A Comparison of Mediterranean Diet and DASH Diet on Weight, Blood Glucose and Physical Function

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Abstract. As global rates of obesity and type 2 diabetes keep climbing, picking a scientifically sound healthy diet has become a key focus in public health. This study draws on clinical evidence and meta-analyses from the past five years (2020–2025) to systematically compare how the Mediterranean diet—rich in olive oil, fish, and whole grains—and the DASH diet—low in sodium and high in potassium, magnesium, and calcium—affect weight management, blood sugar control, and physical function. By analyzing typical intervention data and evidence-based findings, the study shows that the Mediterranean diet stands out for long-term weight maintenance (with BMI dropping 0.8–2.1 kg/m²) and boosting cardiovascular health, while the DASH diet works better for short-term blood sugar stability (cutting post-meal blood sugar swings by 15–20%) and blood pressure control (lowering systolic pressure by 3–15 mmHg). This research offers timely scientific guidance for personalized nutrition plans, suggesting that dietary choices should shift based on metabolic goals.

Keywords: Mediterranean diet, DASH diet, weight management, blood glucose control, physical function.

1. Introduction

Nowadays, obesity, insulin resistance, and metabolic syndrome have become a global health crisis, spreading beyond adults to teenagers and showing distinct prevalence patterns across regions with different economic development levels. The World Health Organization's (WHO) 2023 Global Report on Diabetes notes that among people with type 2 diabetes worldwide, those under 45 now make up 18% of cases—up from 10% in 2010 [1]. Meanwhile, the prevalence of central obesity (waist circumference ≥90cm for men, ≥85cm for women) hits 35% in urban populations, far higher than the 18% seen in rural areas.

This surge in metabolic abnormalities isn't just tied to more refined carbs and trans fats in diets—it also worsens risks for complications like cardiovascular disease and kidney damage by disrupting hormone regulation, gut microbiome balance, and chronic inflammation. Studies show people with metabolic syndrome are 2.5 times more likely to have a heart attack than healthy individuals, and their risk of end-stage kidney disease jumps a full 4 times. Among all prevention and control measures, dietary patterns stand out as a core, adjustable factor—their impact goes way beyond just supplementing single nutrients. They can improve energy metabolism by balancing macros (carbs, fats, proteins) and regulate cellular signaling pathways through micronutrients (like polyphenols and minerals), targeting multiple aspects of metabolic function.

The Mediterranean and DASH diets, both long-proven healthy patterns, owe their success not just to specific food choices but to smart overall structural design. The former uses anti-inflammatory compounds (like olive oil polyphenols and omega-3s from fish) to steady metabolism; the latter optimizes fluid and nerve regulation through electrolyte balance (low sodium, high potassium, magnesium, and calcium). Both are recommended in guidelines as first-line dietary plans for managing metabolic diseases. But as global diets grow more diverse, figuring out how these two patterns differ in achieving various metabolic goals is key to making interventions more precise.

Recent research on the Mediterranean diet has expanded from cardiovascular protection to broader metabolic effects. A cohort study tracking over 20,000 middle-aged and older adults found that strict adherence to the Mediterranean diet lowers obesity risk by 28%—with an even bigger drop (32%) in women [2]. Another randomized controlled trial on people with prediabetes showed that after 1 year

on the diet, improvements in insulin resistance (measured by HOMA-IR) were 15% greater than with a regular diet, and this benefit correlated with how often whole grains were eaten [3].

Plus, the Mediterranean diet's benefits for physical function are becoming clearer: in elderly community dwellers, it cuts fall risk by 20%, likely because omega-3s boost neuromuscular coordination. Research on the DASH diet, meanwhile, focuses on its short-term effects on metabolic markers. Multiple meta-analyses show that sticking strictly to DASH for 3 months lowers systolic blood pressure by an average of 8–10mmHg—and for salt-sensitive individuals (about 50% of people with high blood pressure), the drop is even bigger: 12–15mmHg [4]. For blood sugar, DASH's ability to quickly stabilize post-meal glucose has been confirmed in people with impaired glucose tolerance. By combining low-glycemic-index foods and fiber, it brings post-meal 2-hour glucose peaks down by 1.2mmol/L compared to a typical diet [5].

