Fall Prevention Community of Practice
ADULT+JUNIOR

Preventing falls among older adults through physical activity: A guidance document for practitioners

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Evidence Summary
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Quick links

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Key Messages

- Regular, sustained physical activity for older adults is associated with a range of health benefits, including reductions in all-cause mortality, cognitive decline, depression, fractures, and recurrent falls. Regular physical activity is also associated with higher reported quality of life and healthier aging trajectories among older adults.

- Prolonged periods of physical inactivity places older adults at increased risk of deconditioning. Deconditioning in older adults is associated with a number of adverse health outcomes, including increased hospitalization, balance deficits, new (or worsening) mental health issues and increased risk of falls.

- Structured exercise programs, including multicomponent exercise regimens or alternative programs such as Tai Chi, are a proven means of ensuring that older adults reap the health benefits of physical activity, including reduced falls and fracture risks. However, the positive health impacts of physical activity can also be achieved through routine activities including undertaking everyday chores, gardening, walking or cycling.

- The World Health Organization's (WHO's) Global Recommendations on Physical Activity for Health state that adults aged 65 and over should engage in at least 150 minutes of moderate or 75 minutes of vigorous-intensity aerobic activity per week. In addition, older adults should engage in muscle strengthening activity (i.e., strength/resistance training) on three or more days per week.

- Physical activity levels in older adults are affected by a range of social, cultural, economic, and environmental factors. These include: socio-economic status, the physical or built environment, levels of health literacy and physical literacy, social support, the cultural appropriateness of physical activity options, sex and gender differences, and perceptions about the risks and benefits of physical activity among older adults. Please refer to this guidance document for a detailed description of how these and other factors affect the physical activity levels of older adults as well as implications for practitioners.

- Practitioners designing exercise programs and other interventions to assist older adults in making optimal use of their physical activity time can benefit from two comprehensive sets of recommendations derived through structured evidence reviews and consensus from expert panels. These include The International Exercise Recommendations in Older Adults (ICFSR): Expert Consensus Guidelines, and the World Guidelines for Fall Prevention and Management in Older Adults. Please refer to the full guidance document below for a detailed overview of the recommended practices for physical activity interventions among older adults outlined in these guideline reports.

- Physical activity interventions need to be tailored for older adults at increased risk for injury and other negative outcomes due to pre-existing morbidities, such as Parkinson's Disease, hip fractures, knee replacements, arthritis, and cognitive challenges, such as Alzheimer's Disease. Please refer to the full guidance document below for recommended modifications to physical activity programs that enable the participation of older adults with specific health issues.

Further research on the following areas is needed to guide planning and implementation of more effective physical activity interventions for older adults:

- the development of age-friendly communities for older adults living in rural/remote areas and heterogenous communities of older adults with diverse beliefs and preferences regarding physical activity;
- key elements of the built environment that facilitate physical activity among older adults living in rural or remote communities as well as culturally diverse populations of older adults;
- more rigorous evaluations of the impact of age-friendly communities on the lives of older adults, including changes in patterns of physical activity;
- the promotion and utilization of physical literacy as both a concept and strategy to encourage physical activity among older adults;
- more systematic documentation of adaptations to physical activity programs that meet the needs/preferences of culturally and linguistically diverse (CALD) populations of older adults;
- more large-scale, population-based research on physical activity among older adults (to date, most research consists of short-term studies in specific settings with small samples);
- more studies linking physical activity to greater independence and improved quality of life among older adults;
- further studies on the role of significant others (i.e., partners, family members, caregivers) in encouraging regular physical activity among older adults;
- best practices in the use of virtual exergames and other assistive technologies to support older adults in maintaining a healthy physical activity regimen.

Last, practitioners and policy makers can support physical activity among older adults by:

- ensuring the equitable provision of physical activity amenities and opportunities in low socio-economic status (SES) neighbourhoods;
- increasing the number of safe, walkable, aesthetically pleasing neighbourhoods with easy access to destinations and amenities, including parks/open space, shopping and public transit;
- promoting the benefits of physical activity to older adults with low health literacy levels through tailored communications campaigns and materials;

- tailoring physical activity interventions to socially isolated populations of older adults, as older adults at greater risk of social isolation have different support needs for physical activity;
- increasing the number of physical activity interventions that meet the needs and preferences of male older adults, who are under-represented in exercise programs;
- developing communication campaigns that address misperceptions about physical activity held by some older adults and emphasize the numerous health benefits of physical activity, as well as strategies for minimizing or mitigating any attendant risks;
- ensuring that appropriate supports are provided to older adults with fears or concerns about engaging in physical activity;
- altering the built environment (e.g., more shaded areas) and physical activity interventions (e.g., limiting intense exercises on high temperature days) for older adults to account for significant global warming induced by climate change.

Purpose

The purpose of this guidance document is to assist practitioners with the planning and implementation of structured physical activity programs for older adults. The document reviews evidence on the need for older adults to remain physically active and describes the health risks associated with physical inactivity and aging. It also provides an overview of the key social, economic, and environmental factors affecting physical activity patterns among older adults. Recommended practices for physical activity interventions are summarized along with guidelines for tailoring physical activity interventions to meet the needs of specific subgroups of older adults with health issues. Lastly, gaps in the current body of knowledge regarding physical activity in older adults are summarized, and recommendations for practitioners and policy makers to increase physical activity rates among older adults are provided. A forthcoming document will include specific recommendations for bringing about a more integrated, system-level approach to the provision of physical activity interventions for older adults in Ontario.

