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Review Article

A Review on the Positive Impact of Regular Physical Activity on Metabolic Health and Healthy Aging

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Abstract

Background:
This review article emphasizes that metabolic health is crucial in promoting healthy aging, positively affecting physical, functional, and cognitive areas that enable individuals to enjoy fulfilling lives. It is predicted that healthy lifestyles, adopting exercise routines tailored to the individual physiological structure, eating nutritious diets, and acquiring socially engaged activities will contribute significantly to supporting healthy aging and longevity.

Materials and Methods:
In the search for scientific literature for this review, data from the US National Library of Medicine (PubMed), PsycINFO, MEDLINE, and SportDiscus were used, and the terms "metabolic health'','' healthy aging'', ''metabolic syndrome'' '' life quality'', and "anti-aging." were used. The relevant literature has also taken its source from researching relevant articles from reference lists derived from data searches.

Results:
Maintaining metabolic health is closely related to a healthy and long life. As individuals manage to maintain optimal metabolic markers, their body systems can effectively combat possible diseases and preserve organ functions for a long time, including the aging process.

Conclusion:

As a result, maintaining metabolic health directly affects healthy aging positively, providing quality life for many years. Healthy aging provides effective defense against chronic conditions while addressing all determinants involving physical components. However, metabolic health; as it can also ensure optimal preservation of mental health functions, ultimately contributes to longevity and high-quality life experiences.

Keywords: metabolic health; healthy aging; metabolic syndrome; life quality; anti-aging

Introduction

As people age, maintaining health becomes increasingly important. One aspect of healthy aging is metabolic health, which refers to the body's ability to efficiently convert food into energy. For a healthy and quality life, it would be beneficial to investigate the positive effects of metabolic health on healthy aging and discuss various lifestyle factors that may contribute to the maintenance of optimal metabolic health.

It is becoming increasingly clear that metabolic health, healthy aging and are important aspects of general well-being that deserve our attention. They have the potential to impact quality of life and longevity positively. As individuals age, maintaining metabolic health, preventing chronic diseases, and enhancing vitality in later years become increasingly important (Zhang, 2023). To this end, it would be beneficial to develop effective wellness strategies. Furthermore, since healthy aging encompasses a holistic approach that includes physical, mental, and social well-being, it would be beneficial to examine metabolic health and healthy aging from various aspects of human health (Tavares, 2017).

It is thought that there may be a connection between metabolic health and the proper functioning of the metabolism. Metabolism is a complex series of chemical reactions that occur in our bodies to sustain life. It encompasses several processes, including the digestion, absorption, and distribution of nutrients, as well as the elimination of

waste products. When metabolic health is optimal, it is believed that the body uses nutrients and energy effectively and efficiently, while also removing waste from the body efficiently. This is thought to be associated with the effective functioning of all body systems. Considering the research results of recent years, it is becoming increasingly clear that metabolic health is intricately linked to the proper functioning of the body's metabolism, which encompasses a complex network of biochemical processes essential for the maintenance of life (Ryu et al., 2020). These processes include the digestion, absorption, and distribution of nutrients as well as the elimination of waste. Optimum metabolic health is thought to be characterized by efficient nutrient utilization and energy production, as well as effective waste removal (Saklayen, 2018). Since it is widely accepted that metabolic health is characterized by optimal levels of blood sugar, cholesterol, triglycerides, blood pressure, and waist circumference, maintaining these physiological parameters within recommended ranges is extremely necessary for the prevention of chronic diseases such as diabetes, cardiovascular disorders, and obesity (Chang et al.,2016; Pettman, 2008). Although healthy aging is a process that includes the maintenance of physical function, mental health, and emotional well-being throughout the aging process, the preservation of muscle mass, cognitive abilities, social interactions, and general health elements should also be considered concepts closely related to quality of life.

It is becoming increasingly clear that metabolic health and healthy aging are two interconnected concepts that play an important role in improving quality of life as individuals age. Metabolic health refers to the proper functioning of metabolic processes in the body, including the regulation of glucose metabolism, lipid profile, and blood pressure (Awobajo, Olawale, & Bassey, 2013). On the other hand, since healthy aging encompasses various factors such as physical well-being, cognitive functioning, and emotional balance that contribute to an individual's overall health in later years, it is extremely important to maintain and improve metabolic health to promote healthy aging outcomes. (Galloza, Castillo, & Micheo, 2017).

