

Comparison Between Regular Exercise and Calorie Deficit in Achieving Sustainable Weight Loss: An Article Review

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ABSTRACT

This review examines the comparative effectiveness of regular exercise and calorie deficit strategies in achieving sustainable weight loss among overweight/obese individuals. A literature search was conducted using ScienceDirect, PubMed and Google Scholar for relevant studies published between 2014 and 2024. Of the 14 articles initially identified, 11 met the inclusion criteria for this analysis. The reviewed interventions included various forms of regular exercise such as aerobic, resistance and low-intensity activities as well as calorie deficit approaches, including continuous calorie restriction, intermittent calorie restriction, time-restricted eating and very low-calorie diets. Overall, both strategies demonstrated consistent positive effects on weight reduction. While each method showed distinct benefits, modest evidence suggests that combining regular exercise with calorie restriction may yield greater improvements in body weight and waist circumference. These findings highlight the potential of integrated approaches tailored to individual needs in supporting long-term weight management.

1. Introduction

The complexity of obesity lies in its multifactorial etiology, involving the interaction of multiple contributing factors. The worldwide prevalence of overweight and obesity has doubled since 1980 to the extent that nearly a third of the world's population is now classified as overweight or obese [1]. Obesity rates have been rising across all ages groups and gender, regardless of where people live, their ethnic backgrounds or their financial situations. However, older adults and women do have a trend of higher obesity rates. For younger individuals, obesity also significantly increases the risk of cardiovascular issues later in life [2].

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Obesity can be managed through every day behavioural changes involving energy intake and energy expenditure. Regular exercise is strongly linked to body weight and fat loss, maintaining weight and fat reduction and improving metabolic fitness in obesity [2]. An effective exercise program should promote a significant calorie deficit, encourage long-term adherence and contribute positively to overall health [3]. In this context, endurance training has been shown to be more effective than resistance training or high-intensity interval training. The primary challenge in managing obesity is maintaining weight loss, since weight regain is highly prevalent. There is consistent evidence that higher levels of physical activity are associated with improved weight loss maintenance over the long term [4].

Weight loss is primarily achieved through lifestyle modification, with daily caloric restriction, a frequently used primary strategy in obese individuals. However, most clinical trials investigating dietary interventions report only modest mean weight loss (typically <5%) at 12 months and sustaining weight loss over the long term continues to be a significant challenge. As a result, finding alternative, feasible and sustainable weight loss strategies is of critical importance to public health [5].

2. Methodology

2.1 Research Design

The aim of this review article was to analyse studies published between 2014 and 2024 that explored the effects of physical activity and calorie deficit strategies on weight loss in overweight individuals. A comprehensive literature search was carried out using three major electronic databases: Google Scholar, ScienceDirect and PubMed. Studies were selected based on predefined inclusion and exclusion criteria to ensure relevance, quality and alignment with the review's objectives.

2.2 Eligibility Criteria

The review included studies with participants aged 18 to 40, representing either the general adult population or university students. Studies that met the criteria focused on healthy individuals or those who were overweight or obese without any chronic illnesses. Weight loss and sustainability, especially sustaining weight loss over time, were the key topics of discussion. The included studies assessed outcomes related to body weight, body composition and adherence to the intervention protocols. To ensure the relevance of the results, only English-language publications published within ten years (2014–2024) were taken into consideration. Exclusion criteria included studies involving children or adolescents (under 18 years old). Studies that used pharmaceutical or surgical methods for weight loss were not included. In addition, research focusing only on behavioural or psychological aspects without quantitative data on weight loss was also excluded. Editorials, case reports, commentaries, non–peer-reviewed articles, studies not published in English and articles without full-text availability in the selected databases were excluded.