An overview of the health benefits of physical activity for older adults

Regular, sustained physical activity for older adults is associated with a range of health benefits that are well established in scientific studies.[1,2] For example, a 2020 systematic review of 24 systematic reviews and meta analyses (of moderate to high methodological quality) by Cunningham and colleagues found that physically active older adults (60 yrs of age or greater) are at reduced risk of all-cause and cardiovascular mortality, breast and prostate cancer, disabilities and limitations impairing activities of daily living (ADL), cognitive decline, Alzheimer's disease, depression, fractures and recurrent falls.[3] In addition, physically active older adults have higher reported quality of life, improved cognitive functioning and healthier aging trajectories: with regard to the latter outcome, it appears that physical activity plays a significant role in the 'compression of morbidity', reducing the amount of time spent in ill health and ensuring that increases in life expectancy are accompanied by corresponding increases in the amount of time spent in good health.[3]

The health benefits of physical activity are not limited to healthy older adults. A systematic review of nine randomized control trials by de Labra and colleagues found that exercise training for frail, elderly adults was associated with several improved health outcomes and aspects of physical function. These included improved mobility, balance, muscle strength, functional ability and a reduction in falls.[4]

Prolonged periods of physical inactivity places older adults at increased risk of **deconditioning**, a process of physiological changes following a period of sedentary lifestyle, physical inactivity or bedrest.[5] Deconditioning in older adults is associated with a number of adverse health outcomes, including increased hospitalization,[5, 6] balance deficits, new (or worsening) mental health issues and increased risk of falls.[7,8]

Structured exercise programs are a proven means of ensuring that older adults reap the health benefits of physical activity. In particular, multicomponent exercise programs, including combinations of resistance training, balance and/or gait retraining, and alternative exercise

programs such as Tai Chi or dance, have been shown to be effective in reducing falls and fracture risks among older adults.[9, 10] However, the positive health impacts of physical activity by older adults do not accrue from structured exercise programs alone: they can also be achieved through various domestic, community-based and leisure activities, including undertaking everyday chores, gardening, walking or cycling. These simple, everyday activities can help older adults to maintain good physical health and avoid deconditioning.[11]

Factors affecting physical activity levels in older adults

As is the case with other health-related behaviours, physical activity levels in older adults are affected by a range of social, cultural, economic, and environmental factors. The following section identifies some of the key determinants that enable or impede regular, sustained physical activity by older adults and notes implications for practitioners and policy makers to ensure that all older adults enjoy equitable access to healthy, safe physical activity opportunities that meet their needs and preferences.

Socio-economic status

Studies indicate that older adults with higher levels of income and socio-economic status (SES) are more likely to participate in all physical activities.[12-15] Older adults living in low SES neighbourhoods experience greater environmental and individual barriers to engaging in physical activity than the general older adult population. These include lack of access to public or private transportation, safety concerns and a lack of physical activity amenities (e.g., recreation centres, swimming pools) in low SES areas.[13-15] In many communities, the tendency to place these amenities in central locations makes access more challenging for low SES adults in outlying neighbourhoods with limited financial resources.[16]

To increase physical activity among low SES older adults, providers and policy makers need to ensure the equitable provision of physical activity amenities and opportunities in low SES neighbourhoods. Emphasis should be given to group activities, as the perceived added value of group activity as a catalyst for healthy behaviour change appears to be more important for low SES older adults than their higher SES counterparts.[17] For example, a recent study from the United Kingdom suggests that facilitating strong social bonds and group cohesion helped to maintain regular physical activity among low SES older adults, an outcome the study authors attributed to a perceived obligation to fellow group members.[18] Moreover, emphasizing the social aspect of group interactions may enable low SES older adults to appreciate the enjoyable aspects of physical activity rather than associate it with hard, physical labour (something many low SES older adults may have had enough of during their working years).[18]

Built environment

The **physical or built environment** includes the objective and perceived features of the physical context in which people live (e.g.., home and neighbourhood). These include aspects of urban design (e.g., the presence of sidewalks), traffic volume and speed, the design of and accessibility to venues for physical activity (e.g., parks), and crime and safety.[19] Although the built environment is viewed as especially relevant to the physical activity levels of older

adults,[20] associations between built environment characteristics and physical activity are less frequently studied for older adults than for younger age groups.[21]

A meta-analysis of 100 articles from peer-reviewed and grey literature was conducted by Barnett and colleagues to identify environmental correlates of total physical activity and walking time among older adults.[22] Positive environmental correlates of physical activity ranked on the strength of evidence were walkability, safety from crime , overall access to destinations and services, access to recreational facilities, access to parks and public open space, access to shops and commercial destinations, access to green spaces and aesthetically pleasing scenery, walk friendly infrastructure, and access to public transport.[22]

