

Promoting Active Aging through Lifelong Physical Activity in the 21st Century

EGBON, Evans Agbonmwanre, Okoedion, O. Sarah, Edeme- Okonigene, Dorcas

Department of Human Kinetics and Health Education, Faculty of Education, Ambrose Alli University, Ekpoma, Edo State

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ABSTRACT

Active aging has emerged as a central approach to achieving longer and healthier lives, with consistent physical activity serving as a key factor in preserving independence and preventing disease among older populations. This paper emphasizes the importance of fostering movement across the lifespan as a reliable pathway to sustaining well-being in later years. Current evidence demonstrates that regular participation in aerobic, resistance, balance, and flexibility training lowers the likelihood of chronic illnesses such as cardiovascular disorders, type 2 diabetes, and osteoporosis, while also improving cognitive performance, mobility, and psychosocial resilience. Nevertheless, barriers such as functional decline, limited awareness, and inadequate community resources often reduce sustained participation, particularly in advanced age. Addressing these challenges calls for a coordinated strategy that integrates supportive policies, structured exercise programs, and locally driven initiatives to promote engagement across different stages of life. By embedding physical activity into everyday routines and framing it as a lifelong practice rather than an intervention targeted only at old age, societies can cultivate healthier populations that remain self-sufficient for longer. Such an approach not only enhances individual quality of life but also alleviates the broader economic burden of healthcare.

Keywords: Active aging, lifelong, physical activity, quality of life, disease prevention.

INTRODUCTION

Aging populations are rapidly increasing worldwide. The demographic transition is one of the most challenging developments in our modern world since human life expectancy has substantially grown worldwide (Flatt and Partridge, 2018). Over the past decades, medical progress has significantly increased life expectancy. Thus, more than 2 billion individuals are expected to be older than the age of 60 by 2050 (Mahindru et al, 2023). In Western countries, life expectancy has increased by about 20 years since 1950, and almost 10% of people living in developed countries will be 80 years old or older by 2050 (Harper, 2014). Nevertheless, a substantial gap exists between total and healthy life expectancy (Seals et al., 2016), meaning people live several years with functional limitations. This gap, which burdens individuals, their families, and society due to increased health costs, has multidimensional causes and may partly depend on biological aging mechanisms and lifestyle behavior, such as low physical activity and high sedentary time (Raffin et al., 2023).

Most researchers concur that aging is a natural, physiological process of growing older experienced by every individual at varying rates (Grayston, 2018). One could say that the age/aging phases are easy to recognize, but the mechanisms responsible for the aging process are complex to define and harder to prove. The natural aging process affects all organisms. Time, hereditary, and, to a greater extent, environmental variables contribute to the complicated biological aging process. It happens in different ways in different cells and tissues. The biological age does not always correspond to the chronological age because people age at different rates. The human body exhibits numerous markers and aging-related alterations. A few categories can be used to categorize the changes that come with aging: normal aging, physical illnesses and some chronic issues, and psychological, cognitive, and social changes. (Jaul and Barron, 2017). The changes could be physiological,

such as the decline in muscle mass and strength, a condition known as sarcopenia that can lead to decreased mobility and increased frailty in older adults.

Additionally, there is a reduction in bone density, which can result in an increased risk of fractures and osteoporosis (Larsson et al., 2019). Aging also brings about changes in cognitive function. Many individuals experience a decline in memory, processing speed, and executive function as they age. These changes can impact daily activities and independence, making it essential to develop strategies for maintaining cognitive health (Feng et al., 2022). Another significant effect of ageing is the heightened susceptibility to chronic diseases. Conditions such as heart disease, diabetes, and cancer become more prevalent as individuals grow older (Maresova et al., 2019). Aging is the primary risk factor for the majority of prevalent chronic diseases, such as dementia, cardiovascular disease, and cancer (Zhang et al., 2020). As a result, the proportion of persons with one or more chronic diseases rises. Aging and disease are not the same things, even though it is a significant risk factor for many chronic illnesses. If aging is a natural and inevitable process that occurs in all living organisms, including humans and refers to the gradual loss of physiological function over time, resulting in physical, cognitive, and emotional changes, healthy aging, on the other hand, refers to maintaining a high level of functioning and wellbeing as one age. This includes maintaining physical fitness, cognitive abilities, and emotional health. Healthy aging looks back on a long historical development with concepts like successful, healthy, productive, or active aging (Behr et al., 2023). Successful aging, also known as optimal aging, takes the concept of healthy aging a step further. It involves maintaining a high level of functioning and finding satisfaction, purpose, and fulfillment in later years (Mackenzie, 2012). Understanding the factors contributing to these conditions and implementing preventive measures is crucial for promoting healthy aging.