But there is debate over DASH's long-term weight maintenance: some studies suggest that after a year, weight regain is higher than with the Mediterranean diet, possibly because adherence fades over time. Even so, current research has clear gaps. Head-to-head trials directly comparing the two diets are scarce; most conclusions rely on indirect comparisons. Assessments of physical function are scattered, lacking integrated analyses of cardiorespiratory endurance, muscle strength, and balance. Samples are mostly from European and American populations, with too few studies on Asian, African, or other groups—making it hard to rule out racial differences in dietary responses. And research on how these diets interact with gut microbes or genetic variations is still in early stages, limiting how precisely we can tailor recommendations. Given the central role of the Mediterranean diet and DASH diet in metabolic interventions, as well as the lack of evidence for direct comparisons between the two in existing research, this study plans to systematically review high-quality randomized controlled trials (RCTs) and meta-analyses published between 2020 and 2025. By extracting the effect sizes (such as mean difference and relative risk) of the two dietary patterns in each study, qualitative synthesis and trend analysis will be conducted to clarify their respective strengths and applicable scenarios. The ultimate goal of this study is to provide evidence-based and hierarchical recommendations for clinical nutrition practice, and provide guidance on diet selection for individuals with different metabolic needs (such as short-term blood pressure control and long-term weight management) or different characteristics (such as the elderly, diabetes patients). Simultaneously exploring strategies that integrate the core elements of two modes, such as a low sodium Mediterranean diet and a DASH diet rich in healthy fats, to provide more flexible solutions for personalized nutrition interventions.

2. Comparative Analysis of Two Dietary Patterns and Core Indicators

The Mediterranean diet originated from the traditional dietary patterns of Mediterranean coastal countries such as Greece and Italy, and gradually evolved into a mature healthy dietary system through the long-term dietary habits of local residents. Its specific food composition has distinct characteristics: in terms of basic food group, daily intake of no less than 500g of fresh vegetables (such as tomatoes, spinach, onions) and 200-300g of fruits (such as citrus and figs) is required; Using whole grains (brown rice, quinoa, whole wheat bread) as staple food to replace refined carbohydrates; Daily supplementation of legumes (chickpeas, mung beans) and nuts (almonds, walnuts) can provide rich dietary fiber (daily intake can reach 25-30g), B vitamins, and minerals (such as magnesium, potassium). In terms of characteristic fat sources, extra virgin olive oil is the only cooking oil (30-50ml per day), which is rich in oleic acid (monounsaturated fatty acid, accounting for more than 70% of total fatty acids) and has antioxidant and anti-inflammatory properties. Eating 2 – 3 servings of deep-sea fish (salmon, sardine, mackerel) every week can provide Omega-3 polyunsaturated fatty acids such as EPA and DHA, with an average weekly intake of 300 – 400g. At the same time, the Mediterranean diet has restrictions on some foods. Red meat (beef, mutton) should be eaten no more than 2 – 3 times a month. Processed meat (sausage, ham) is almost avoided. Dairy products are limited to low-fat cheese and sugar free yogurt (100 – 200g per day). Alcohol intake is mainly red wine (≤

200ml per day for men and ≤ 100ml for women), and it is only drunk with meals. Overall, the Mediterranean diet emphasizes the naturalness and diversity of food, focusing on the reasonable combination of healthy fats and plant nutrients.

The DASH diet (short for "Dietary Approaches to Stop Hypertension") was designed by a research institution in the United States with the initial aim of intervening in hypertension. The core principle is low sodium (strict control of daily salt intake), high potassium, high magnesium, and high calcium, regulating body metabolism through precise nutrient ratios. In the core food group composed of specific foods, it is necessary to consume 4-5 servings of vegetables (1 portion=100g, such as spinach, kale, potatoes, with priority given to dark green vegetables) and 4-5 servings of fruits (1 portion=100g, such as bananas, oranges, kiwis) daily to ensure potassium intake; 3-6 portions of whole grains (1 portion=25g, such as oats, buckwheat, whole wheat noodles), providing dietary fiber and B vitamins; 2-3 servings of low-fat dairy products (1 serving=240ml milk or 150g yogurt) to meet calcium requirements; 1-2 portions of lean meat (skinless chicken, fish) or legumes (1 portion=50g lean meat or 100g legumes) provide high-quality protein while controlling fat intake. In addition, the DASH diet has strict restriction requirements, controlling sodium intake by reducing salt (≤ 5g per day) and avoiding processed foods (canned, pickled, snacks). Saturated fats (fatty meat, butter, palm oil) should account for less than 7% of total calories, and added sugars (sweet drinks, pastries) should be limited to ≤ 50g per day.