The results supported the findings of an earlier systematic review of qualitative studies assessing the relationship between the physical environment and physical activity in older adults.[23] Through a content analysis of 31 studies, Moran and colleagues found five themes affecting the physical activity of older adults:

- pedestrian-friendly infrastructure (not only the presence of sidewalks, but also their maintenance, continuity, slope, separation from cyclists, etc.),
- safety (both crime and traffic-related),
- access to amenities (e.g., shopping, health services, seniors' centres),
- aesthetics (e.g., well maintained neighbourhoods and parks), and
- environmental factors (e.g., the presence of benches in parks and public spaces).[23]

The creation of physical/built environments to enable greater physical activity levels among older adults is a key component of an **age-friendly community**. Over the past two decades, interest in age-friendly communities has grown as governments have adopted **aging in place**, supporting older adults to continue living in the community for as long as possible, as a policy goal that is more socially and economically viable than institutionalized care.[24-26]

While the age-friendly community movement has focused attention on the built environment, it has several limitations with the potential to impact the physical activity levels of older adults. First, most age-friendly community initiatives are focused on urban settings, and relatively little attention has been paid to the neighbourhood characteristics of older adults living in remote or rural areas.[25, 26] Second, age-friendly communities tend to adopt a 'one size fits all' population-level approach that does not give sufficient attention to increasingly diverse communities of older adults with different beliefs and preferences.[25, 27] Lastly, much of the literature on age-friendly communities is descriptive in nature, with limited evaluation of the impact of age-friendly initiatives on the lives of older adults.[25]

In summary, planners and policy makers can enable greater levels of physical activity among older adults through the creation of safe, walkable, aesthetically pleasing neighbourhoods with easy access to destinations and amenities, including parks/open space, shopping and public transit.[22] Features of these spaces, such as paths, benches, and washrooms, should adopt ergonomic designs that meet the needs of older adults.[28] Further research is needed to identify

key elements of the built environment to facilitate physical activity among older adults living in rural or remote communities[25, 26] as well as culturally diverse populations of older adults.[25, 27]

Health literacy and physical literacy

Ratzan and Parker (2000, p. 4) define **health literacy** as "the degree to which individuals have the capacity to obtain, process and understand basic health services needed to make appropriate health decisions."[29] Studies indicate that low levels of health literacy are predictors of negative health outcomes, including increased use of emergency services, decreased use of preventive services (e.g., vaccinations and mammograms), and higher mortality rates.[30] Low SES, age, ethno-racial background, cognition and low educational attainment have all been identified as contributing factors to low health literacy. Of these, age is the demographic variable showing one of the highest correlations with low health literacy.[31, 32]

Evidence indicates a significant association between low health literacy and decreased physical activity in older adults. For example, a 2021 meta-analysis of five studies (using the random effects model) by Lim and colleagues found that older adults with low health literacy were 38% less likely to report engaging in physical activity on five days a week or more than older adults with higher health literacy levels (odds ratio = 0.62, 95% confidence interval 0.55-0.77).[33]

Promoting the benefits of physical activity to older adults with low health literacy levels requires the development of tailored communications campaigns and materials. An expert panel convened by the US Centers for Disease Control (CDC) put forward the following recommendations for reaching older adults with low health literacy:[34]

- using plain language in all materials;
- 'bundling' related messages to avoid information overload;
- conducting participatory research with low health literacy older adults to engage them in the process of creating more effective health communication campaigns and materials;
- using 'information layering' (i.e., making the most important information available first);
- repeating information using multiple channels;
- improving the quality/usability of health-related websites and e-tools;
- implementing strategies for reaching older adults with limited or no internet access (e.g., presentations or distribution of print information resources at seniors' centres).[34]

In recent years, **physical literacy** has emerged as a promising strategy for increasing physical activity across all age groups. Canada's Physical Literacy Consensus Statement defines physical literacy as "the motivation, confidence, physical competence, knowledge and understanding to value and take responsibility for engagement in physical activities for life".[35] Physical literacy is considered an underlying mechanism that enables the adoption of physical activity.[36]

To date, physical literacy strategies have been applied primarily to promote physical activity among younger individuals, and its utility in supporting older adults to remain physically active

has not been as widely explored.[37] To address this knowledge gap, Active Aging Canada received funding from the Canadian Institutes of Health Research (CIHR) Institute of Aging to assess awareness and understanding of physical literacy among older adults, and individuals who work with older adults. A majority (75%) of the 725 older adults responding to an online survey had not heard of physical literacy, but 82% percent of respondents indicated they would be interested in learning more about it. A large majority (95%) of individuals working with older adults (N=104) were also interested in learning more about physical literacy as a means of supporting physical activity. The authors concluded that there is an opportunity to raise awareness of and promote physical literacy among older adults. However, further work is needed to guide how physical literacy is presented to older adults (in terms of concept and strategy).[37]

Social support

There is a substantive body of evidence linking social support from families, friends, and communities to improved health outcomes.[38] Not surprisingly, levels of social support have been linked to the frequency of physical activity among older adults. A 2017 systematic review of 27 studies by Lindsay Smith and colleagues found a positive association between social support and physical activity among older adults, especially when the support came from family members.[39] However, high measurement variability made comparison between studies challenging. Moreover, nearly all the studies linking social support to physical activity are one-time (cross sectional) surveys, thereby making it difficult to determine whether higher levels of social support are associated with higher levels of physical activity or vice versa.[39]

