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Research Progress on the Impact of Exercise on Dietary Behavior

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ABSTRACT

Unhealthy dietary behaviors, such as excessive consumption of high-energy-density foods, emotional eating, and binge eating, significantly contribute to the global rise in obesity and overweight prevalence, adding to the burden on public health systems. While current interventions, including nutritional counseling, psychological therapies, and pharmacological treatments, face challenges like high costs and poor compliance, exercise emerges as an economical, scalable, and sustainable alternative or adjunctive strategy. Regular exercise has been shown to improve appetite regulation, reduce impulsive eating, and enhance dietary quality, with minimal side effects and high acceptability. This review systematically analyzes the effects of different exercise modalities on dietary behaviors, evaluates the influence of exercise intensity, frequency, and duration, and explores the combined effects of exercise with nutritional or psychological interventions. Additionally, it discusses the biological mechanisms underlying exercise-induced improvements in dietary behaviors, including the regulation of appetite hormones, reward-executive control networks, inflammatory pathways, and the HPA axis. The findings highlight that moderate-intensity aerobic exercise performed 3–5 times per week for ≥30 minutes per session is optimal for improving dietary behaviors. Combining exercise with nutritional or psychological strategies offers more sustainable outcomes. Future research should address limitations in dietary behavior assessment, optimize integrated intervention parameters, and explore mechanistic pathways through longitudinal and interdisciplinary approaches. These insights provide a foundation for developing precise and individualized exercise prescriptions to promote healthier dietary behaviors.

1.Introduction

Unhealthy dietary behaviors are characterized by persistent and stable patterns of eating disorders, including excessive consumption of high-energy-density foods, disordered meal rhythms, emotional eating, and binge eating. According to thxxe World Health Organization and epidemiological surveys conducted in multiple countries, the global prevalence of overweight and obesity continues to rise. Unhealthy eating habits and weight-related issues have become one of the leading preventable sources of disease burden, posing increasing pressure on public health systems

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over the next decade (Huang et al., 2025b). Current interventions to improve dietary behaviors primarily include nutritional counseling, psychological interventions, and pharmacological treatments (Hu, 2025). However, many individuals find it difficult to adhere to these methods due to high time costs, poor compliance, concerns about side effects, or economic burdens (Zhang et al., 2025). Therefore, there is an urgent need to explore more economical, scalable, and sustainable intervention strategies.

Research has shown that regular exercise can significantly improve appetite regulation and reduce impulsive eating. Individuals who exercise regularly are less likely to experience binge eating and emotional eating episodes (Hu, Zhang, & Huang, 2025). Moreover, exercise has the advantages of minimal side effects, relatively low cost, and ease of implementation in community or home settings, making it a widely acceptable lifestyle-based intervention (Hu et al., 2025; Yuan et al., 2025). Consequently, exercise, as an alternative or adjunctive strategy to optimize dietary behaviors, has garnered increasing attention. However, the specific mechanisms through which exercise influences appetite hormones, reward/executive control networks, and metabolic-inflammatory pathways remain unclear (Hu, Bin, Zhang, et al., 2025). To address this, the present study systematically reviews theoretical and applied research on the relationship between exercise and dietary behavior, drawing on databases such as Web of Science, PubMed, and SCOPUS. The review aims to elucidate the effects of exercise on dietary behavior and analyze its potential mechanisms, providing theoretical insights for the formulation of dietary management and health promotion strategies.

2.Intervention Effects of Different Types of Exercise on Dietary Behavior

2.1 Aerobic Exercise

A substantial body of research confirms that aerobic exercise improves hunger and satiety perception, reduces preferences for high-sugar and high-fat foods, and enhances dietary quality (Huang et al., 2025a). Randomized controlled trials have shown that after 8–12 weeks of moderate-intensity aerobic exercise interventions, participants reported reduced subjective hunger, decreased impulsive eating, and increased consumption of fruits, vegetables, and whole grains. Short-term aerobic exercise (single sessions of 30–60 minutes) can also temporarily suppress energy intake (Ebrahimi et al., 2013). Community-based studies indicate a positive correlation between aerobic activity and healthier dietary patterns, such as adherence to the Mediterranean diet (Hu, 2025.). Moreover, aerobic exercise has been shown to reduce the incidence of nighttime snacking and emotional eating among overweight and obese individuals, helping to establish regular eating rhythms (Beaulieu et al., 2021; Chen et al., 2025).