2.3 Search Strategy

A literature search was conducted using three electronic databases: Google Scholar, PubMed and ScienceDirect, focusing on studies published between 2014 and 2024. A total of 14 articles were initially identified: 7 from Google Scholar, 5 from PubMed and 2 from ScienceDirect. Of which, 3 articles were excluded: one was a systematic review and two implemented interventions unrelated

to calorie restriction or exercise-based weight loss approaches. Ultimately, 11 articles met the eligibility criteria and were included in this review. The selection process is summarized in the flow diagram (Figure 1).

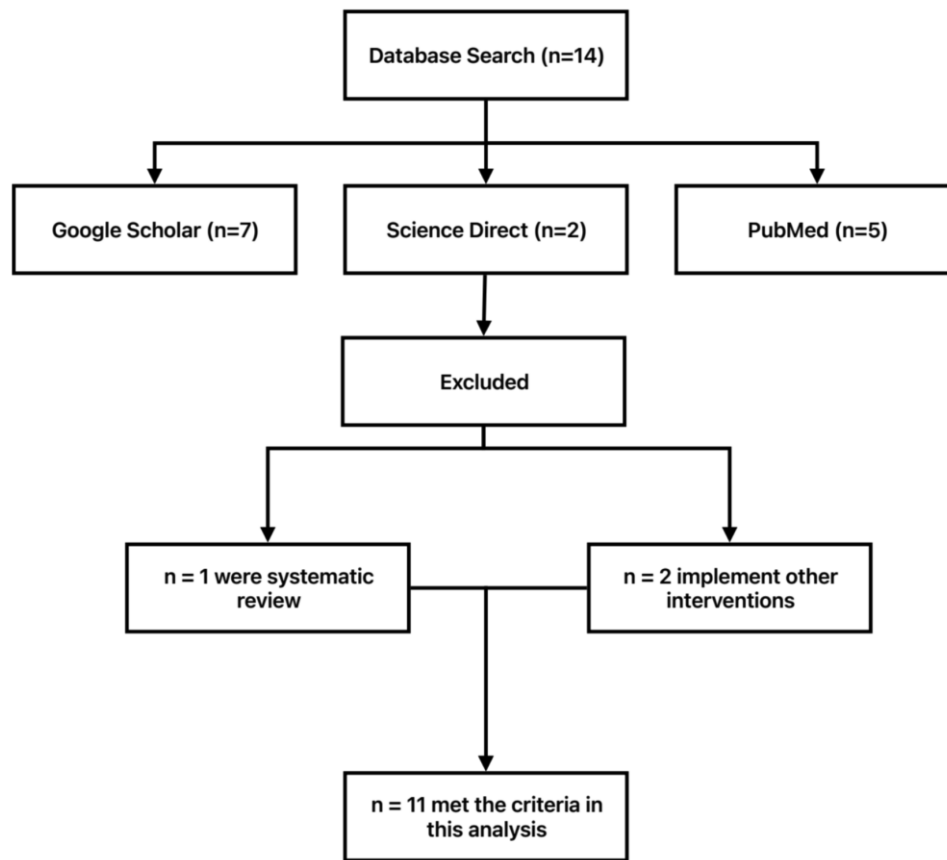


Fig. 1. Review screening process

3. Results

The results are categorized into three main groups: regular exercise interventions, calorie deficit strategies and combined exercise and caloric deficit strategies (Table 1).

3.1 Regular Exercise Interventions

The reviewed studies consistently showed that various forms of exercise, including aerobic, resistance, high-intensity and low-intensity exercises, are effective in promoting weight loss and improving body composition. Flack *et al.*, [6] reported that individuals who engaged in six aerobic sessions per week achieved greater energy expenditure and more significant fat loss than those who were less active or sedentary, emphasizing the dose-response relationship between exercise frequency and fat reduction.

