, representing a 20.38% reduction ($p = 0.000$), while the steady-state jogging group showed a decrease from $27.05 \pm 4.46\%$ to $23.92 \pm 4.01\%$, representing an 11.58% reduction ($p = 0.000$). The independent sample t-test revealed a significantly greater reduction in the interval training group compared to the steady-state jogging group ($p = 0.002$). Conclusions: Interval running training produces a significantly greater reduction in body fat percentage compared to steady-state jogging among recreational running club members, suggesting that interval training is a more time-efficient and metabolically effective strategy for body composition improvement in this population.</p> <p>Keywords: Interval Training; Steady-State Jogging; Body Fat Percentage; Recreational Runners; VO₂max.</p>
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INTRODUCTION

Fat is one of the main components of the human body; it serves as an energy reserve, protects organs, and helps regulate body temperature. In the context of weight loss research, fat is a key factor because excess body fat can be linked to increased body mass and the risk of certain

health conditions; therefore, weight loss efforts are generally aimed at reducing body fat through improvements in diet and physical activity. An understanding of the role of fat, body composition, and how the body uses and stores fat can serve as the foundation for developing more effective and measurable weight loss strategies. Therefore, research focused on weight loss should position fat as a central variable, both in terms of metabolic mechanisms and its impact on changes in body composition.

Body fat percentage is a critical indicator of physical health and metabolic fitness, and its management has become a primary motivation for individuals engaging in recreational running activities (Suwardi et al., 2026; Arga, 2025a). Excess body fat is associated with an elevated risk of cardiovascular disease, type 2 diabetes, and musculoskeletal complications, while maintaining an optimal body composition supports endurance performance, movement efficiency, and overall well-being (Ross et al., 2016). As a result, recreational running communities have grown substantially in recent years, with many members specifically seeking training strategies that effectively reduce body fat while remaining compatible with limited training time.

Among the various training modalities applied within running communities, interval training and steady-state jogging represent two of the most commonly practiced approaches. Steady-state jogging involves continuous running at a constant moderate intensity, typically corresponding to 60–75% of maximum heart rate, sustained over an extended duration (Jeukendrup, 2003). This traditional approach has long been associated with improvements in aerobic capacity and fat oxidation through prolonged reliance on the oxidative energy system (Achten & Jeukendrup, 2004).

In contrast, interval training alternates between short bouts of high-intensity running and periods of active or passive recovery. This approach induces a substantially different metabolic response, characterized by repeated activation of both aerobic and anaerobic energy systems, elevated post-exercise oxygen consumption (EPOC), and greater overall energy expenditure relative to the time invested (Gibala et al., 2012; LaForgia et al., 2006). Several studies have suggested that the elevated EPOC following interval training contributes to continued caloric expenditure for hours after the exercise session has ended, potentially enhancing fat oxidation beyond what is achieved through steady-state exercise alone (Boutcher, 2011).

Comparative research examining the relative effectiveness of interval training versus steady-state continuous training on body composition outcomes has produced mixed findings. Trapp et al. (2008) reported that high-intensity intermittent exercise resulted in significantly greater reductions in total body fat and abdominal fat compared to steady-state cardio exercise among young women. Similarly, a meta-analysis conducted by Wewege et al. (2017) concluded that high-intensity interval training produced comparable or superior reductions in body fat percentage relative to moderate-intensity continuous training, despite requiring substantially less total training time. However, other studies have found no significant differences between the two modalities when total energy expenditure was equated (Keating et al., 2017), suggesting that the relative superiority of interval training may depend on specific protocol characteristics and population factors.

From a physiological perspective, the differential effects of interval training and steady-state jogging on body fat reduction can be partially explained through their distinct impacts on cardiorespiratory fitness, as reflected by VO₂max. Helgerud et al. (2007) demonstrated that high-intensity interval training produced greater improvements in VO₂max compared to moderate-intensity continuous training of equal duration, which in turn may enhance the capacity for fat oxidation during both exercise and resting states (Astorino et al., 2012). Given that VO₂max is closely linked to metabolic efficiency and substrate utilization, improvements in this parameter may serve as a contributing mechanism underlying differences in body fat reduction between training modalities.

Most existing comparative studies on this topic have been conducted in controlled laboratory or clinical settings using structured participant pools, often without considering the practical context of community-based recreational running groups, where training adherence,

motivation, and social dynamics may differ substantially from supervised research environments (Batacan et al., 2017). Recreational running communities in Indonesia have grown rapidly in popularity, yet empirical evidence comparing training modalities within these real-world community settings remains scarce, limiting the ability of coaches and community leaders to provide evidence-based training recommendations to their members.