Both dietary patterns focus on natural foods, but due to differences in origin and design goals, there are differences in food selection and nutritional priorities. Although both the Mediterranean diet and the DASH diet are widely recognized as health models, their different origins, core design goals, and nutritional composition result in significant differences in their impact on the body. The key difference lies not only in specific food choices - the former features healthy fats (such as olive oil, fish) and plant-based foods, while the latter focuses on balanced intake of low sodium and minerals such as potassium, magnesium, and calcium, but also in the mechanism of action and intervention direction. These differences lead to varying performances in weight management, blood sugar control, and physical function improvement. Clarifying these differences can help systematically compare their impact on specific health indicators.

2.1. Weight Management

In terms of weight management, the Mediterranean diet focuses more on long-term effects in weight management. Meta-analysis data from 6-month interventions show that it can reduce BMI by 0.8–2.1 kg/m² and waist circumference by 2–5 cm, with significant long-term maintenance effects [3]. This is mainly due to monounsaturated fatty acids in olive oil, which delay gastric emptying and prolong post-meal satiety (30% reduction in hunger scores 2 hours after meals). Dietary fiber in whole grains and vegetables (especially insoluble fiber) swells in the intestines, reducing total calorie intake [6]. Additionally, it increases the abundance of Akkermansia muciniphila (a mucus-degrading bacterium), which improves intestinal barrier function, reduces endotoxemia, and indirectly inhibits fat cell inflammation and fat storage.

In contrast, the DASH diet shows more prominent short-term weight loss effects: an average weight loss of 3.2 kg and a BMI reduction of 0.4–1.02 kg/m² after 3 months of intervention [3]. Its mechanism lies in strict sodium restriction (<1500mg/day), which reduces renal water retention—resulting in 1–2 kg of fluid loss within the first week, accounting for 40–50% of initial weight loss—and the combination of high fiber and low saturated fat, which lowers total calorie intake [4].

2.2. Blood Glucose

In terms of blood sugar control, the Mediterranean diet improves blood sugar levels through long-term regulation. A primary prevention study of cardiovascular disease showed that after adhering to the Mediterranean diet for two years, the glycosylated hemoglobin (HbA1c) of pre diabetes population decreased by 0.3 – 0.6% on average, fasting blood glucose decreased by 0.5 – 0.8 mmol/L, and insulin resistance index (HOMA-IR) decreased by 20 – 30% [2]. Its core mechanism includes

enhancing insulin sensitivity, that is, polyphenols in olive oil (such as oleuropein) increase the membrane expression of glucose transporter 4 (GLUT4) in muscle cells, promote glucose uptake, Omega-3 fatty acids in fish inhibit the TLR4/NF - κ B inflammatory pathway, and improve insulin resistance in adipose tissue [7]. Inhibiting gluconeogenesis, short chain fatty acids (such as propionic acid) produced by fermentation of whole grain dietary fiber inhibit hepatic gluconeogenesis through GPR43 receptor signaling, reducing endogenous glucose production [8]. Protecting beta cells, antioxidants in the Mediterranean diet (such as vitamin E and flavonoids) reduce oxidative stress damage to pancreatic beta cells and maintain insulin secretion function [7].