Villareal *et al.*, [7] supported this finding by showing that older adults who participated in aerobic exercise programs experienced notable decreases in both body weight and fat mass. Interestingly, Villareal *et al.*, [7] highlighted that resistance training produced similar reductions in body weight as aerobic training, while additionally preserving lean muscle mass, making it particularly beneficial for aging populations concerned with muscle loss. Berge *et al.*, [8] added that incorporating high-intensity interval training (HIIT) into resistance training regimens led to more substantial weight loss

than moderate-intensity continuous training (MICT), suggesting that increasing training intensity can optimize fat loss outcomes. Furthermore, low-intensity exercises also proved effective; Hui *et al.*, [9] demonstrated that practices such as Tai Chi and brisk walking led to reductions in body weight, fat mass and waist circumference. These findings indicate that even gentle physical activities can contribute significantly to weight management, particularly among populations with limited mobility or exercise tolerance. Overall, the evidence underscores the importance of both the type and intensity of exercise in achieving sustainable weight loss.

Table 1

Summary of reviewed articles on efficacy of exercise on body composition

Author & participants	Intervention/Methods	Results/Outcomes
Flack <i>et al.</i> , [6] N = 43 Overweight & obese adults (18–40 yrs)	12-week aerobic exercise: <ul style="list-style-type: none"> 6 sessions/week (n=19) 2 sessions/week (n=20) Sedentary control (n=4) 	<ul style="list-style-type: none"> 6-session group expended more energy (2753.5 kcal/week) and exercised longer (320.5 min/week) than 2-session group. Greater fat loss observed in 6-session group ($p < 0.05$).
Villareal <i>et al.</i> , [7] N = 160 Obese, sedentary older adults (≥ 65 yrs)	6-month program: <ul style="list-style-type: none"> Control (n=40) Aerobic Exercise (n=40) Resistance Exercise (n=40) Combined Aerobic + Resistance (n=40) <p>*All participated in weight-management program*</p>	<ul style="list-style-type: none"> Significant weight loss in all 3 exercise groups ($p < 0.05$): <ul style="list-style-type: none"> - Aerobic: -9.0 ± 0.6 kg - Resistance: -8.5 ± 0.5 kg - Combined: -8.5 ± 0.5 kg Control: -0.9 ± 0.5 kg (not significant)
Flack <i>et al.</i> , [10] N = 52 Sedentary, overweight or obese adults	12-week aerobic program: <ul style="list-style-type: none"> Two-Session Group (n=20): 2x/week at 1,000 kcal/session Six-Session Group (n=19): 6x/week at 400 kcal/session Sedentary Control (n=14) 	<ul style="list-style-type: none"> Body Fat Mass: <ul style="list-style-type: none"> - Two-Session: $\downarrow 0.64 \pm 0.95$ kg ($p < 0.05$ vs control) - Six-Session: $\downarrow 1.82 \pm 1.51$ kg ($p < 0.05$ vs baseline & control) - Control: $\uparrow 0.98 \pm 2.62$ kg No significant differences in Fat-Free Mass across groups.
Berge <i>et al.</i> , [8] N = 71 Adults with severe obesity (BMI >35 + comorbidities)	24-week intervention: <ul style="list-style-type: none"> MICT: Moderate-Intensity Continuous Training HIIT/MICT: 8w MICT \rightarrow 8w HIIT \rightarrow 8w MICT <p>*3 sessions/week prescribed to both groups*</p>	<ul style="list-style-type: none"> MICT group: Avg. weight loss = 2 kg HIIT/MICT group: Avg. weight loss = 5 kg Difference statistically significant ($p = 0.036$)

Note: MICT = Moderate-Intensity Continuous Training; HIIT = High-Intensity Interval Training; FFM = Fat-Free Mass; FM = Fat Mass; BMI = Body Mass Index; NS = Not Significant