The types of social support impacting the physical activity of older adults were analysed through baseline data from 21,491 older adults (age 65+) participating in the Canadian Longitudinal Study of Aging.[40] Greater social network size, social contact with network members and participation in community activities predicted higher levels of physical activity. Conversely, being in a domestic partnership and perceiving more tangible support to be available were negatively associated with physical activity levels. While the results suggest that the forms of social support positively correlated with physical activity should be incorporated into health promotion campaigns for older adults, the study also demonstrates that older adults at greater risk of social isolation have different social support needs for physical activity. Accordingly, further efforts are needed to tailor physical activity interventions to socially isolated populations of older adults.[40]

One under-studied aspect of social support and physical activity among older adults concerns the use of social networking platforms, such as Facebook and Instagram, to encourage healthy behaviours. There is some evidence that social networking sites can enhance social support.[41] However, there is a lack of research on the relationship between physical activity and the use of social networking sites by older adults.[40] This deficit may be partially attributable to the relatively low utilization of social network platforms by older adults. Statistics Canada data from 2019 indicate that only 56 percent of older adults use these sites,[42] and the majority of older adults who access these sites limit usage to a few times a year or less to interact with family and friends.[40]

Diversity

There is growing consensus that both global and country-specific physical activity guidelines and frameworks for older adults need to be tailored to meet the needs of culturally and linguistically diverse (CALD) sub-groups.[43] CALD populations tend to have lower rates of participation in physical activities such as sports compared to the general population.[44] Systematic reviews of the literature indicate that effective tailoring strategies to promote physical activity among older adults from CALD populations include community consultation to inform the intervention, language adjustments, the use of bilingual/bi-cultural personnel for intervention delivery, the use of culturally relevant material,[45] as well as native language instruction and the adaptation of culturally familiar physical activities.[43] However, greater levels of detail and transparency about the cultural adaptations of physical activity programs for CALD populations are needed to better inform practice.[45]

Sex and gender differences

Older adult women are more likely to participate in exercise programs than their male counterparts.[46, 47] This disparity may be attributable to men feeling that the content of exercise programs does not meet their own interests or preferred modes of physical activity.[48] These findings indicate a greater need for physical activity interventions geared towards male older adults. In addition, promotional efforts targeting male older adults may also increase their participation in structured physical activity programs: 90 percent of men responding to a survey on barriers to participation in fall prevention exercise classes felt that advertisements featuring men would increase their involvement.[48]

Perceptions of physical activity benefits and risks

Some older adults continue to believe that physical activity is unnecessary or even potentially hazardous.[49] Others recognize the benefits of physical activity but have misperceptions about the range of activities needed to maintain good health. For example, a qualitative survey of older adults in the United Kingdom revealed a lack of knowledge about the need to incorporate strength-maintaining exercises into a healthy physical activity routine: many older adults felt that walking constituted sufficient exercise.[50]

One commonly held perception that exerts a detrimental effect on the physical activity levels of many older adults is fear of falling. Fear of falling (FOF) refers to persistent concern about sustaining a fall that causes an older adult to minimize or avoid walking or other physical activities.[51] Over time, FOF can lead to an abnormal gait and a loss of confidence in walking ability.[52, 53] Persistent FOF is associated with a range of negative health outcomes, including deconditioning, social isolation, depression, more frequent falls, greater frailty, decline in mobility and increased mortality.[54-57]

Communication campaigns are needed to address misperceptions about physical activity held by older adults. In addition, these campaigns need to emphasize the numerous health benefits of physical activity as well as strategies for minimizing or mitigating any attendant risks. A

survey of 1,200 older adults (age 50 +) in Australia found that public service announcement ads encouraging older adults to be more physically active were more likely to be accepted if they depicted their peers engaging in common forms of moderate to vigorous physical activity.[58]

Some older adults may require additional supports to overcome their fears or concerns about engaging in physical activity. For example, cognitive behavioural therapy was found to be effective in reducing FOF.[59]

Recommended practices for physical activity among older adults

The World Health Organization's (WHO) Global Recommendations on Physical Activity for Health state that adults aged 65 and over should engage in at least 150 minutes of moderate- or 75 minutes of vigorous-intensity aerobic activity per week. In addition, older adults should undertake muscle strengthening activity (i.e., strength/resistance training) three days or more per week.[60] The 150 min/week benchmark was also adopted by the Canadian 24-Hour Movement Guidelines for Adults 65 years or older, which were developed by the Canadian Society for Exercise Physiology in collaboration with the Public Health Agency of Canada, Queen's University and ParticipACTION.[61] Unlike the WHO recommendations, the 24-Hour Movement Guidelines state that the 150 min/week can be attained through a combination of moderate to vigorous physical activities.[61]