2.2 Resistance Training

Resistance training has demonstrated potential in regulating postprandial metabolism and stabilizing appetite (Halliday et al., 2021). Numerous intervention studies have found that engaging in resistance training for 12–24 weeks, 2–3 sessions per week, can increase resting metabolic rate and satiety while reducing the intake of high-calorie snacks. Cohort studies and meta-analyses suggest that resistance training is associated with reduced binge eating symptoms. However, its effects on food preferences and total energy intake are less consistent than those of aerobic exercise. Some studies report a transient increase in appetite and energy compensation during the early stages of resistance training, highlighting the need for dietary guidance and behavioral strategies during this period (Martinez-Avila et al., 2020).

2.3 Other Types of Exercise

High-intensity interval training (HIIT) and mind-body exercises (e.g., yoga, tai chi) have also

gained attention(Afrasyabi et al., 2019). Meta-analyses indicate that HIIT and moderate-intensity continuous training have similar effects on improving appetite hormones and self-control, with some studies suggesting that HIIT is more effective in reducing postprandial sugar cravings. However, other research highlights the potential for HIIT to increase perceived stress and compensatory eating in stress-sensitive individuals. Mind-body exercises can alleviate emotional eating and stress-related snacking, enhancing awareness of satiety signals. Evidence on e-sports and dietary behavior remains limited, with some studies suggesting risks associated with prolonged screen exposure and increased consumption of unhealthy snacks, warranting further investigation.

In summary, aerobic exercise provides the most consistent evidence for optimizing dietary behavior. Resistance training and HIIT demonstrate positive effects under specific conditions but require attention to individual differences and the risk of compensatory eating. Mind-body exercises offer unique benefits for addressing emotional eating.

3.Evaluation of the Effects of Exercise Intensity, Frequency, and Duration on Dietary Behavior

3.1 Exercise Intensity

Moderate-intensity exercise is more effective than low-intensity exercise in suppressing immediate hunger, reducing preferences for energy-dense foods, and improving dietary quality. Although high-intensity exercise may temporarily lower appetite hormones (e.g., ghrelin) and sugar cravings, it can trigger delayed energy compensation in some individuals. Overall, long-term moderate-intensity exercise is most conducive to stabilizing eating rhythms and achieving sustainable dietary improvements (Khodabandeh et al., 2024).

3.2 Exercise Frequency

Regular exercise (3–5 sessions per week) is associated with reduced emotional eating, higher dietary quality indices, and more stable meal structures(Kim et al., 2021). Among populations such as pregnant women and individuals under high work stress, reduced exercise frequency often correlates with increased consumption of unhealthy snacks and late-night meals(Fan et al., 2025). Supervised or group-based exercise performed at least three times per week is more effective in sustaining behavioral changes and preventing binge-eating relapses.

3.3 Exercise Duration

A single exercise session lasting ≥30 minutes can produce detectable effects on appetite regulation and postprandial intake optimization. Planned exercise lasting 30–60 minutes per session for 6–12 weeks has been shown to reduce high-calorie snack consumption and increase protein and dietary fiber intake(Maylor et al., 2022; Turesson et al., 2025). Resistance training sessions lasting 60 minutes or more, conducted over 12 weeks, can simultaneously enhance strength and reduce emotional eating. Guidelines generally recommend setting the duration of each exercise session at ≥30 minutes to achieve stable dietary behavior benefits.

4. Combined Effects of Exercise and Other Interventions on Dietary Behavior

Single-modality interventions, such as exercise or nutrition alone, often face the challenge of short-term effectiveness and long-term relapse. Increasing evidence supports the combined use of exercise with nutritional education, behavioral therapy (e.g., motivational interviewing, mindful

eating training), or pharmacotherapy (e.g., weight management drugs)(Sweet & Fortier, 2010). Studies on adolescents and older adults show that combining health education with aerobic exercise can reduce emotional eating and improve meal regularity. Among perinatal and metabolically at-risk populations, exercise combined with dietary prescriptions outperforms single interventions in maintaining weight and dietary quality improvements, with lower relapse rates(Kazeminasab et al., 2025). Overall, integrating exercise with nutrition or psychological interventions yields more enduring changes in dietary behavior and metabolic benefits, and individualized combined prescriptions should be tailored to specific populations.

