



# Physical Activity, Exercise, and Physical Rehabilitation

# 14

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## Abstract

Enhancing physical activity promotes positive health trajectories throughout the life course. Physical activity should be tailored and graded to suit older adults' capacities and needs and can be combined with rehabilitation interventions to manage geriatric syndromes and disability. This chapter provides a summary of current evidence about the role of physical activity for older adults, emphasizing nutritional aspects. We also present strategies to help health-care professionals to enhance physical activity participation.

## Keywords

Physical activity · Exercise · Nutrition · Rehabilitation · Older adults

This chapter is a component of Part II: Special Topic in Geriatric Nutrition. For an explanation of the grouping of chapters in this book, please see Chap. 1: "Overview of Nutrition Care in Geriatrics and Orthogeriatrics."

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## Learning Outcomes

By the end of this chapter, you will be able to:

- Apply the updated recommendations of physical activity for older people.
- Justify health benefits of physical activity in older adults.
- Describe the rationale for combined exercise and nutritional interventions.
- Report strategies to enhance physical activity level.

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## 14.1 Importance of Physical Activity in Older Adults

Healthy aging conceptualization is grounded in fostering the functional ability of older people, so they can be and do what they value [1]. Being physically active is a key factor to prevent and maintain intrinsic capacity and to optimize functional ability in old age. Physical activity (PA) is considered as any bodily movement produced by the contraction of muscles, increasing energy expenditure [2]. In a new and broader definition, PA involves people moving, acting, and performing within culturally specific spaces and contexts and is influenced by a unique array of interests, emotions, ideas, instructions, and relationships [3]. Exercise is defined as planned, structured, and repetitive movement to improve or maintain some component of physical fitness [2].

PA can be undertaken as part of recreation and work or as part of domestic tasks. While some PA activities can be more pleasant than others, with associated mental and social benefits, if older people undertake PA regularly and in a sufficient duration and intensity, they will have health benefits [4]. Reducing physical inactivity is part of World Health Organization (WHO) global strategy to manage noncommunicable diseases (NCDs). Implementing community-wide public education and awareness for PA and providing PA counseling and referral as part of routine primary health-care services are considered “best buys” interventions, particularly for low- and middle-income countries [5].

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## 14.2 Recommendations for Physical Activity

Recommendations suggest 150–300 min of moderate-intensity aerobic physical activity or at least 75–150 min of vigorous-intensity aerobic physical activity or an equivalent combination of moderate- and vigorous-intensity activity throughout the week, for substantial health benefits [6]. Aerobic activity is recommended to be performed in bouts of at least 10 min each. There is high evidence of an inverse dose response relationship between volume of aerobic physical activity and risk of physical functional limitations in the general older adult population.

For older adults that are not able to complete the above recommendations, they should be physically active as their abilities and conditions allow [6]. As highlighted in the 2020 WHO recommendation, “Doing some physical activity is better than doing none.”

Older adults should include multicomponent physical activity that combines aerobic, strengthening, and functional balance on 3 or more days a week; strength training for all major muscle groups should be considered 2 or more days a week [6]. For adults with chronic conditions, a frequency of 3 days a week is commonly recommended.

The types of PA most popular for older adults are light intensity, such as walking and gardening [2]. Older adults should gradually increase the duration and frequency of moderate-intensity activity rather than rapidly increasing to vigorous-intensity activity [6, 7]. Growing evidence supports that light-intensity activities, like a slow walking or housework (e.g., ironing and dusting), also offer a protective benefit against diseases and disability [8, 9]. Older adults should be as active as possible. Even when recommendations are not met, efforts to integrate more light-intensity activities into everyday life are beneficial.

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### 14.3 Benefits of Physical Activity

*Márcia has worked on a cattle ranch for most of her life. Although she was thin, she was a strong, hardworking, healthy, and happy woman who slept well at night. She did not take any medications and, although having annual checkups with the community nurse, had never needed to see the doctor or go to hospital.*

Benefits of PA in middle age to older adult years include the maintenance of balance, strength, flexibility, and exercise capacity (Table 14.1). Whether achieved through prescribed multimodal or multicomponent exercises or mustering cattle and rural fencing, PA optimizes physical, mental, and musculoskeletal health, health-related quality of life, and functional independence and abilities and decreases the risk of falling.