The DASH diet is more effective in reducing short-term blood sugar fluctuations. The research indicates that it can reduce the peak blood sugar in 2 hours after meal by 1.1 – 1.5 mmol/L, the fluctuation range of blood sugar by 15 – 20%, and the reversal rate of pre diabetes population reaches 30% (significantly higher than 15% of the regular diet) [5,8]. The key mechanisms include controlling carbohydrate quality, prioritizing low glycemic index (GI<55) foods such as oats, quinoa, and legumes, and prolonging glucose absorption time (reducing the area under the postprandial blood glucose curve by 25%). Mineral synergy, magnesium acts as an activator of tyrosine kinases in the insulin signaling pathway, enhancing insulin receptor binding, while potassium promotes glucose entry into cells by maintaining intracellular osmotic pressure (in vitro experiments have shown a 15% increase in cellular glucose uptake). Regulating intestinal hormones, a high fiber diet stimulates the secretion of glucagon like peptide-1 (GLP-1) in the intestine, delays gastric emptying, and promotes insulin secretion (postprandial GLP-1 levels increase by 20-30%) [8].

2.3. Physical Function

In terms of physical function, the Mediterranean diet mainly improves "cardiovascular endurance and exercise ability". The core mechanism is to protect mitochondrial function: vitamin E (such as alpha tocopherol) in nuts and polyphenols in olive oil reduce mitochondrial oxidative damage in muscle tissue (reducing reactive oxygen species levels by 20%), and improve cellular aerobic metabolism efficiency (increasing maximum oxygen uptake VO_2 max by 3-5 ml/kg/min) [9]. In addition, oleic acid in olive oil improves endothelial function (increasing brachial artery flow mediated vasodilation by 10-15%) and reduces peripheral vascular resistance; Omega-3 fatty acids in fish reduce platelet aggregation and lower the risk of blood clots during exercise. These effects collectively increase Gao Yi's 6-minute walking distance from the crowd by 10-15% (an average increase of 50-70 meters).

The DASH diet is more beneficial for "muscle strength and daily activity ability". Research has shown that after 6 months of adhering to the DASH diet, older adults experience a 6-12% increase in grip strength (an average increase of 2-3kg) and a 10-15% reduction in standing up and walking test time [10]. This is related to the following mechanisms: maintaining neuromuscular excitability, calcium and magnesium are key ions for muscle contraction (calcium triggers muscle filament sliding, magnesium regulates myosin ATPase activity), high calcium and high magnesium intake in DASH diet reduces post exercise muscle spasms (incidence reduced by 40%) [10]. To prevent muscle wasting, maintain muscle mass (increase limb skeletal muscle index by 0.5-1.0 kg/m ²) with high-quality protein (low-fat dairy products, lean meat) at a dose of 1.2-1.5 g/kg body weight, especially delaying muscle loss in the elderly. Low sodium intake reduces tissue edema to control inflammation, improves joint mobility (increasing knee range of motion by 5-10 °), and enhances daily activity flexibility [11].

The Mediterranean diet has precise application value in long-term metabolic health management, and its core value lies in the synergistic protective effect of multiple systems, especially suitable for people who need long-term management of cardiovascular risk, blood glucose homeostasis, and physical function. In terms of cardiovascular protection, its rich olive oil polyphenols (such as hydroxytyrosol) inhibit the NF - κB inflammatory pathway and reduce endothelial damage [7]. 2-3 servings of Omega-3 fatty acids provided by deep-sea fish per week regulate blood lipid profiles and reduce platelet aggregation. This combination reduces the risk of cardiovascular event recurrence by

20-30% in high-risk populations, such as those with a history of coronary heart disease, and the protective effect increases over time [2]. For type 2 diabetes patients who need long-term blood glucose control, the Mediterranean diet reshapes the intestinal flora through dietary fiber in whole grains and beans, promotes the generation of short chain fatty acids, enhances insulin sensitivity, and thus stabilizes glycosylated hemoglobin [3,6]. In addition, the high-quality protein and antioxidants provided by nuts and fish delay muscle loss and joint degeneration in the elderly, improve walking endurance and exercise metabolic efficiency - these effects are closely related to mitochondrial protection [9]. In clinical practice, this group of people should maintain dietary consistency: replace refined carbohydrates with whole grains as the main staple, cook and season with olive oil, reduce red meat intake, maintain daily fruit and vegetable diversity, and maximize the synergistic effect of plant nutrients.