Practitioners designing exercise programs and other interventions to assist older adults in making optimal use of their physical activity time can benefit from two comprehensive sets of recommendations derived through structured evidence reviews and consensus from expert panels. In 2021, the International Exercise Recommendations in Older Adults (ICFSR): Expert Consensus Guidelines were released.[9] These provide comprehensive recommendations for optimal aging and the maintenance of functional capacities in older adults, including guidance for the frequency, volume and intensity of resistance training, aerobic exercise training and balance training as well as specific physiological adaptations and sample exercises.[9]

Physical activity recommendations aimed at fall prevention were released in 2022 as part of the World Guidelines for Fall Prevention and Management in Older Adults.[10] Led by the World Falls Guidelines (WFG) Task Force, these guidelines were developed by a global, multidisciplinary group of experts and stakeholders, including older adults. Recommendations from 11 working groups, including a group focused on exercise and physical activity interventions (Working Group 4), were developed using a modified Delphi process, with final recommendations determined by voting.[10] The WFG include several guidelines regarding the intensity, duration, delivery, and maintenance of physical activity to prevent falls among older adults.

A summary of the ICFSR and WFG recommendations, including key implications for practitioners, are presented in the following section.

International Exercise Recommendations for Older Adults (ICFSR)

The core ICFSR recommendations are summarized in Table 1. These recommendations provide guidance for the frequency, volume and intensity of resistance training, aerobic exercise training and balance training as well as specific physiological adaptations and sample exercises.[9] The full ICFSR recommendations are available at https://link.springer.com/article/10.1007/s12603-021-1665-8.

Table 1. International Exercise Recommendations for Older Adults (Adopted from Izquieredo et al, 2021)[9]

	Resistance Training	Aerobic Exercise Training	Balance Training
Frequency (days per week)	2 – 3	3 – 7	1 – 7
Volume	1–3 sets of 8–12 repetitions, 8–10 major muscle groups	20 – 60 minutes / session	1 – 2 sets of 4 – 10 different exercises emphasizing static and dynamic postures
Intensity	Start at 30–40% of 1RM and progress to heavier loads of 70–80% 1 RM (15–18 on Borg Scale)[a] 1–3 min rest between sets Power training at 40 – 60% of 1RM	12–14 on Borg Scale[a] (55–70% heart rate reserve or maximum exercise capacity)	Progressive difficulty as tolerated[b] Narrowing the base of support Perturbation of ground support Decrease in proprioceptive sensation. Diminished or misleading visual inputs Movement of the centre of mass of the body away from the vertical or stationary position Dual tasking: adding a cognitive distractor or secondary physical task while practising a balance task
Specific Physiological adaptations	Strength Power Hypertrophy Endurance Maximal aerobic capacity	Maximal aerobic capacity Sub-maximal endurance Cardiac contractility/stroke volume Peripheral oxygen extraction Arterial stiffness Heart rate variability	Dynamic stability
Exercise examples	• Multiple and single joint exercises (free weights and machine) with slow to moderate lifting velocity • Bench press and squat • Knee extensions and knee curls • Exercise selection can be varied through alterations in body posture, grip, hand and foot stance, unilateral vs bilateral exercises • Once body weight no longer serves as a sufficient source of overload, additional resistance can be provided by machines or free weights as needed to ensure progression.	• Dancing • Cycling • Hiking • Jogging / long distance running • Swimming • Walking with change in pace and direction • Treadmill walking • Stair climbing • Step-ups • Seated stepping • Recumbent cycling May start with 5–10 mins and progress to 15–30 mins. The intensity is proportional to heart rate and/or perceived exertional scales if on B blockers or has pacemaker and can be increased from moderate to vigorous depending on fitness.	• Tai Chi • Standing yoga or ballet movements • Tandem walking • Standing on one leg, stepping over objects, climbing slowly up and down steps • Turning • Standing on heels and toes, walking on a compliant surface such as foam mattresses • Maintaining balance on a moving vehicle, such as a bus or train • Dual-tasking: adding cognitive distractor while maintaining balance Many conditions in older adults require balance training before aerobic exercise/ gait retraining

a. Original Borg Scale of Perceived Exertion from 6 (easy) to 20 (maximal); b. Intensity is increased by decreasing the base of support [e.g., progressing from standing on two feet while holding on to the back of a chair to standing on one foot with no hand support); by decreasing other sensory input (e.g., closing eyes or standing on a foam pillow); by perturbing (i.e., moving) the centre of mass (e.g., holding a heavy object out to one side while maintaining balance, standing on one leg while lifting the other leg out behind the body, or leaning forward as far as possible without falling or moving feet); or by dual-tasking (adding a secondary cognitive [e.g., naming animals] or physical (e.g., juggling) task while tandem walking].