*Following a fall off her horse at the age of 76, Márcia spent most of her days in bed. She had poor dietary intake, ongoing falls, and urinary incontinence over the next 6 months. Márcia's son José eventually convinced her to receive a visit from the local community nurse. Shortly afterward, Márcia presented to hospital where multiple vertebral crush fractures, malnutrition, frailty, vitamin D deficiency, osteoporosis, and depression were diagnosed.*

Older adults presenting with geriatric syndromes, such as falls and fragility fractures, malnutrition, frailty, depression, and urinary incontinence, may present with different levels of functional disability and deconditioning, resulting in low physical

**Table 14.1** Benefits of physical activity in older adults

Potential benefit	Examples
Health conditions and mortality	<ul style="list-style-type: none"> <li>• 22% ↓ all-cause mortality [10]</li> <li>• 12% ↓ risk of breast cancer [11]</li> <li>• Noncommunicable disease (e.g., coronary heart disease, type 2 diabetes) prevention/management [2, 12]</li> </ul>
Cognitive function, mental health, and health-related quality of life	<ul style="list-style-type: none"> <li>• 36% ↓ risk of cognitive decline [13, 14]</li> <li>• 24% ↓ all-cause dementia (moderate-intensity)</li> <li>• 28% ↓ all-cause dementia (high-intensity) [13, 14]</li> <li>• 40% ↓ Alzheimer's disease development [11]</li> <li>• 21% ↓ incident depression (high-intensity) [11]</li> <li>• Poor sleep quality and declining intrinsic capacity</li> <li>• Increased health-related quality of life</li> </ul>
Musculoskeletal health	<ul style="list-style-type: none"> <li>• 31% ↓ in relative risk of fracture (hip, wrist, and vertebral fractures) [15]</li> <li>• Improved lumbar spine bone mineral density, may improve hip (femoral neck) bone mineral density [15]</li> <li>• Probable positive impact on frailty and sarcopenia (resistance training, combination of resistance, balance, endurance, and function exercise) [16]</li> </ul>
Physical function and disability	<ul style="list-style-type: none"> <li>• Approximately 50% likely ↓ risk of functional limitations/disability (moderate/high levels) [17]</li> <li>• Strongly recommended to ↓ loss of physical function and mobility (multimodal or multicomponent exercises including balance, strength, flexibility, and functional training) [17]</li> <li>• Delayed disability or functional limitation and prolonged disability-free life (high levels in middle age) [18]</li> </ul>
Fall prevention	<ul style="list-style-type: none"> <li>• 31% ↓ in falls (dance-based mind-motor activities) [19]</li> <li>• 23% ↓ in falls (structured exercise) [20]</li> <li>• 42% estimated reduction in the rate of falls (exercise dose of more than 3 h/week of balance and functional exercises) [20]</li> <li>• Exercise as a single intervention did not reduce falls but was able to enhance mobility in frail older people recently discharged from hospital [21]</li> </ul>

activity levels and the adoption of sedentary behavior over time. Appropriately prescribed exercise and PA are demonstrated to be safe and have a beneficial effect on functional ability; these benefits can be extended to older adults like Márcia, even in the presence of existing physical and functional limitations. Multimodal or multicomponent exercises including balance, strength, flexibility, and functional training are strongly recommended to manage significant loss of physical function and mobility [22].

*Over the next 6 months, Márcia worked together with many different health-care providers in the hospital, rehabilitation center, and secondary prevention fracture clinic and achieved her goal of being back in the saddle within 1 year.*

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## 14.4 Nutrition Status and Physical, Functional, Exercise, and Rehabilitation Outcomes

Malnutrition can influence physical and functional activity, exercise, and rehabilitation processes of older adults [23], increasing the length of stay in the hospital and the rates of readmission [24]. Nutritional status has been correlated with poor basic activities of daily living (ADL) and instrumental activities of daily living (IADL) in community-dwelling [22], institutionalized [25], and hospitalized older adults [26]. Older people who report unintentional weight loss are at a higher risk of developing limitations in ADL such as bathing, dressing, and eating [27], as well as older people who report obesity [28]. Also, low body mass index (BMI) [29] and high BMI [28] have been shown as a risk factor for the onset of activities of daily living limitations. Particularly the combination of a high BMI and dynapenia, defined as dynapenic obesity, is associated with a poorer physical function when compared to obesity alone [30]. Malnutrition has also been associated with high risk of falling [31], harmful falls [32], hip fracture incidence, and reduced ability to recover pre-fracture functional capacity in patients after hip fracture [33].

Vitamin D and protein has an important function on muscle strength, so its deficits can lead to muscle weakness [34]. Administration of high-protein diets, with protein throughout the three meals associated with high doses of calcium and vitamin D, can improve muscle health and decrease the risk of fracture [34] (Chap. 9).

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## 14.5 Combined Nutrition Physical Activity/ Exercise Interventions

Consequently, we make the case that in the absence of adequate nutrition, physical activity or exercise interventions are unlikely to lead to optimized health or health-related quality of life for older adults like Márcia. Although the evidence remains inconsistent, there is a growing body of evidence to support combined nutrition and exercise/PA interventions in older adults. Particularly the combination of protein intake and nutrition counseling with exercise has demonstrated reduced long-term mobility disability [17, 22], improved frailty scores [35], improved lower limb functionality [35], and increased independence in activities of daily living [35].

