运动干预对肥胖合并高血脂的研究进展

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摘要：为贯彻党中央决策部署，落实《健康中国行动（2019—2030 年）》有关工作要求，预防和控制超重肥胖，国家卫生健康委等 16 个部门联合制定了《“体重管理年”活动实施方案》。国家体育总局发布的《全民健身指南》将体育活动根据其不同特征分为有氧运动、力量练习、球类运动、中国传统运动和牵拉练习五类。先前研究表明，规律运动可以有效改善肥胖人群的脂代谢紊乱、生长发育、身体形态，促进机体脂肪的动员和利用。按照美国运动医学学院的推荐，正常成人应保证每周至少 150 分钟（2.5 h）的中等强度运动，而肥胖（即 BMI≥25）或高脂血症人群的运动推荐量应逐步适当提高，保持在每周至少 200～300 分钟（3.3-5 h）。目前“运动可以预防和控制超重肥胖”这一观念已经达成共识，但不同运动对肥胖合并高血脂人群的影响差异尚未明确，其改善效果受到运动强度、运动时间、运动方式等因素的影响。**研究目的：**通过整理运动干预肥胖合并高血脂人群的相关研究，梳理当前领域的研究进展，为后续研究提供参考。**研究方法：**采用文献资料法，通过以“运动”“肥胖”“高血压”“exercise”“obesity”“Hyperlipidemia”等为关键词，在中国知网、万方数据库、维普期刊、Web of Science 等文献网站进行检索，对所检索的文献进行梳理、阅读，为本文研究提供可靠的理论支撑。**研究结果：**有氧运动是指全身各大肌肉群在氧气供给充足的情况下参加的具有节律性的周期运动，根据运动强度可将有氧运动分为低、中、高三个强度。研究表明有氧运动可以显著改善甘油三酸酯代谢，减少氧化应激，促进脂肪分解。在中低强度范围，人体脂肪氧化量随着运动强度的增加逐渐递增，大量研究表明有氧运动可以降低肥胖人群体重和脂肪量，提高脂蛋白脂肪酶活性，适合作为肥胖合并高血脂人群的运动干预手段。除中老年人群外，青少年肥胖合并高血脂的发病率也逐渐上升，有氧运动对肥胖青少年血脂、血糖、血压及心肺功能同样可以产生显著的改善效果。力量练习即力量训练，也称为抗阻训练或重量训练，是一种通过多次数、多组数、有节奏，通过反复克服外部阻力（如重力、弹力、器械阻力等）的负重练习来改善肌肉群的力量、耐力和形状的运动方式。以往研究往往关注力量练习对肌肉产生的益处，如增加肌力、扩大肌肉面积等，现在也有研究逐步关注到力量练习在促进能量消耗、改善脂代谢、降低动脉硬度等方面的健康效益。有研究表明力量练习联合有氧运动干预肥胖合并高血脂人群取得了显著成效，也有研究发现单一力量练习同样可以对肥胖合并高血脂人群的代谢特征和向心性肥胖起到显著改善效果。有研究发现高强度间歇训练与力量训练均可以通过增加运动中能量消耗和运动后过量氧耗来降低体脂，同时增加肌肉含量及人体基础代谢率达到燃烧脂肪、改善肥胖的目的，且有研究表明力量练习对向心性肥胖改善更为有效。中国传统运动源于人类最基本的生存、生产活动和民俗活动，是中华优秀传统文化中的绚丽瑰宝，它包括太极拳、健身气功、导引养生功等广受群众喜爱的项目。

这些运动普遍具有动作平缓、强度适中、安全性高等特点，可以综合改善身体的运动能力和心肺功能，且更加强调意念与身体活动相结合。中国传统运动对肥胖人群的 BMI、体脂率和血脂相关指标有着积极的改善作用，且其改善情况通常优于常规运动。为期 6 个月的健身气功·八段锦研究表明，八段锦能有效降低糖化血红蛋白及血脂，提高高密度脂蛋白水平，另一项 12 周八段锦干预研究发现高血脂患者甘油三酯水平得到降低，且八段锦临床疗效优于步行锻炼。太极拳作为中等强度的有氧运动，可以有效提高脂蛋白脂肪酶的活性促使高密度脂蛋白的增加和甘油三酯下降。在为期 3 个月的运动干预研究中，太极拳组相较快走组在改善血脂各项指标上表现更为优异。有研究认为，运动后机体通过升高血脂多糖水平来加快低密度脂蛋白胆固醇和乳糜微粒的分解，达到改善血脂各项指标的效果。在另一项针对向心性肥胖的随机对照试验中，也证明了相较于其他运动干预，太极拳可以持续对高密度脂蛋白胆固醇产生有利影响。**研究结论：**有氧运动可以通过提高脂肪氧化、利用能力等方式，起到改善肥胖、降低血脂的作用，而力量训练可能是通过增加肌肉含量改善脂代谢，从而达到这一效果，中国传统运动相较于其他运动方式在改善肥胖、降低血脂的效果方面有着更为突出的表现。综上所述，不同运动方式均能有效改善肥胖合并高血脂，且已有研究证明太极拳对肥胖合并高血脂具有显著的改善效果，但其作用机制尚不明确，在后续研究中应围绕太极拳对肥胖合并高血脂的影响及作用机制展开研究。

关键词：肥胖；高血脂；运动干预

Research Advances on Exercise Intervention for Obesity Comorbid with Hyperlipidemia