The DASH diet can be targeted for short-term metabolic interventions. With precise nutrient ratios, it excels in short-term blood pressure regulation, improvement of blood glucose fluctuations, and rapid weight loss initiation, making it suitable for individuals in need of phased intensive interventions. For individuals with prehypertension or mild hypertension, a low sodium (<2300mg/day) and high potassium design regulates renal sodium excretion and vascular smooth muscle contraction, resulting in an average decrease of 8-12mmHg in systolic blood pressure within 4 weeks, with a more significant effect when combined with salt restriction [4,11]. For patients with pre diabetes, low glycemic index whole grains and high magnesium foods (such as dark green vegetables and nuts) in DASH diet synergistically delay glucose absorption, reduce postprandial blood glucose fluctuations, and reduce the risk of developing type 2 diabetes by 30% [5]. In short-term weight loss, the combination of high fiber and low saturated fat reduces food energy density, enhances satiety, and lays the foundation for long-term management of obese populations. When using, pay attention to food selection and pairing: prioritize fresh vegetables, fruits, and whole grains; Reduce processed foods (such as pickles and canned foods) to control implicit sodium intake; Ensure sufficient supply of low-fat dairy products and high-quality protein to avoid nutritional imbalance.

2.4. Strategies for Personalized Plan Optimization

Personalized plan optimization should balance the stages of metabolic goals, population physiological characteristics, and regional dietary culture to flexibly integrate the two patterns. From a stage goal perspective, individuals with metabolic syndrome can first use the DASH diet to quickly control blood pressure and blood glucose fluctuations (1–3 months), then gradually incorporate healthy fats and anti-inflammatory components of the Mediterranean diet once indicators stabilize, forming a "low-sodium base + anti-inflammatory enhancement" hybrid model that retains short-term regulatory effects while strengthening long-term protection [12]. For different populations, adolescents more easily accept the Mediterranean diet (compatible with Western-style diets) and can develop healthy habits through family meals [3]. older adults at risk of sarcopenia can add natural calcium- and magnesium-rich foods (e.g., soy products, leafy greens) to the DASH diet to maintain neuromuscular function [10].

In regional adaptation, Chinese populations can adjust based on local ingredients: in the Mediterranean diet, use tea seed oil or linseed oil instead of olive oil, and choose local high-Omega-3 fish like saury and hairtail; in the DASH diet, replace some dairy products with tofu and mixed beans, and reduce salt use with natural spices (e.g., ginger, garlic) to balance nutritional needs and cultural adaptability. Other regions, such as high-latitude areas, can add cold-tolerant nuts (e.g., walnuts, hazelnuts) to supplement fat-soluble vitamins; tropical regions can leverage abundant tropical fruits (e.g., bananas, mangoes) to ensure potassium intake, enhancing plan sustainability. In summary, the selection and integration of the two dietary patterns should be guided by individual metabolic goals, combined with physiological characteristics and regional culture, achieving maximum health benefits through dynamic adjustments.

3. Conclusion

This study, pulling together clinical evidence, confirms that both the Mediterranean diet and DASH diet are scientifically solid for improving metabolism, though each has its own strengths. The Mediterranean diet excels in long-term weight management (with more lasting BMI reductions), protecting the heart and blood vessels (lowering systolic pressure by 3–15 mmHg), and enhancing physical function—particularly walking endurance. Its benefits tie closely to anti-inflammatory effects from olive oil, balanced gut bacteria, and the combined action of omega-3 fatty acids. The DASH diet, on the other hand, shines in short-term blood pressure reduction (especially when paired with strict salt limits), quickly stabilizing blood sugar (reducing post-meal fluctuations), and strengthening grip strength—critical for keeping older adults mobile. It works through a careful mix of low sodium, high potassium, fiber for fullness, and precise calorie control, with positive effects on nerve and muscle function that make it a strong choice for older populations. Even with this thorough analysis of existing research, the study has limits. Some data comparing physical function needs more direct support from randomized controlled trials. Also, there's not enough focus on diverse samples—like teens and older adults—and how well these diets fit different cultural eating habits. Future research should zero in on large-scale, long-term head-to-head trials across multiple centers, especially looking at how these diets work for people with conditions like chronic kidney disease or sarcopenia. Digging deeper into the biological mechanisms behind these effects will also help us better understand how diet impacts health.

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