Physical activity plays a crucial role in overall health in preventing metabolic diseases such as obesity, type 2 diabetes, cardiovascular diseases, osteoporosis, and certain types of cancer by improving metabolism, enhancing insulin sensitivity, reducing inflammation levels, promoting weight management, and supporting overall well-being (Carroll, Borkoles, & Polman, 2007)

It is stated that it may be useful to realize the positive effect of regular exercise in preserving metabolic health and therefore the importance of acquiring regular exercise habits in preserving cognitive functionality during a healthy life and healthy aging process. Fritsch et al.s (2007) study sheds light on cognitive functionality in healthy aging by emphasizing the importance of cognitive reserve and lifestyle factors. Cognitive reserve refers to the brain's ability to withstand neuropathological damage caused by factors such as the level of education or occupations engaged in (Arida & Teixeira-Machado, 2021; Ntoumanis et al., 2021). Lifestyle factors such as regular exercise routines, balanced nutrition, and social engagement also contribute significantly to the preservation of cognitive abilities as individuals age (Hertzog et al., 2008; Gomez-Pinilla & Hillman, 2013).

Discussion:

Physical activity plays a crucial role in overall health in preventing metabolic diseases such as obesity, type 2 diabetes, cardiovascular diseases, osteoporosis, and certain types of cancer by improving metabolism, enhancing insulin sensitivity, reducing inflammation levels, promoting weight management, and supporting overall well-being. Liu et al. (2020) conducted a study focusing on how exercise impacts cardiovascular health, metabolic health, and cognition among older adults. Exercise was found beneficial for improving heart function, blood sugar regulation, and cognitive performance. It underscores that incorporating regular exercise routines into daily life can help maintain metabolic balance promote heart wellness, and preserve cognitive functions with advanced age. Lee, et al.'s (2012) study examined how physical inactivity contributes to major non-communicable diseases globally. Lack of physical activity has been linked to increased risks of developing conditions like cardiovascular diseases, type 2 diabetes, and obesity among others around the world highlighting the importance of staying physically active for promoting metabolic health.

Studies by Kramer & Colcombe (2018) and Colcombe et al. (2003) found that fitness had significant effects on the cognitive functions of older adults and highlighted the potential benefits of exercise interventions on healthy aging. Additionally, progressive resistance exercise has been shown to have positive effects on physical function in older adults (Taylor et al., 2005., Pedersen et al., 2017). On the other hand, the fact that physical activity plays an important role in healthy aging should be emphasized, as a sedentary lifestyle is associated with an increased risk of major non-communicable diseases worldwide (Archer & Blair, 2012; Lee et al., 2012; Thapa, Oral, & Nomikos, 2024).

In a study published in 2019, Steckling and colleagues explored the potential impact of high-intensity interval training (HIIT) on systemic inflammatory and hormonal markers in postmenopausal women with metabolic syndrome. Fifteen postmenopausal women with metabolic syndrome participated in treadmill exercise. We also analyzed messenger RNA (mRNA) expression of these cytokines in peripheral blood mononuclear cells (PBMC). Following the HIIT program, there were indications of improvements in VO2 max and some anthropometric parameters. Additionally, there were indications of a decrease in proinflammatory indicators and an increase in interleukin-10 (IL-10) levels. The mRNA expression of the analyzed genes did not appear to differ after HIIT. The findings suggest that HIIT may have a beneficial effect on the inflammatory and hormonal profile in serum or plasma samples, without altering the PBMC of individuals with postmenopausal metabolic syndrome (Steckling et al., 2019).

It seems that there is some evidence to suggest that high-intensity aerobic interval exercise may be more effective than moderate-intensity continuous exercise in reducing cardiovascular risk factors associated with metabolic syndrome (Haram et al., 2009). However, both exercise programs were found to be equally effective in reducing body weight and fat content. These results suggest that exercise may play a role in reducing the effects of metabolic syndrome, though the magnitude of this effect may depend on the intensity of the exercise (Haram et al., 2009).