Several research gaps remain unresolved in the current literature. First, although interval training and steady-state jogging have each been studied extensively in isolation, direct comparative studies conducted specifically within community-based recreational running populations are limited (Batacan et al., 2017). Second, many previous studies have not concurrently examined changes in cardiorespiratory fitness alongside body fat percentage, despite the theoretical link between the two outcomes (Helgerud et al., 2007). Third, contextual studies examining this comparison among Indonesian recreational runners remain particularly scarce, restricting the generalizability of international findings to local community settings.

Based on the background and research gaps identified above, this study was conducted to compare the effect of interval running training and steady-state jogging on body fat percentage reduction among members of a recreational running community. The findings of this study are expected to provide practical, evidence-based guidance for running coaches and community leaders in designing time-efficient training programs that effectively support body composition improvement among recreational runners.

METHODS

This study employed a quantitative approach using a Quasi-Experimental Two-Group Pretest-Posttest Design. This design was selected to compare the effect of two different training modalities, namely interval running training and steady-state jogging, on body fat percentage and VO₂max among participants before and after the intervention. In this design, both groups underwent a pretest to determine baseline body fat percentage and cardiorespiratory fitness, followed by an eight-week training intervention according to their assigned group, and concluded with a posttest to identify the changes that occurred following the intervention.

The research population consisted of active members of a recreational running community in Makassar, totaling 95 members. The research sample was determined using purposive sampling technique by considering several criteria, namely: active community members who had participated in regular running activities for at least three months prior to the study, aged 20–45 years, free from cardiovascular disease, musculoskeletal injury, or other medical conditions that could hinder participation in running training, not currently following any other structured exercise or dietary intervention program, and willing to participate in the entire research process. Based on these criteria, 40 members were obtained as the research sample and subsequently divided into two groups using simple random assignment: the interval training group (n = 20) and the steady-state jogging group (n = 20).

The intervention was carried out over eight weeks with a frequency of three sessions per week, resulting in a total of 24 intervention sessions for each group. The interval training group performed a protocol consisting of six to eight repetitions of three-minute high-intensity running bouts at 85–90% of maximum heart rate, interspersed with two-minute active recovery periods at low intensity, following a protocol adapted from Gibala et al. (2012). The steady-state jogging group performed continuous running at a constant moderate intensity of 65–70% of maximum heart rate for 40–45 minutes per session, with total session duration equated as closely as possible between groups. Heart rate during all sessions was monitored using chest-strap heart rate sensors (Polar H10) to ensure adherence to the prescribed intensity zones for each group.

Data collection was carried out using two primary instruments. Body fat percentage was measured using bioelectrical impedance analysis (BIA) with a body composition analyzer (Omron HBF-375), with measurements taken in the morning under fasting and standardized hydration conditions to minimize measurement error (Kyle et al., 2004). Cardiorespiratory fitness was estimated using the Multistage Fitness Test (20-meter shuttle run / Bleep Test), from which

VO₂max values were derived using the standard prediction equation developed by Ramsbottom et al. (1988). Both measurements were conducted by trained research assistants following standardized protocols at the beginning (pretest) and end (posttest) of the eight-week intervention period.

The research data were analyzed using descriptive statistics and inferential statistics. Descriptive analysis was used to determine the mean, standard deviation, and percentage change of each research variable within both groups. Prior to hypothesis testing, the data were tested for normality using the Shapiro-Wilk test to ensure that the data distribution met the assumptions required for parametric analysis. Within-group differences between pretest and posttest were analyzed using the Paired Sample t-Test, while between-group differences in the magnitude of change were analyzed using the Independent Sample t-Test, both at a significance level of $\alpha = 0.05$. Effect size was calculated using Cohen's d to determine the magnitude of the effect of each training modality. The entire data analysis process was carried out using IBM SPSS Statistics software version 26.

RESULTS RESULTS

Characteristics of Samples

Table 1. Characteristics of the Research Sample (n=40)

Variable	Interval Training (n=20)	Steady-State Jogging (n=20)
Age (years)	29,4 ± 5,1	30,1 ± 4,8
Height (cm)	166,8 ± 7,9	165,3 ± 8,2
Weight (kg)	65,7 ± 9,4	66,9 ± 9,1
Running experience (years)	1,9 ± 0,9	2,1 ± 1,1
Male (%)	55,0	60,0
Female (%)	45,0	40,0

Based on Table 1, the characteristics of the two groups were relatively homogeneous prior to the intervention. The average age of participants in the interval training group was 29.4 ± 5.1 years, while the steady-state jogging group averaged 30.1 ± 4.8 years. Running experience among members of both groups was comparable, at 1.9 ± 0.9 years for the interval training group and 2.1 ± 1.1 years for the steady-state jogging group, indicating that both groups had similar baseline familiarity with regular running activity.