The ICFSR also includes recommendations on gait training, although these were not included in the core recommendations. This may be due to conflicting evidence on the efficacy of exercise interventions on gait ability (velocity and stability) in older adults.[9] Where possible, weight-bearing aerobic exercises simulating real life activities (e.g., treadmill walking, stair climbing) are preferable to enhance gait.[9] Modes of physical activity such as aquatic exercise, seated steppers or recumbent cycles may be feasible gait training alternatives for older adults with arthritis or balance impairment. However, as a general rule initial priority should be given to resistance, power and balance training if an older adult cannot support their body weight independently.[9] Gait training should start at 5-10 minutes (or less) during the initial weeks, progressing to 20-30 minutes long-tem.[9]

Multicomponent physical activity programs, which are generally inclusive of various combinations of strength, power, balance, gait and functional training, should incorporate gradual increases in the volume, intensity and complexity of the individual exercises. Multicomponent exercise training can also be provided to vulnerable populations of older adults, including acutely ill, hospitalized patients or institutionalized older adults.[9]

World Guidelines for Falls Prevention Recommendations for Exercise and Physical Activity Interventions

The WFG Task Force working groups utilized a modified version of the Grading of Recommendations, Assessment and Evaluation (GRADE) criteria[62] to assess the strength of evidence supporting their recommendations. The GRADE system utilizes numeric/letter combinations (e.g., 1A): 1 = strong evidence, 2 = weak or conditional evidence, A = high quality evidence, B = intermediate quality evidence, C = low quality evidence and E = expert consensus in the absence of supporting evidence.

The recommendations of the WFG Task Force Working Group 4, Exercise and Physical Activity Interventions for the Prevention of Falls, and their associated levels of supporting evidence are summarized in Table 2. The full report from the WFG Task Force Working Group on Exercise and Physical Activity is available at file:///C:/Users/User/Downloads/appendix2_full_reccomendations_afac205.pdf.

Table 2. WFG Task Force Recommendations for Exercise and Physical Activity for the Prevention of Falls.[63]

Rec #	Intervention	Level of Supporting Evidence
1.	We recommend exercise programmes for fall prevention for community-dwelling older adults that include balance challenging and functional exercises (e.g. sit-to stand, stepping) should be offered with sessions three times or more weekly which are individualised, progressed in intensity for at least 12 weeks and continued longer for greater effect.	**1A**
2.	We recommend inclusion, when feasible, of Tai Chi and/or additional individualised progressive resistance strength training.	**1B**
3.	We recommend individualised supervised exercise as a falls prevention strategy for adults living in long-term care settings.	**1B**
4.	We recommend that adults with Parkinson's Disease at an early to mid-stage and with mild or no cognitive impairment are offered individualised exercise programmes including balance and resistance training exercise.	**1A**
5.	We conditionally recommend that older adults after a stroke should be offered participation in individualised exercise programmes aimed at improving balance/strength/walking to prevent falls.	**2C**
6.	We recommend that older adults after sustaining a hip fracture should be offered an individualised and progressive exercise programme aimed at improving mobility (i.e. standing up, balance, walking, climbing stairs) as a fall prevention strategy.	**1B**
7.	We conditionally recommend that such programmes for older adults after a hip fracture are best commenced in hospitals and continued in the community.	**2C (Inpatients) 1A (Community)**
8.	We recommend that community-dwelling older adults with cognitive impairment (mild cognitive impairment and mild to moderate dementia) should be offered an exercise programme to prevent falls.	**1B**

Recommendation 1 applies to all older adults irrespective of their assessed risk of falling or age.[10] Where possible and safe, older adults should aim to participate in 150-300 minutes per week of intermediate-intensity physical activity or 75-100 minutes of vigorous-intensity physical activity per week.[10]

The WFG Task Force recommendations also include a number of guidelines regarding the intensity, duration, delivery, and maintenance of physical activity to prevent falls among older adults. Some of the key guidelines are provided below. Please refer to Appendix 2 of the WFG report[63] for the full set of detailed guidelines.

- Uptake and adherence to exercise interventions and to increasing physical activity may be helped by behaviour change approaches, such as coaching, supervision, group activities and educational materials.[10]
- Exercise programs that need to be of sufficient intensity and duration should be delivered in a way that ensures the safety and functional abilities of older adults.[10]
- Exercise needs to be progressive initially and maintained once a plateau is reached.[10]

- The benefits of exercise programs are lost upon cessation, so the continuation of appropriate physical activity at the end of a program is critical. If older adults withdraw from a program they should be encouraged to return; if necessary, programs should be modified to ensure appropriate dose and difficulty level.[10]
- Exercise programs should be delivered by appropriately trained professionals able to adapt exercises according to the functional status and comorbidities of older adults. These professionals can include physiotherapists, exercise physiologists, kinesiologists, trained exercise instructors or other allied health professionals (NB. The WFG Task Force recognizes that adherence to this recommendation will be challenging in some settings; however, the vast majority of exercise interventions found to be effective utilized trained providers).[10]
- Exercise programs can be implemented in groups, taught/supported in individualized home programs or delivered through a mix of both.[10]
- Smaller groups or individual supervision may be necessary for older adults with cognitive impairment.[10]
- Smaller groups and higher supervision levels are recommended in exercise programs for older adults who are frail.[10]
- Regaining the skill to rise from the floor, a critical component of exercise programs for frail older adults, is most effectively acquired through backward-chaining, the practice of each specific movement required.[63]

Tailoring physical activity interventions for older adults

Both the ICFSR and the WFG Task Force recommendations include guidelines for tailoring physical activity programs for older adults at increased risk for injury and other negative outcomes due to pre-existing morbidities.[9, 10] The following section reviews some of the key health challenges that may limit the physical activity of older adults and identifies recommended changes to physical activity interventions that enable their participation.