3.2 Calorie Deficit Strategies

Calorie deficit strategies, encompassing a range of dietary approaches such as continuous calorie restriction (CCR), intermittent calorie restriction (ICR), time-restricted eating (TRE) and very low-calorie diets (VLCD), were also shown to be effective in reducing body weight and fat mass. Schübel *et al.*, [11] found that overall calorie restriction (OCR) over a 12-week period led to significant weight loss, although intermittent calorie restriction (ICR) yielded slightly superior results in some outcomes. Liu *et al.*, [5] confirmed that CCR maintained consistent and meaningful weight reduction over a longer period of 12 months, highlighting its potential for sustainable long-term weight management. Intermittent fasting (IF), a specific form of ICR, was shown by both Schübel *et al.*, [11] and Catenacci

et al., [12] to be effective in reducing both body weight and fat mass; however, the advantage of IF over continuous restriction was relatively modest, especially in terms of fat mass reduction. Liu *et al.*, [5] also noted that time-restricted eating (TRE) produced comparable weight loss to traditional calorie restriction, supporting the idea that dietary timing can be as important as calorie quantity in some cases. Deshmukh *et al.*, [13] highlighted that very low-calorie diets (VLCDs) can lead to rapid and substantial weight loss, making them useful for individuals with obesity-related health conditions. Nonetheless, adherence to VLCDs remains a significant challenge due to their restrictive nature and potential side effects. In summary, calorie deficit methods—whether through moderate continuous restriction or more intensive intermittent strategies—are effective for weight loss, but their long-term success largely depends on individual compliance and sustainability of the dietary approach.

Table 2

Summary of reviewed articles on efficacy of caloric deficit strategies on body composition

Author & participants	Intervention/Methods	Results/Outcomes
Catenacci <i>et al.</i> , [12] N = 26 Overweight/obese adults (18–55 yrs), non-smokers	8-week intervention: • ADF Group (n=14): Alternated 0-calorie fast days with ad libitum fed days • CR Group (n=12): Daily 400 kcal deficit	• ADF: -8.2 ± 0.9 kg (-8.8%) • CR: -7.1 ± 1.0 kg (-6.2%) • ADF showed slightly greater fat mass reduction ($p = 0.056$)
Schübel <i>et al.</i> , [11] N = 150 Overweight/obese nonsmokers (35–65 yrs)	12-week intervention: • ICR (n=49) • CCR (n=49) • Control (n=52)	• ICR: $-7.1 \pm 0.7\%$ • CCR: $-5.2 \pm 0.6\%$ • Control: $-3.3 \pm 0.6\%$ • Significant group differences ($P < 0.001$)
Liu <i>et al.</i> , [5] N = 139 Overweight adults (18–75 yrs)	12-month intervention: • TRE Group (n=69): Eat within 8am–4pm • DCR Group (n=70): Same calories, no time restriction	• TRE: -8.0 kg • DCR: -6.3 kg • NS ($P = 0.11$) • Fat mass decreased in both groups
Deshmukh <i>et al.</i> , [13] N = 40 Obese women with PCOS (18–45 yrs)	8-week intervention: • VLCD Group (n=21): 800 kcal/day • Control Group (n=19): 600 kcal/day deficit	• VLCD: -10.9% body weight ($p < 0.0001$) • Control: -3.9% • Greater waist reduction in VLCD group ($p = 0.003$)

Note: ADF = Alternate-Day Fasting; CR = Calorie Restriction; CCR = Continuous Calorie Restriction; ICR = Intermittent Calorie Restriction; TRE = Time-Restricted Eating; DCR = Daily Calorie Restriction; VLCD = Very Low-Calorie Diet; NS = Not Significant