5. Regulation of Cytokines and Appetite-Related Hormones

5.1 Regulation of Cytokines and Appetite-Related Hormones

Exercise decreases ghrelin (and its active form) while increasing satiety-related hormones such as peptide YY (PYY), glucagon-like peptide-1 (GLP-1), and insulin sensitivity, improving postprandial satiety and energy intake control(Guelfi et al., 2013). Long-term exercise enhances baseline GLP-1 responses and reduces fasting ghrelin levels, promoting dietary structure optimization.

Leptin and adiponectin play key roles in energy homeostasis and appetite regulation. Chronic exercise reduces leptin resistance and increases adiponectin levels, improving satiety signaling and insulin sensitivity while reducing preferences for high-sugar and high-fat foods(Kim et al., 2021). Studies on individuals with obesity and metabolic disorders indicate that exercise restores leptin signaling pathways, improving eating regulation.

Exercise-induced myokines, such as irisin and muscle-derived IL-6, contribute to central and peripheral metabolic regulation(Beer et al., 2022). Irisin may enhance neuroplasticity and emotion-eating coupling via the PGC-1α–FNDC5–BDNF axis, while IL-6 exerts anti-inflammatory effects during exercise, indirectly improving insulin and satiety signaling. These changes collectively promote sensitivity to satiety cues and self-control.

5.2 Regulation of CNS Structure and Function

Dietary behavior is regulated by the reward system (ventral striatum), executive control network (prefrontal cortex), and interoceptive network (insula)(Thomas et al., 2016). Neuroimaging studies show that regular aerobic exercise is associated with larger hippocampal and prefrontal volumes and enhanced functional connectivity(Balbim et al., 2024). Exercise reduces reward responses to high-calorie cues and strengthens prefrontal inhibitory control over impulsive eating(Firth et al., 2018). Animal studies suggest that exercise upregulates hippocampal and prefrontal BDNF expression, reducing neuroinflammation and apoptosis, thereby improving emotion and decision-making and indirectly reducing emotional and binge eating.

5.3 Regulation of Inflammation and Metabolic Pathways

Chronic low-grade inflammation and insulin resistance mutually reinforce unhealthy dietary behaviors(Bobbo et al., 2019). Exercise increases muscle-derived IL-6 and suppresses pro-inflammatory cytokines such as TNF-α and IL-1β, improving peripheral and central inflammatory microenvironments(Bae et al., 2016). It also enhances insulin and leptin signaling sensitivity, reducing stress-induced high-energy intake. Clinical studies have observed concurrent reductions in inflammatory markers and improvements in dietary quality.

5.4 Regulation of the HPA Axis and Stress Eating

Dysfunction of the hypothalamic-pituitary-adrenal (HPA) axis is closely associated with stress eating and nighttime eating. Exercise lowers basal cortisol levels and enhances negative feedback,

reducing food cravings triggered by stress. Mind-body exercises are particularly effective in regulating the HPA axis(Tavares et al., 2025). Correcting HPA axis dysfunction helps reduce dependence on comfort foods (high sugar and fat), improving eating rhythms and sleep, thereby positively influencing dietary choices.

6.Conclusion and Future Directions

In summary, from the perspective of "exercise prescription—dietary behavior," long-term moderate-intensity aerobic exercise (3–5 sessions per week, ≥30 minutes per session) is the optimal strategy for improving appetite regulation, reducing emotional eating, and enhancing dietary quality. Combining exercise with nutritional education or psychological interventions leads to more sustainable behavior changes. Exercise may improve dietary behavior through multiple pathways, including appetite and myokine factors, reward-executive control networks, inflammatory and metabolic pathways, and the HPA axis.

However, several challenges remain in current research: (1) Dietary behavior assessments rely heavily on self-reported questionnaires and 24-hour recalls, which are prone to subjective bias. Objective biomarkers and digital monitoring tools (e.g., image-based records, wearable devices) need to be further developed. (2) The differential effects of various exercise modalities (e.g., resistance training, HIIT, mind-body exercises) on specific dietary behaviors (e.g., binge eating, late-night snacking, sugar cravings) are not well understood. (3) Optimal parameters for integrating exercise and dietary prescriptions (intensity-frequency-duration-timing, such as pre-meal/post-meal exercise) lack consensus. (4) Mechanistic evidence on the gut microbiota-gut-brain axis, reward learning, and habit loop plasticity requires more longitudinal and causal studies.

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