In a study conducted by Yoo et al. (2013), the effects of exercises on metabolic syndrome were examined in elderly individuals with metabolic syndrome. The study combined in-water exercises and muscle-strengthening exercises with elastic tera bands. It was observed that triglyceride levels and waist circumference were found to be significantly reduced in the combined exercise group in comparison to the tera band and in-water exercises. It is worth noting that HDL-cholesterol levels increased significantly in the combined group compared to the muscle-strengthening group. The results indicate that combined exercise may be more effective in improving dyslipidemia and abdominal obesity. (Yoo et al., 2013).

In a study by Thivel et al. (2012), the effect of exercise intensity on energy intake in obese adolescents was investigated in three different experimental settings: acutely sedentary, low-intensity (40% VO2max), and high-intensity (75% VO2max) exercise days providing isocaloric energy expenditure. It was observed that in both exercise conditions, energy intake decreased without a change in subjective appetite status after exercise. Notably, in the high-intensity exercise group, there was a significant decrease in energy intake compared to the other two groups (Thivel et al., 2012).

In a study conducted by Prado et al. (2015), two aerobic exercise models of low (50% VO2max) and high (70% VO2max) intensity were applied for 12 weeks. The energy expenditure of these models was isocaloric. In addition, the effects of these models on energy intake and the levels of hormones responsible for appetite were examined. While there was a comparable reduction in body weight in both exercise groups, the high-intensity aerobic exercise group exhibited a

notable decrease in energy intake compared to the baseline (Prado et al., 2015).

Conclusion:

It is generally accepted that metabolic health is closely related to optimal levels of blood sugar, cholesterol, triglycerides, blood pressure, and waist circumference. For this reason, maintaining these physiological parameters within recommended ranges is extremely important for the prevention of chronic diseases such as diabetes, cardiovascular disorders, and obesity. While healthy aging is a process that includes the maintenance of physical function, mental health, and emotional well-being throughout the aging process, it is also important to consider the preservation of muscle mass, cognitive abilities, social interactions, and general health elements as concepts closely related to the quality of life.

Since it is widely accepted that maintaining metabolic health is essential for general well-being, blood sugar levels, cholesterol levels, blood pressure, and body weight must be within normal physiological limits for metabolic health to be optimal. To achieve this targeted optimum metabolic health, having balanced and healthy eating habits, regular exercise, and weight management are important for healthy aging.

Regular exercise plays an important role in weight control by increasing energy expenditure and aiding weight loss or maintenance. While aerobic exercises such as running or swimming and resistance training such as weightlifting help build muscle mass, these physical activities are known to increase the metabolic rate. Increasing muscle mass allows individuals to burn calories even while resting, contributing to weight management and general metabolic health, allowing for effective weight control.

Exercise also has positive effects on cholesterol levels. Since high levels of LDL cholesterol can increase the risk of heart disease, it is very important that regular physical activity can help reduce triglyceride levels and increase HDL cholesterol. Because higher HDL cholesterol levels can remove LDL cholesterol from the bloodstream, regular exercise interventions may support cardiovascular health and metabolic well-being. At the same time, exercise plays an active role in the prevention and treatment of common metabolic health problems that can lead to cardiovascular problems such as hypertension. It has been proven that regular exercise can help reduce blood pressure levels by allowing blood vessels to relax and reducing resistance to blood flow. By keeping blood pressure within normal limits, individuals will have an effective health contribution in terms of protecting their long-term metabolic and cardiovascular health.

It is becoming increasingly clear that sustaining metabolic health in older adults is crucial for maintaining functional independence and reducing the risk of age-related chronic diseases. Lifestyle factors, especially exercise and nutrition, have been identified as key determinants of metabolic health in older adults. Studies have shown that regular physical activity can increase insulin sensitivity, improve cardiovascular function, and increase muscle strength and endurance. It seems that there is growing evidence that physical activity programs may play an important role in maintaining metabolic health, particularly in older adults. In light of this information, it seems that physical activity, when combined with a calorie-restricted nutrition program, may be an effective way to protect metabolic health. For this reason, it may be helpful to recognize the positive impact of regular exercise on maintaining metabolic health and the value of developing regular exercise habits as part of a healthy lifestyle and healthy aging process.

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