3.3 Combined Interventions

Weiss *et al.*, [14], Wu *et al.*, [15] and Daubenmier *et al.*, [16] provided compelling evidence that combining regular exercise with calorie restriction produces significantly greater benefits for weight loss and overall health than either intervention alone. All three studies observed notable reductions in fat mass, waist circumference and improvements in metabolic health markers when participants followed a combined program, indicating a synergistic effect between physical activity and dietary control. Weiss *et al.*, [14] emphasized that while calorie restriction alone could result in weight loss, it often led to a reduction in fat-free mass, including muscle tissue. However, when exercise was added, especially aerobic or resistance training, the preservation of lean muscle mass was significantly improved. This preservation is crucial not only for maintaining physical function and strength but also for supporting a higher basal metabolic rate, which helps prevent weight regain. Wu *et al.*, [15] similarly reported that participants who adhered to a calorie-restricted diet and

concurrently engaged in structured exercise achieved more favourable body composition outcomes, such as reduced visceral fat and better retention of muscle mass, compared to calorie restriction alone. Furthermore, Daubenmier *et al.*, [16] highlighted the additional psychological and behavioural advantages of combining exercise and dietary interventions within a mindfulness-based framework. Although their study did not find statistically significant differences in weight loss between the mindfulness group and the control group, the mindfulness group achieved greater weight and waist circumference reductions, suggesting that integrating psychological strategies with combined diet and exercise programs may further enhance adherence and long-term success. Collectively, these integrated approaches provide more sustainable, balanced and health-enhancing outcomes, making them particularly effective for individuals aiming for lasting improvements in weight management, metabolic health and overall well-being.

Table 3

Summary of combined exercise and caloric deficit strategies on body composition

Author & participants	Intervention/Methods	Results/Outcomes
Weiss <i>et al.</i> , [14] N = 52 Overweight sedentary adults (45–65 yrs)	12–14 weeks: • CR (n=17) • EX (n=16) • CR + EX (n=19) (~7% weight loss target)	<ul style="list-style-type: none"> • All groups ~15% fat mass reduction • CR & CR+EX reduced FFM; EX maintained FFM • No sig. difference in weight loss (P = 0.43)
Daubenmier <i>et al.</i> , [16] N = 194 Overweight adults (BMI 30–45.9)	18-month intervention: • Mindfulness (n=100): + meditation, mindful eating • Control (n=94): physical activity & nutrition education *Both: 500 kcal/day deficit + exercise	<ul style="list-style-type: none"> • Weight loss: Mindfulness = 4.2–5.0 kg, Control = 2.4 kg • Between-group difference NS (P = 0.24) • Waist circumference NS (P = 0.33)
Wu <i>et al.</i> , [15] N = 66 Young women (normal BMI, high body fat)	4-week intervention: • CR (n=22) • CR + EX (n=22) • Control (n=22)	<ul style="list-style-type: none"> • CR & CR+EX: ↓ weight, fat %, waist/hip (P < 0.05) • CR reduced muscle mass significantly • CR+EX preserved muscle mass

Note: CR = Calorie Restriction; EX = Exercise; CR+EX = Calorie Restriction and Exercise Combined; FFM = Fat-Free Mass; NS = Not Significant; BMI = Body Mass Index; PCOS = Polycystic Ovary Syndrome

3. Discussion

This review offers a comprehensive comparison of regular exercise and calorie deficit interventions in achieving sustainable weight loss among overweight individuals. The findings from the 11 included studies underscore the effectiveness of both strategies, while revealing nuanced differences in their outcomes based on intervention type, intensity and duration. Collectively, the evidence suggests that each approach has merit, yet their integration may offer superior and more balanced benefits, particularly for long-term weight management and body composition.

Regular exercise especially structured aerobic and resistance training emerged as a consistently effective strategy for reducing body weight and improving body composition. Flack *et al.*, [6] demonstrated that individuals engaging in six aerobic sessions per week experienced significantly greater fat loss than those with fewer sessions or sedentary lifestyles. Villareal *et al.*, [7] further emphasized that both aerobic and resistance training led to comparable weight reductions in older adults, particularly when combined, with added benefits in preserving muscle mass. Importantly, low-intensity activities such as Tai Chi and brisk walking, as shown by Hui *et al.*, [9], also contributed to reductions in body weight, fat mass and waist circumference, highlighting the accessibility of such interventions for diverse populations. Moreover, Berge *et al.*, [8] found that integrating high-intensity

interval training (HIIT) with moderate-intensity continuous training (MICT) produced significantly greater weight loss than MICT alone, suggesting that varying intensity levels within a training regimen may enhance outcomes. These findings collectively highlight the value of regular exercise not only in promoting fat loss but also in preserving fat-free mass and improving overall metabolic health.

