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Opinion Article

Enhancing Strength and Balance in Older Adults through Exercise

Paccou Tobai*

Department of Physical Education and Sport, University of A Coruna, A Coruna, Spain

DESCRIPTION

Aging is often associated with a decline in physical function, which can lead to a decrease in quality of life, loss of independence, and a higher risk of disability. As people age, they experience reductions in muscle mass, strength, endurance, and balance. These changes are closely linked to the risk of chronic diseases such as cardiovascular conditions, osteoporosis, and metabolic disorders. However, research shows that exercise interventions can significantly improve physical function in older adults by positively influencing key biomarkers. Physical function biomarkers are measurable indicators that reflect the health and functional capacity of the body. In older adults, these biomarkers help evaluate physical performance and the body's ability to carry out everyday activities.

Some common physical function biomarkers include, sarcopenia, the age-related loss of muscle mass and strength, is a important biomarker linked to frailty, falls, and disability. Maintaining muscle mass is essential for mobility and independence. Cardiorespiratory fitness measured by VO_2 max (the maximum amount of oxygen the body can utilize during exercise), this biomarker is important for endurance and overall cardiovascular health. It reflects the body's ability to perform sustained physical activity. Balance is a key factor in preventing falls, a major cause of injury in older adults. This biomarker is often assessed through balance tests and gait analysis. Range of motion and joint health are important for performing daily activities such as bending, reaching, and walking. Reduced flexibility is linked to stiffness, discomfort, and limited mobility.

Exercise interventions and their impact on biomarkers

Exercise interventions, customised specifically for older adults, have been proven to slow down, prevent, or even reverse declines in these physical function biomarkers. The types of exercise interventions include aerobic exercises, resistance training, balance and flexibility exercises, and High-Intensity Interval Training (HIIT). Each has a unique impact on specific biomarkers.

Resistance training and muscle strength: Resistance or strength training, which involves exercises like weightlifting, bodyweight exercises, or the use of resistance bands, has a profound impact on improving muscle mass and strength in older adults. It directly addresses sarcopenia by stimulating muscle hypertrophy (growth) and improving neuromuscular function. Studies show that older adults who engage in resistance training at least two to three times per week experience significant gains in muscle mass and strength, even after just a few months. Improved muscle strength leads to better physical performance in activities of daily living (e.g., climbing stairs, carrying groceries), reduces the risk of falls, and enhances independence.

Aerobic exercise and cardiorespiratory fitness: Aerobic exercises such as walking, swimming, cycling, and low-impact aerobics enhance cardiorespiratory fitness by improving heart and lung function. Regular aerobic exercise increases VO_2 max, helping the body use oxygen more efficiently. This improved efficiency leads to greater endurance and reduces fatigue, making it easier for older adults to remain active for longer periods. Research indicates that moderate-intensity aerobic exercise for at least 150 minutes per week significantly improves cardiovascular biomarkers and reduces the risk of heart disease, stroke, and other age-related cardiovascular conditions.

Balance and flexibility exercises for fall prevention: Balance training is particularly important for older adults to reduce the risk of falls. Exercises that focus on improving balance and coordination, such as yoga, tai chi, and specific stability exercises, enhance proprioception (the body's sense of position) and strengthen stabilizing muscles around the joints. Regular practice of these exercises has been shown to improve postural control and reduce the incidence of falls by improving biomarkers related to balance and gait. These exercises also improve joint flexibility, which helps in maintaining a full range of motion and reducing stiffness in the joints.

Multimodal and HIIT programs for comprehensive benefits: High-Intensity Interval Training (HIIT), even when adapted to older adults, has been found to improve multiple biomarkers simultaneously. HIIT involves short bursts of intense activity followed by periods of rest or low-intensity exercise. It has been

Correspondence to: Paccou Tobai, Department of Physical Education and Sport, University of A Coruna, A Coruna, Spain, E-mail: pactobi@gmail.com

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muscle strength and metabolic health in older adults. Combining different types of exercise, such as resistance training, aerobic exercise, and balance exercises, in a multimodal intervention provides comprehensive improvements in multiple physical function biomarkers. These combined programs have been particularly effective in improving overall physical function and quality of life in older adults.

CONCLUSION

Exercise interventions are a powerful tool for improving physical function biomarkers in older adults. Whether through resistance training, aerobic activities, balance exercises, or HIIT, these interventions can significantly improve muscle strength, cardiorespiratory fitness, balance, and flexibility. By targeting these key biomarkers, older adults can maintain independence, reduce the risk of disability, and improve their quality of life as they age. Incorporating regular physical activity into daily routines is one of the most effective strategies for promoting healthy aging and sustaining physical function well into later years.