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Abstract: To implement the decisions and plans of the Central Committee of the Communist Party of China and fulfill the requirements of the "Healthy China Initiative (2019-2030)", the National Health Commission and 15 other departments jointly formulated the "Implementation Plan for the 'Weight Management Year' Campaign". The General Administration of Sport of China released the "National Fitness Guidelines", which categorizes sports activities into five types based on their different characteristics: aerobic exercise, strength training, ball games, traditional Chinese exercise, and stretching exercises. Previous studies have shown that regular exercise can effectively improve lipid metabolism disorders, growth and development, and body shape in obese individuals, and promote the mobilization and utilization of body fat. According to the recommendations of the American College of Sports Medicine, normal adults should ensure at least 150 minutes (2.5 hours) of moderate-intensity exercise per week, while the recommended amount of exercise for obese (BMI ≥ 25) or hyperlipidemic individuals should be gradually increased to at least 200-300 minutes (3.3-5 hours) per week. Currently, the notion that "exercise can prevent and control overweight and obesity" has reached a consensus, but the differences in

the effects of different exercises on obese individuals with hyperlipidemia have not been clearly defined. The improvement effects are influenced by factors such as exercise intensity, duration, and mode. **Objective:** To review the relevant studies on exercise intervention for obese individuals with hyperlipidemia, summarize the current research progress in this field, and provide references for future research. **Method:** The literature review method was adopted. By using keywords such as "exercise", "obesity", "hyperlipidemia", "exercise", "obesity", and "Hyperlipidemia", literature was retrieved from databases such as CNKI, Wanfang Database, VIP Journal, and Web of Science. The retrieved literature was sorted and read to provide reliable theoretical support for this study. **Results:** Aerobic exercise refers to rhythmic and cyclical exercise involving major muscle groups under sufficient oxygen supply. Aerobic exercise can be classified into low, moderate, and high intensities based on exercise intensity. Studies have shown that aerobic exercise can significantly improve triglyceride metabolism, reduce oxidative stress, and promote fat breakdown. Within the moderate and low-intensity range, the amount of fat oxidation in the human body gradually increases with the increase in exercise intensity. Numerous studies have demonstrated that aerobic exercise can reduce body weight and fat mass in obese individuals, increase lipoprotein lipase activity, and is suitable as an exercise intervention method for obese individuals with hyperlipidemia. In addition to the elderly, the incidence of obesity and hyperlipidemia among adolescents is also gradually increasing. Aerobic exercise can also significantly improve lipid, blood glucose, blood pressure, and cardiopulmonary function in obese adolescents. Strength training, also known as resistance training or weight training, is a form of exercise that improves the strength, endurance, and shape of muscle groups through repeated resistance against external forces (such as gravity, elasticity, and equipment resistance) in a rhythmic manner. Previous studies often focused on the benefits of strength training on muscles, such as increasing muscle strength and size. However, recent studies have gradually paid attention to the health benefits of strength training in promoting energy expenditure, improving lipid metabolism, and reducing arterial stiffness. Some studies have shown that the combination of strength training and aerobic exercise has achieved significant results in the intervention of obese individuals with hyperlipidemia. Other studies have found that single strength training can also significantly improve the metabolic characteristics and central obesity of obese individuals with hyperlipidemia. Some studies have found that both high-intensity interval training and strength training can reduce body fat by increasing energy expenditure during exercise and post-exercise oxygen consumption, while increasing muscle mass and basal metabolic rate to achieve the purpose of burning fat and improving obesity. Moreover, some studies have shown that strength training is more effective in improving central obesity. Traditional Chinese exercise originated from the most basic survival, production activities and folk customs of human beings. They are splendid treasures of Chinese excellent traditional culture, including popular sports such as Taijiquan, Health Qigong, and Daoyin Yangsheng Gong. These sports generally feature slow and smooth movements, moderate intensity, and high safety. They can comprehensively improve the body's motor ability and cardiopulmonary function, and place more emphasis on the combination of mind and body activities. Traditional Chinese exercise have positive effects on BMI, body fat rate, and lipid-related

indicators of obese people, and their improvement is usually better than that of conventional sports. A 6-month study on Health Qigong of Baduanjin showed that Baduanjin can effectively reduce glycated hemoglobin and blood lipids, and increase high-density lipoprotein levels. Another 12-week Baduanjin intervention study found that the triglyceride levels of patients with hyperlipidemia were reduced, and the clinical efficacy of Baduanjin was better than that of walking exercise. As a moderate-intensity aerobic exercise, Taijiquan can effectively increase the activity of lipoprotein lipase, promote the increase of high-density lipoprotein and the decrease of triglycerides. In a 3-month exercise intervention study, the Taijiquan group performed better than the fast walking group in improving lipid indicators. Some studies suggest that after exercise, the body can accelerate the decomposition of low-density lipoprotein cholesterol and chylomicrons by increasing the level of lipid polysaccharides, thereby improving lipid indicators. In another randomized controlled trial on central obesity, it was also proved that compared with other exercise interventions, Taijiquan can continuously have a favorable impact on high-density lipoprotein cholesterol. **Conclusion:** Aerobic exercise can improve obesity and lower blood lipids by increasing fat oxidation and utilization, while strength training may improve lipid metabolism by increasing muscle mass, thereby achieving this effect. Traditional Chinese exercise have more prominent effects in improving obesity and lowering blood lipids compared to other exercise methods. In summary, different exercise methods can effectively improve obesity combined with hyperlipidemia, and existing studies have proved that Taijiquan has a significant improvement effect on obesity combined with hyperlipidemia, but its mechanism of action is still unclear. In subsequent studies, research should focus on the impact and mechanism of Taijiquan on obesity combined with hyperlipidemia.

Keywords: Obesity; Hyperlipidemia; Exercise intervention