Calorie deficit strategies including continuous calorie restriction (CCR), intermittent calorie restriction (ICR), time-restricted eating (TRE) and very low-calorie diets (VLCD) were also effective in promoting weight loss. Schübel *et al.*, [11] reported that ICR yielded slightly greater reductions in body weight than CCR, although both approaches significantly outperformed the control group. Similarly, Liu *et al.*, [5] found comparable weight and fat mass reductions between TRE and standard daily calorie restriction, indicating that dietary timing may offer flexibility without compromising effectiveness. Deshmukh *et al.*, [13] provided strong evidence for the rapid effectiveness of VLCDs, particularly in obese women with polycystic ovary syndrome (PCOS), though they also highlighted the challenges of long-term adherence. Catenacci *et al.*, [12] observed slightly greater fat mass reduction with alternate day fasting (ADF) compared to daily restriction, although overall weight loss between the two methods was similar. Notably, Daubenmier *et al.*, [16] reported modest improvements in weight and waist circumference from a mindfulness-based calorie reduction program, although differences from standard approaches were not statistically significant.

These findings reinforce the adaptability of calorie deficit strategies across various populations and preferences, while also underlining the importance of individual adherence and sustainability. While both exercise and calorie deficit strategies were independently effective, several studies suggest that combining the two may yield greater benefits, particularly for body composition and metabolic health. Weiss *et al.*, [14] found that although weight loss was similar across calorie restriction, exercise-only and combined groups, the combined approach better preserved fat-free mass—an important marker for long-term health and metabolic efficiency. Wu *et al.*, [15] similarly reported that combining calorie restriction with structured exercise resulted in more favourable outcomes in terms of body fat percentage and waist circumference than calorie restriction alone. Additionally, Daubenmier *et al.*, [16] showed that incorporating stress management and mindfulness within a calorie-restricted, exercise-supported framework yielded slightly greater, albeit non-significant, weight and waist circumference improvements than conventional methods. These findings collectively suggest that integrated interventions especially those tailored to include behavioural, dietary and physical activity components—may offer more holistic and sustainable outcomes.

Sustainability remains a central consideration in designing weight loss programs. Studies that incorporated flexible, achievable goals such as moderate walking [9] or time-restricted eating [5] were associated with higher adherence and long-term engagement. Conversely, more intensive protocols, such as daily high-volume exercise [10] or VLCDs [13], though effective in the short term, were more challenging to maintain. This highlights the importance of tailoring interventions to individuals' lifestyles and capabilities to promote adherence. Programs that emphasize gradual, sustainable changes, while providing psychological or social support, may be better suited for long-term weight maintenance and health improvement.

Despite the valuable insights gained, several limitations must be acknowledged. The included studies varied widely in design, population characteristics, intervention durations and outcome measures, which may limit the generalizability of findings. Direct comparisons between exercise and calorie deficit within the same populations were relatively scarce, revealing a gap in the current literature. Additionally, many studies relied on self-reported adherence and follow-up durations were often short, restricting the ability to assess long-term sustainability. Future research should aim

to explore the comparative and combined effects of these interventions in diverse populations using standardized outcome measures and longer follow-up periods.

4. Conclusions

This review demonstrates that both regular exercise and calorie deficit strategies are effective in promoting weight loss, each offering unique advantages, exercise supports physical fitness and preservation of fat-free mass, while calorie restriction provides a straightforward path to energy imbalance. Notably, combined interventions tailored to individual preferences appear most promising for sustainable outcomes. Future research should prioritize direct comparisons under standardized conditions to better inform evidence-based weight management approaches.

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