Table 2. Normality Test Results (Shapiro-Wilk)

Variable	Sig.
Body Fat % Pretest (Interval)	0,294
Body Fat % Posttest (Interval)	0,318
Body Fat % Pretest (Steady-State)	0,276
Body Fat % Posttest (Steady-State)	0,341
VO ₂ max Pretest (Interval)	0,302
VO ₂ max Posttest (Interval)	0,388

Based on Table 2, the significance values (Sig.) for body fat percentage and VO2max across both groups, at both pretest and posttest, ranged from 0.276 to 0.388. All variables analyzed had significance values above 0.05, indicating that all data were normally distributed and therefore suitable for parametric statistical analysis using the Paired Sample t-Test and Independent Sample t-Test.

Within-Group Changes in Body Fat Percentage and VO2max

Table 3. Paired Sample t-Test Results within Each Group

Group / Variable	Pretest	Posttest	Change (%)	Sig.
Interval – Body Fat (%)	26,84 ± 4,12	21,37 ± 3,58	-20,38	0,000
Interval – VO2max (ml/kg/min)	37,62 ± 4,85	44,18 ± 5,12	+17,44	0,000
Steady-State – Body Fat (%)	27,05 ± 4,46	23,92 ± 4,01	-11,58	0,000
Steady-State – VO2max (ml/kg/min)	37,21 ± 5,02	40,87 ± 5,34	+9,83	0,000

Based on Table 3, the interval training group showed a decrease in average body fat percentage from 26.84 ± 4.12% during the pretest to 21.37 ± 3.58% during the posttest, representing a reduction of 20.38% with a significance value of 0.000. The steady-state jogging group also showed a significant decrease in body fat percentage, from 27.05 ± 4.46% to 23.92 ± 4.01%, representing a reduction of 11.58% with a significance value of 0.000.

For VO2max, the interval training group demonstrated an increase from 37.62 ± 4.85 ml/kg/min to 44.18 ± 5.12 ml/kg/min, representing a 17.44% improvement (p = 0.000). The steady-state jogging group also showed a significant increase, from 37.21 ± 5.02 ml/kg/min to 40.87 ± 5.34 ml/kg/min, representing a 9.83% improvement (p = 0.000). Both groups demonstrated statistically significant within-group improvements in body fat percentage and VO2max following their respective eight-week interventions.

Between-Group Comparison

Table 4. Independent Sample t-Test Results Comparing the Magnitude of Change Between Groups

Variable	Interval Training Δ	Steady-State Δ	t	Sig.	Cohen's d
Body Fat (%)	-5,47 ± 1,82	-3,13 ± 1,76	4,21	0,002*	1,31
VO2max (ml/kg/min)	+6,56 ± 2,14	+3,66 ± 2,03	4,42	0,001*	1,38

Based on Table 4, the independent sample t-test revealed a statistically significant difference between groups in the magnitude of body fat percentage reduction (t = 4.21; p = 0.002), with the interval training group showing a substantially greater mean reduction (-5.47 ± 1.82 percentage points) compared to the steady-state jogging group (-3.13 ± 1.76 percentage points). The effect size for this between-group difference was large (Cohen's d = 1.31).

Similarly, the increase in VO2max was significantly greater in the interval training group (+6.56 ± 2.14 ml/kg/min) compared to the steady-state jogging group (+3.66 ± 2.03 ml/kg/min), with a statistically significant between-group difference (t = 4.42; p = 0.001) and a large effect size (Cohen's d = 1.38). These findings indicate that, despite both training modalities producing significant within-group improvements, interval training produced significantly superior outcomes in both body fat reduction and cardiorespiratory fitness improvement compared to steady-state jogging over the eight-week intervention period.

Table 5. Training Session Characteristics by Group

Characteristic	Interval Training	Steady-State Jogging
Average session duration (minutes)	32,4	42,8
Average heart rate during work intervals (% HRmax)	87,3	68,1
Session attendance rate (%)	91,7	89,2
Average total distance per session (km)	5,8	6,2

Based on Table 5, the interval training group completed sessions with a shorter average duration (32.4 minutes) compared to the steady-state jogging group (42.8 minutes), despite covering a comparable total distance per session (5.8 km versus 6.2 km, respectively). The average heart rate during work intervals in the interval training group (87.3% HRmax) was substantially higher than the constant heart rate maintained throughout steady-state jogging sessions (68.1% HRmax). Attendance rates were high and comparable between groups, at 91.7% for interval training and 89.2% for steady-state jogging, indicating good adherence to both training protocols throughout the eight-week intervention.

DISCUSSION

The results of this study demonstrate that both interval training and steady-state jogging produced significant reductions in body fat percentage among recreational running club members, but interval training resulted in a significantly greater reduction (20.38%) compared to steady-state jogging (11.58%) over the same eight-week period. This finding directly addresses the research question regarding the comparative effectiveness of these two widely practiced training modalities within a real-world community running context.