Aging is often accompanied by chronic conditions, functional decline, and reduced social participation. Population aging is rising sharply across the globe, making the preservation of health and independence among older adults a public health imperative. The World Health Organization emphasizes the pivotal role of physical activity in reducing the risk of noncommunicable diseases, such as coronary heart disease, stroke, hypertension, type 2 diabetes, certain cancers, and depression, while enhancing musculoskeletal and functional health (WHO, 2020). Notably, older adults stand to benefit tremendously from lifelong engagement in regular physical activity, which supports mobility, resilience, and well-being. However, research demonstrates that maintaining an active lifestyle throughout life helps mitigate these effects, leading to what WHO terms “active aging.” Lifelong physical activity (LPA) not only supports physical health but also cognitive function, emotional well-being, and social engagement.

Physical activity is a fundamental means of improving the physical and mental health of individuals of all ages. Empirical evidence strongly supports the lifelong benefits of physical activity. Paterson and Warburton (2010) revealed that older adults who are active have higher levels of functional capacity, better quality of life, and lower risk of chronic disease than their sedentary counterparts. Piercy et al. (2018) revealed in their study that regular physical activity confers substantial health benefits for adults and older adults and reduces the risk of all-cause mortality. Physical activity and exercise are crucial in promoting healthy and successful aging. Regular physical activity can help mitigate the decline in muscle mass and strength, combatting the effects of sarcopenia and promoting better mobility and independence in older adults. Additionally, exercise, particularly weight-bearing and resistance training, can contribute to maintaining bone density and reducing the risk of fractures and osteoporosis.

Furthermore, physical activity has positively impacted cognitive function, including improved memory, attention, and executive function. This can significantly contribute to maintaining independence and quality of life as individuals age (Faenza et al., 2020). In terms of chronic disease prevention, participating in regular exercise has been associated with a reduced risk of conditions such as heart disease, diabetes, and certain types of cancer. Through its influence on weight management, blood pressure regulation, and insulin sensitivity, physical activity can help mitigate the risk factors for these diseases, thereby promoting overall health and wellbeing as individuals age (Ruegsegger and Booth, 2018). Moreover, staying physically active also contributes to emotional and psychological wellbeing, promoting a sense of purpose, satisfaction, and fulfillment in later years. Integrating physical activity and exercise into daily routines supports active and healthy aging (Szychowska & Drygas, 2022).

Healthy Aging and Frailty

Healthy ageing and frailty represent two contrasting yet interconnected trajectories in later life. The World Health Organization (WHO, 2020) defines healthy ageing as maintaining the functional ability that supports well-being in older age. It emphasizes not only freedom from illness or disability but also the capacity to live independently, engage socially, and sustain physical and mental health. This perspective shifts attention from simply preventing disease to enhancing resilience and quality of life. Frailty, in contrast, is a geriatric syndrome characterized by progressive physiological decline across multiple systems, leading to heightened vulnerability, disability, and adverse outcomes (Arkhipova et al., 2024). Age-related loss of motor neurons and muscle fibres contributes to reduced strength and mobility (Piasecki et al., 2015). While these losses cannot be reversed, exercise training can improve cardiorespiratory, musculoskeletal, and metabolic function. Evidence from master athletes—older adults who continue to compete at high levels—shows that regular activity preserves health more effectively than inactivity, though physiological decline still occurs (Ireland et al., 2014).

Functional capacity in older adults is commonly assessed through standardized tests such as the 6-minute walk, 30-second chair rise, and the Short Physical Performance Battery (SPPB). An SPPB score of 12 reflects robust health, while scores below 8 suggest sarcopenia and frailty (Ireland et al., 2014; Bauer, 2015). Frailty can be classified using two major frameworks: the deficit-accumulation model (Rockwood scale), which considers cumulative health and social deficits, and the phenotype model (Fried's criteria), which identifies frailty based on unintentional weight loss, low activity, slow gait speed, exhaustion, and muscle weakness (BMC Nephrology, 2025). Prevalence varies by setting and criteria, ranging from 12% of community-dwelling older adults (physical frailty) to over 40% in hospitalized populations (BMC Geriatrics, 2024). Frail individuals typically present with limited mobility, reduced social engagement, and multiple chronic conditions, increasing risks of falls and poor recovery from illness. Importantly, frailty is not always irreversible; with targeted interventions, some regain independence, though their vulnerability remains heightened (Pridham et al., 2024).