Parkinson's Disease

As was noted previously, the WFG Task Force recommends individualized interventions, including balance and resistance training exercises, for older adults with early to mid-stage Parkinson's Disease with no or mild cognitive impairment (Recommendation 4).[10] More detailed guidance on physical activity for individuals with Parkinson's disease was released by the US Parkinson's Foundation and the American College of Sports Medicine.[64] The new exercise guidelines (see Table 3) include recommendations regarding the frequency, intensity, time, volume and progression of exercises across four domains: aerobic activity, balance/agility/multi-tasking and stretching. Each recommendation is accompanied by specific examples of recommended physical activities and safety considerations for individuals with Parkinson's Disease.

Table 3. Exercise Recommendations for the Parkinson's Community[64]

	Aerobic Activity	Strength Training	Balance, Agility and Multi-Tasking	Stretching
Frequency/Duration	3 days a week for at least 30 minutes per session of continuous movement at moderate-vigorous intensity.	2-3 non-consecutive days per week of at least 30 minutes per session, with 10-15 repos for major muscle groups: resistance, speed or power focus.	2-3 days per week with daily integration if possible.	2-3 days per week with daily stretching being most effective.
Type	Continuous rhythmic activities such as brisk walking, cycling, swimming, aerobics classes.	Major muscle groups of upper/lower extremities such as using weight machines, resistance bands, light/moderate handheld weights or body weight.	Multi-directional stepping, weight shifting, dynamic balance activities, large movement, multi-tasking such as yoga, tai-chi, dance, boxing.	Sustained stretching with deep breathing or dynamic stretching before exercise.
Safety Considerations	Safety concerns due to risks of freezing of gait, low blood pressure and blunted heart rate response. Supervision may be required.	Muscle stiffness or postural instability may hinder full range of motion.	Safety concerns with cognitive and balance problems. Hold onto something stable as needed. Supervision may be required.	May require adaptations for flexed posture, osteoporosis and pain.

Hip fractures and hip/knee replacement

The WFG Task Force recommends an individualized, progressive exercise regimen aimed at mobility improvement (i.e., standing up, balance, walking, stair climbing) for older adults sustaining a hip fracture.[10] The Task Force made a more qualified recommendation regarding the hospital to community progression of exercise programs for older adults with hip fractures, as evidence supporting the efficacy of in-patient exercise programs for this population is weak.[10] Current guidelines for the physical therapy management of older adults with hip fractures recommend a structured exercise regimen, including progressive high-intensity resistive strength, balance, weight-bearing, and functional mobility training.[65]

Strengthening exercises to assist older adults with gaining mobility following a hip replacement should initially be conducted 3-4 times a week (every other day), with one set of 10-15 repetitions. The volume and frequency can be gradually increased to three sets of 10-15 repetitions (with a 1-2 minute break between sets). There are a number of specialized exercises designed to assist older adults in regaining strength and mobility following hip replacements, including bridge progressions, hip flexor strengthening, squat progression, and crab walks.[66]

There is a lack of evidence-based guidelines for physical activity post hip and knee replacement for both older adults and the general population. Most recommendations have been derived

from cross-sectional (i.e., one-time) opinion surveys of orthopedic surgeons.[67] Based on the existing literature, the general areas of consensus for physical activity post hip/knee replacement are: 1) return to low- to moderate-intensity activities and no-, low-, or intermediate-impact activities within three to six months postoperatively, 2) discourage high-impact physical activities, 3) avoid high-contact athletic activities (e.g, hockey, football), and 4) educate rather than dissuade patients from resuming leisure/sporting activities.[67]

Arthritis

The CDC recommends that older adults with arthritis aim for 150 minutes per week of moderate-intensity activity (e.g., brisk walking) or 75 minutes a week of more vigorous-intensity aerobic activity (e.g., cycling at 10 miles per hour (16.09 km/hr) or faster or an equivalent combination).[68] Preference should be given to low-impact aerobic activities that do not put stress on the joints, such as walking, cycling, swimming, water aerobics, light gardening, group exercise classes and dancing. In addition, older adults with arthritis should devote at least two days a week to strength and balance building activities, such as standing on one foot.[68]

Cognitive challenges

A growing body of evidence indicates that regular physical activity can slow the decline and improve the functioning of older adults with Alzheimer's and other cognitive challenges.[69, 70] The WFG Task Force recommends that exercise programs be offered to community-dwelling older adults with cognitive impairment (mild cognitive impairment and mild to moderate dementia) to prevent falls.[10]

The recommended duration and types of physical activity are dependent upon the stage of cognitive impairment. For older adults with early to middle-stage dementia, the Alzheimer's Society (United Kingdom) recommends 150 minutes of moderately strenuous physical activity per week that can be broken up into shorter sessions of 10-15 minutes per day. Recommended activities for people with early to middle stage dementia include gardening, light bowling, dancing, a range of seated exercises, swimming, Tai Chi and walking.[71]

The goal of physical activity for older adults with late-stage dementia is to reduce the need for constant supervision and minimize the need for certain adaptations, such as walk-in bathtubs or stair lifts.[72] Recommended exercises include changing position from sitting to standing, walking short distances into another room, balancing in a standing position and moving to sit in a different chair.[72]

