



# Effects of Diet and Lifestyle Program on Metabolic Biomarkers in Overweight Adults

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## DESCRIPTION

The global rise in overweight and obesity has placed increasing emphasis on preventive health measures, as excess weight is no longer considered merely a cosmetic concern but a major risk factor for multiple chronic diseases. Overweight individuals, even when otherwise healthy, exhibit subtle but important metabolic alterations that predispose them to conditions such as type 2 diabetes, cardiovascular disease, fatty liver disease and certain cancers. These changes are reflected in impaired glucose regulation, dyslipidemia, systemic low-grade inflammation and disturbances in gut microbial balance. Such alterations represent early warning signals that warrant timely intervention before irreversible disease states are established.

Structured diet and lifestyle modification programs have gained recognition as effective non-pharmacological strategies capable of addressing these concerns. Unlike pharmacological interventions, which often target single biochemical pathways, lifestyle programs act broadly by influencing energy balance, metabolic regulation and gut microbial ecology simultaneously. The gut microbiota, in particular, has emerged as a critical determinant of health, with mounting evidence linking microbial composition and diversity to nutrient absorption, immune modulation and even neurological signaling.

## Rationale for diet and lifestyle interventions

Traditional approaches to weight management have typically emphasized calorie restriction as the principal means of reducing excess body fat. While short-term weight loss is achievable through strict caloric reduction, long-term sustainability remains challenging, as most individuals struggle with hunger, cravings and motivational decline. In addition, calorie counting alone fails to address the behavioral, psychological and environmental

determinants of eating habits. This explains why weight regain is common once restrictive diets are discontinued.

Lifestyle modification programs seek to overcome these limitations by integrating nutritional strategies with physical activity and behavioral guidance. Such programs recognize that weight regulation is not purely a matter of caloric intake but involves complex physiological processes, including insulin sensitivity, lipid metabolism and inflammatory signaling. Importantly, they also incorporate psychological support to strengthen adherence, reduce stress and foster sustainable behavior change.

## Diet and lifestyle modification program

Diet and lifestyle modification programs are typically structured around three interconnected components: nutritional adjustments, physical activity and behavioral guidance. Nutritional adjustments focus not only on caloric reduction but also on improving the quality of foods consumed. Diets rich in whole grains, vegetables, fruits, legumes, nuts and seeds provide essential nutrients and increase dietary fiber intake, which fosters the growth of beneficial microbial populations such as *Bifidobacteria* and *Lactobacillus*. Reducing refined carbohydrates, added sugars and trans fats stabilizes insulin sensitivity and prevents lipid accumulation. The inclusion of omega-3 fatty acids from fish and plant sources supports anti-inflammatory processes, further protecting metabolic health.

## Gut microbiota composition and health

The gut microbiota has emerged as a central player in determining metabolic outcomes, with imbalances linked to obesity, insulin resistance and systemic inflammation. Overweight individuals often display reduced microbial diversity and an unfavorable ratio of Firmicutes to Bacteroidetes, which

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has been associated with enhanced energy harvest from food and increased fat storage.

Moreover, lifestyle interventions limit the growth of pathogenic bacteria that thrive on simple sugars and processed foods. By reducing dietary sources of these substrates, harmful bacterial populations decline, restoring microbial balance. Physical activity independently enhances microbial diversity, creating a more resilient microbial ecosystem. Behavioral practices that reduce stress and improve sleep also stabilize microbial communities by minimizing fluctuations driven by stress-related hormonal changes.

### Mechanistic Pathways

Exercise influences gut physiology by increasing intestinal circulation and altering bile acid metabolism, which favors the

growth of beneficial microbial species. Enhanced bile acid signaling further contributes to lipid regulation and glucose homeostasis. Additionally, exercise-induced anti-inflammatory effects create a favorable internal environment for microbial stability.

Diet and lifestyle modification programs exert profound effects on both metabolic biomarkers and gut microbiota composition in healthy overweight adults. By improving glucose regulation, lipid profiles, inflammatory markers and microbial diversity, these interventions provide a comprehensive and sustainable approach to health promotion. Unlike pharmacological treatments that typically target single pathways, lifestyle interventions act holistically, addressing the root causes of metabolic dysfunction.