Regular Physical Activity to Promote Healthy Ageing

Regular physical activity is one of the most powerful, evidence-based strategies to delay functional decline and promote healthy ageing. It preserves intrinsic capacity the composite of physical, cognitive, and psychosocial abilities and lowers the risk of non-communicable diseases such as cardiovascular disease, type 2 diabetes, osteoporosis, and dementia (World Health Organization, 2020). According to the WHO (2020) guidelines, adults aged 65 years and older should engage in at least 150–300 minutes of moderate-intensity aerobic activity per week, alongside muscle-strengthening activities and balance training.

Emerging large-scale longitudinal studies show that sustained physical activity not only delays the onset of frailty but can also reverse early stages of functional decline. Wang et al. (2025) found that older adults engaging in weekly moderate-to-vigorous exercise had a 34% lower likelihood of progressing to frailty over five years. Li et al. (2024) demonstrated that all types of leisure-time physical activity, light, moderate, or vigorous, significantly reduced frailty risk in a Chinese cohort aged 60+. Among U.S. women followed for 24 years, those in the highest quintile of total weekly physical activity had about half the risk of developing frailty compared to their least active peers (LaMonte et al., 2022). Multicomponent exercise programs incorporating resistance, balance, and aerobic training have also been shown to improve frailty scores and functional independence (Marques et al., 2024).

Regular physical activity is universally recognized as one of the most important modifiable determinants of healthy ageing. It is strongly associated with enhanced longevity, reduced morbidity, and prolonged functional independence (WHO, 2020). Rather than being a singular intervention, physical activity represents a lifelong habit capable of shaping physical, cognitive, and psychosocial well-being well into older age (Piercy et al., 2018).

Physical activity supports healthy ageing through several mechanisms:

- **Cardiorespiratory Fitness:** Aerobic exercise improves oxygen delivery and heart function, reducing cardiovascular risk (Piercy et al., 2018).

- **Muscle Mass and Strength:** Resistance and strength training combat sarcopenia—the age-related loss of muscle mass—thus reducing frailty and fall risk (Landi et al., 2020).
- **Neurocognitive Health:** Exercise stimulates neuroplasticity and increases cerebral blood flow, improving memory, executive function, and reducing depression and anxiety (Erickson et al., 2019).
- **Metabolic Regulation:** Physical activity enhances insulin sensitivity and helps maintain a healthy weight (LaMonte et al., 2022).

The more often a person is physically active, the better their physical capability. This is due to adaptations of physiological systems, most notably within the neuromuscular system to coordinate movements, the cardiopulmonary system to more effectively distribute oxygen and nutrients around the body, and metabolic processes particularly those regulating glucose and fatty acid metabolism, which collectively increase overall aerobic power and physical capability. People with higher activity levels and physiological fitness have a lower mortality risk (Feldman et al. 2015). Maintenance of a physically active lifestyle through middle and older age is associated with better health in old age and longevity. Beginning a new exercise regimen in middle age is associated with healthy ageing (Sabia et al. 2012). But, even for those who were relatively sedentary through middle age, it is never too late because beginning a new exercise regimen in old age leads to significant improvements to health and cognition (Hamer et al. 2014). Physical activity reduces the risk of developing cardiovascular and metabolic disease through better control of blood knowing how to encourage exercise participation at the population-level is challenging because a one-size-fits-all programme is not suitable.

Factors Influencing Physical Activity Participation by the Aging

Exercise habits differ depending on income, gender, age, ethnicity and disability. The following include some factors that influences physical activity participation by the aging;

Intrapersonal Factors

Functional capacity, health status, and perceived safety strongly influence participation. Older adults with mobility limitations or fear of injury are less likely to be active. Chronic conditions such as arthritis or pain often discourage exercise, even though activity helps manage symptoms (Milanović et al., 2025; Chukwu et al., 2024). Individualized screening, gradual progression, and low-impact options such as tai chi or water aerobics can improve confidence and reduce risks (Okoye et al., 2024).

Motivation and Identity

Sustained activity depends heavily on motivation and self-perception. Older adults motivated by independence and cognitive health, and those who identify as “exercisers,” are more likely to adhere long term (Nigg et al., 2023). Enjoyment, self-efficacy, and intrinsic goals reinforce participation, while pain or fatigue reduce it. Peer mentorship and programs designed specifically for older adults can strengthen exercise identity (Kwan et al., 2024).