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## 14.6 Physical Rehabilitation

Rehabilitation is a set of person-centered interventions across multiple disciplines with the key objective of optimizing functioning and reducing disability [36]. A person-centered care approach for older people includes the assessment and development of a care plan based on the assessment of vitality (including the nutritional care), visual, hearing, cognitive, locomotor, and psychological capacities; underlying diseases (and risk factors); caregiving needs; assessment, selection, and

provision of assistive products (e.g., walking aids, therapeutic shoes, grab bars); physical environment modifications; and need for social care (Chaps. 1 and 13) [37].

A comprehensive care approach conducted by an interdisciplinary team allows tailoring older people and caregiver's needs and ensures interventions orientated toward relevant outcomes, avoiding unnecessary treatments, polypharmacy, and poor adherence to interventions. Particularly for older people with significant loss of mobility due to chronic conditions, the combination of rehabilitation interventions and the enhancement of PA level may amplify positive outcomes [6].

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## 14.7 Enhancing Physical Activity Level Among Older People

Diverse health-care professionals can help older people to increase their PA levels by exploring, discussing, and intervening to reduce barriers and enhance facilitators for being more active (Table 14.2) [38]. These actions include establishing and negotiating individual realistic goals, taking into account specific needs, health conditions, and physical limitations, and creating a shared, tailored plan that addresses each recommended type of activity/exercise with specific goals, need of supervision, and safety procedures. Applying behavioral strategies of positive reinforcement using motivational interviewing strategies to stimulate participation in PA demonstrates successful long-term results. Goal setting and self-monitoring in combination with the use of digital technologies such as sensors (e.g., pedometers and accelerometers) have also proven beneficial [38, 39]. The use of smartphone, tablet apps, and mobile text messages is promising and appears to be acceptable and beneficial for the maintenance and improvement of PA in the short term [39]. E-health strategies are being increasingly used to promote and track physical activity among older people (e.g., mobile apps, wearable, digital PA coaching, online social support, video demonstrations, video games, etc.) with positive results in increasing the time spent on physical activity, the energy expenditure in physical activity, and the number of walking steps. These strategies should be used to enhance physical activity level among older adults [39].

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## 14.8 Summary

Benefits of physical activity are substantial and contribute to healthy aging. Particularly, multicomponent exercises, nutritional interventions, and rehabilitation can improve physical functioning and prevent disability. Health-care professionals play a key role in implementing strategies to enhance physical activity participation.

### Take-Home Points

- The recommendation is 150–300 min of moderate-intensity aerobic physical activity or at least 75–150 min of vigorous-intensity aerobic physical activity or

**Table 14.2** Interdisciplinary opportunities for enhancing physical activity in older adults

Who	What	How
Medical doctor/physician	Physical activity advice	Specific physical activity advice (type, frequency); plan of action and follow-up [40]; address individual motivators, facilitators, and barriers; refer to local physical activity opportunities or to a professional able to offer a specific physical activity or exercise plan
Physiotherapist	Promote physical activity [41] and provide tailored preventive interventions and/or rehabilitation program	Assess and prescribe appropriate program according to needs, preferences, abilities, and conditions; specific physical activity advice (type, frequency); plan of action and follow-up; encourage progress and participation [42]
Physical educator and fitness professionals	Provide tailored physical activity/exercise program	Assess and prescribe appropriate program according to needs, preferences, abilities, and conditions; specific physical activity advice (type, frequency); plan of action and follow-up; encourage progress and participation
Nurse and other health-care professionals	Promote physical activity participation	Explore and discuss awareness of the benefits of being active; address individual motivators, facilitators, and barriers; refer to local physical activity opportunities or to a professional able to offer a specific physical activity or exercise plan [43, 44]
Volunteers and carers	Promote physical activity participation	Be a physical activity enthusiast; explore and discuss awareness of benefits of being active. Address motivators, facilitators, and barriers; refer to local physical activity opportunities or to a professional able to offer a specific physical activity or exercise plan [43]; provide support and/or company to those who need it [38]
Researchers	Promote and disseminate science	Generate and implement high-quality evidence for physical activity; investigate local barriers and facilitators for implementing successful strategies
Policy makers	Implement healthy aging policies, environments, and infrastructure	Provide free or low-cost exercise programs that are tailored to personal needs and preferences [4–6]; create safe environments, access to parks and other recreational facilities, and safe footpaths [45]

an equivalent combination of moderate- and vigorous-intensity activity throughout the week, for substantial health benefits.

- Older adults should combine aerobic, strengthening, and functional balance exercises.
- Exercise can be part of lots of things as recreation, work, or domestic activities.
- Doing some physical activity is better than doing none—it is important be physically active as their abilities and conditions allow.
- Nutritional treatment reduces the progression of functional decline, even further when associated with PA programs, reducing long-term mobility disability.
- The use of e-health strategies to enhance PA should be considered.

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