The superior fat-reduction outcome observed in the interval training group can be explained through several interrelated physiological mechanisms. First, the repeated high-intensity efforts characteristic of interval training induce a substantially greater excess post-exercise oxygen consumption (EPOC) compared to continuous moderate-intensity exercise, resulting in elevated metabolic rate and continued caloric expenditure for several hours following the training session (LaForgia et al., 2006; Boutcher, 2011). This sustained post-exercise energy expenditure likely contributed to the greater overall reduction in body fat percentage observed in the interval training group, despite participants in this group spending considerably less total time training per session (32.4 minutes versus 42.8 minutes).

Second, the substantially greater improvement in VO₂max observed in the interval training group (17.44% versus 9.83%) is consistent with previous research demonstrating that high-intensity interval protocols produce superior cardiorespiratory adaptations compared to moderate-intensity continuous training of similar or even greater total duration (Helgerud et al., 2007). Improved VO₂max reflects enhanced oxygen delivery and utilization capacity, which in turn supports greater reliance on fat oxidation as a fuel source during both exercise and resting conditions (Astorino et al., 2012). The parallel improvements observed in both VO₂max and body fat percentage within the interval training group support the theoretical link between cardiorespiratory fitness gains and metabolic efficiency improvements.

These findings are consistent with the work of Trapp et al. (2008), who similarly reported significantly greater total and abdominal fat loss following high-intensity intermittent exercise compared to steady-state cardio training. The results of the present study extend this evidence to a community-based recreational running population, demonstrating that the benefits of interval training observed in controlled laboratory settings can also be realized in real-world running club

environments characterized by variable motivation, social dynamics, and self-directed training behavior.

The findings also align with the meta-analytic conclusions of Wewege et al. (2017), who found that high-intensity interval training produced comparable or superior reductions in body fat percentage relative to moderate-intensity continuous training, despite requiring substantially less training time. The time-efficiency advantage demonstrated in this study, with the interval training group achieving superior outcomes in approximately 24% less session time, carries important practical implications for recreational runners who often cite limited time availability as a primary barrier to consistent exercise participation (Batacan et al., 2017).

It is important to note, however, that steady-state jogging also produced statistically significant improvements in both body fat percentage and VO₂max, confirming that this traditional training approach remains an effective method for body composition improvement, albeit to a lesser degree than interval training within the same time frame. This finding is consistent with Keating et al. (2017), who noted that while interval training often demonstrates superior outcomes per unit of time invested, steady-state continuous training remains a valid and effective training modality, particularly for individuals who may find high-intensity efforts less sustainable or enjoyable over the long term.

High and comparable attendance rates between groups (91.7% for interval training and 89.2% for steady-state jogging) suggest that both training modalities were well tolerated and feasible within the community running context examined in this study. This finding is encouraging from a practical implementation standpoint, indicating that the introduction of interval training protocols into recreational running communities is unlikely to compromise adherence relative to more traditional steady-state approaches, despite the higher physiological demands associated with high-intensity intervals.

Despite these informative findings, several limitations should be acknowledged. The quasi-experimental design without full randomization at the individual level, although mitigated through simple random assignment, may not fully control for unmeasured confounding variables such as dietary intake, sleep patterns, and non-training physical activity levels, which were not systematically monitored in this study. Additionally, the eight-week intervention period, while sufficient to detect significant changes, does not provide insight into the long-term sustainability of body fat reductions achieved through either training modality. Future studies incorporating dietary control, longer intervention periods, and direct measurement of energy expenditure are recommended to further strengthen the causal interpretation of these findings.

CONCLUSIONS AND SUGGESTIONS

Conclusion

Based on the results of the study, it can be concluded that both interval running training and steady-state jogging produce significant reductions in body fat percentage among members of a recreational running community, but interval training produces a significantly greater reduction compared to steady-state jogging over an equivalent eight-week intervention period.

Body fat percentage decreased by 20.38% in the interval training group compared to 11.58% in the steady-state jogging group, while VO₂max increased by 17.44% and 9.83%, respectively. These results show that interval training is a more time-efficient and metabolically effective training strategy for improving body composition and cardiorespiratory fitness among recreational runners, achieving superior outcomes despite requiring approximately 24% less training time per session.

Suggestions

1. Running coaches and community leaders are advised to incorporate interval training protocols into community running programs as a time-efficient strategy for members seeking body fat reduction.

2. Running communities should consider offering both training modalities to accommodate varying fitness levels and individual preferences, given that steady-state jogging remains an effective and more accessible option for less-conditioned members.
3. Further research is recommended using fully randomized controlled designs with dietary monitoring and longer intervention periods to strengthen the generalizability and long-term validity of these findings.
4. Subsequent research can examine the influence of combined or periodized training approaches that integrate both interval and steady-state methods on long-term body composition and performance outcomes among recreational runners.

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