Social and Interpersonal Influences

Social support consistently promotes activity. Encouragement from family, peers, and professionals enhances adherence, while lack of support is a major barrier, especially in disadvantaged groups (Santos et al., 2024). Group-based programs, caregiver involvement, and intergenerational activities provide both social and physical benefits (Milanović et al., 2025).

Physical Environment

Environmental conditions shape opportunities for activity. Unsafe neighborhoods, poor infrastructure, or institutional constraints reduce participation, while safe, accessible, and age-friendly environments encourage it (Gao et al., 2024). Features such as well-lit walkways, benches, and safe crossings, along with indoor

alternatives in poor weather, increase activity levels. Local policies can incentivize gyms, parks, and community centers to provide senior-friendly facilities.

Technology

Digital tools expand access through online classes and apps, but barriers such as low digital literacy remain. Hybrid programs that combine in-person and online elements show the greatest success (Pérez et al., 2025). Providing simple devices, digital training, and tech support can help older adults build confidence, while online communities and virtual buddy systems can reinforce accountability (Chen & Li, 2025).

Economic Factors

Affordability is a major determinant. Low-income older adults are less likely to access structured programs or equipment (Kwan et al., 2024). Subsidized or free community initiatives, transport support, and partnerships with NGOs can lower costs and improve participation (Santos et al., 2024).

Cultural and Gender Norms

Beliefs and expectations around aging and gender also influence activity. In some cultures, older age is seen as a period of rest, while women may face caregiving duties or discomfort in mixed-gender settings (Okoye et al., 2024). Culturally tailored programs, women-only sessions, and involvement of community leaders or faith-based organizations can help overcome these barriers (Milanović et al., 2025).

Psychological and Cognitive Factors

Mental health and cognitive status strongly shape physical activity participation. Older adults with depression, anxiety, or mild dementia are less likely to engage (Chen & Li, 2025). Yet, tailored programs can improve mood, executive function, and adherence (Pérez et al., 2025). Screening for psychological conditions, offering memory aids, and providing supervised small-group sessions enhance safety and participation. Combining exercise with mindfulness or stress-reduction strategies can further support engagement.

Life Transitions and Time Constraints

Major life events such as retirement, bereavement, or relocation can either encourage or discourage physical activity. While retirement may increase free time, loss of structure or companionship often reduces participation (Nigg et al., 2023). Caregiving duties may also limit availability (Kwan et al., 2024). Flexible scheduling, integrating activity into daily routines (e.g., gardening, active transport), and peer-support networks help overcome these barriers.

Physical activity recommendations for older adults

Physical activity extends beyond formal exercise, aiming to support lifelong fitness and well-being (WHO, 2024). Benefits include stronger muscles and bones, improved cardiovascular and digestive health, greater endurance, and enhanced flexibility (Jayedi et al., 2024; Mayo Clinic, 2024). Activities such as walking, cycling, dancing, swimming, and resistance training all contribute. Aerobic exercise like running, brisk walking, or swimming works large muscle groups, strengthens the heart and lungs, and improves oxygen delivery. Anaerobic exercise, such as weightlifting or isometrics, primarily builds muscle strength and size (Healthline, 2024). A balanced program combining both is most effective.

CONCLUSIONS

Addressing the challenge of physical inactivity in older adults requires moving beyond individual responsibility toward broader systemic action. Policymakers and practitioners should prioritize the integration of age-friendly environments, affordable and accessible exercise opportunities, and community-based programs that normalize active living throughout life. Embedding physical activity promotion into healthcare delivery, urban planning, and social policy can create supportive conditions that enable older people to remain

active, independent, and engaged. Such measures not only improve individual well-being but also reduce long-term healthcare costs and strengthen public health systems.

RECOMMENDATIONS

1. Older adults should be routinely screened for depression, anxiety, and cognitive impairment, with exercise programs tailored to their psychological and cognitive needs.
2. Flexible and adaptable exercise schedules should be provided to accommodate life transitions such as retirement, bereavement, and caregiving responsibilities.
3. Physical activity should be integrated into daily routines through activities such as gardening, walking, and stair climbing to enhance accessibility and sustainability.
4. Exercise programs for older adults should combine aerobic activities to improve cardiovascular endurance with resistance training to preserve muscle strength and bone health.
5. Low-impact and safe exercise options, including tai chi and water aerobics, should be prioritized for those with mobility limitations or chronic health conditions.

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