Knowledge gaps and implications for research and data collection

There are several knowledge gaps concerning the many social, economic, environmental and cultural factors affecting the physical activity patterns of older adults. Further research on the

following areas is needed., New knowledge will benefit the planning and implementation of more effective physical activity interventions:

- Key elements of the built environment that facilitate physical activity among older adults living in rural or remote communities as well as culturally diverse populations of older adults.[25-27]
- More rigorous evaluations of the impact of age-friendly communities on the lives of older adults, including changes in patterns of physical activity. Particular emphasis needs to be given to age-friendly communities for adults living in rural/remote areas and heterogenous communities of older adults with diverse beliefs and preferences regarding physical activity[25-27]
- The promotion and utilization of physical literacy as both a concept and strategy to encourage and tailor physical activity among older adults.[35]
- More systematic documentation of adaptations to physical activity programs that meet the needs/preferences of culturally and linguistically diverse (CALD) populations of older adults.[45]
- More rigorous research and evaluations of the impact of web-based physical activity programs for older adults, especially in light of the lack of supervision for adherence to these exercises to reap the proper benefits.

Several of these knowledge gaps are indicative of a broader research deficit on the tailoring of physical activity programs for older adults in specific settings. For example, a systematic review of effective community-based physical activity interventions for older adults living in rural and regional settings by Moore and colleagues was unable to identify the most critical characteristics of these interventions due to a lack of rigorous studies.[73]

Two additional knowledge gaps regarding study design have been revealed by recent reviews of the literature on physical activity interventions for older adults.[74, 75] First, research on physical activity interventions for older adults appears to be biased towards short-term studies in controlled settings with selected samples rather than the large-scale, population-based research that is needed to bring about meaningful changes in physical activity levels and related health outcomes.[74] Second, studies on the efficacy of physical activity programs tend to focus on exercise compliance and one or more aspects of physical health as the key outcomes of interest at the expense of psychosocial outcomes such as independence and quality of life. A systematic review of meta-analyses of exercise interventions for older adults conducted by DiLorito and colleagues found that 80% of reviews focused on physical health outcomes for older adults, while only 20% addressed the impacts of physical activity on mood, independence and quality of life.[75]

Another critical knowledge gap concerns a lack of research on the role of significant others, such as family, friends and caregivers, in supporting older adults to become more physically

active. Significant others may be critical for the success of physical activity interventions, especially for older adults with physical or cognitive impairments.[75, 76]

One key innovation that was noticeably absent from the recent guidelines for physical activity in older adults is the advent of exercise-based video games and other forms of assisted technology designed to support older adults in maintaining a healthy physical activity regimen. Despite some promising results concerning the uptake of these emerging technologies, there is contradictory evidence regarding their acceptance by older adults.[75] There is some evidence that supports, such as technology orientation sessions, can enable the participation of older adults in virtual exercise programs.[77, 78] However, the utilization of on-line physical activity programs is a fairly recent innovation, and further research is needed to guide the acceptance and optimal utilization of exergames and other assisted technologies among older adults.

Implications for practitioners and policy makers

There are a number of actions that practitioners and policy makers can take to support physical activity among older adults. These include:

- ensuring the equitable provision of physical activity amenities and opportunities in low SES neighbourhoods.[18]
- increasing the number of safe, walkable, aesthetically pleasing neighbourhoods with easy access to destinations and amenities, including parks/open space, shopping and public transit.[22]
- promoting the benefits of physical activity to older adults with low health literacy and physical literacy levels through tailored communications campaigns and materials.[34]
- tailoring physical activity interventions to socially isolated populations of older adults, as older adults at greater risk of social isolation have different support needs for physical activity.[40]
- increasing the number of physical activity interventions that meet the needs and preferences of male older adults, who are under-represented in exercise programs.[46-48]
- developing communication campaigns that address misperceptions about physical activity held by some older adults and emphasize the numerous health benefits of physical activity as well as strategies for minimizing or mitigating any attendant risks.[58]
- ensuring that appropriate supports are provided to older adults with medical conditions, fears or concerns about engaging in physical activity.

One important issue that requires attention by practitioners and policy makers alike is the challenge of promoting physical activity among older adults during a period of significant global warming induced by climate change. Adults aged 60 and above are significantly affected by extreme heat due to the aging-related physiological changes impacting their ability to thermoregulate. [79, 80] Those responsible for planning and implementing physical activity programs for older adults need to consider factors such as features of the built environment

(e.g., the availability of shaded areas and water fountains), the nature and timing of physical activities, the importance of maintaining good hydration and limiting intense exercises on high temperature days.[81]

Conclusion

Participation in physical activity provides a range of physical, social and cognitive benefits for older adults. Among older adults with impaired health status, physical activity can be more effective than tertiary options. For example, exercise interventions are more useful than pharmaceuticals targeting single systems (e.g., inflammation) for managing frailty.[9]

The considerable body of accumulated evidence on the benefits of physical activity has led some experts to argue for the integration of exercise programs as a mandatory part of the health system for older adults across the spectrum of care.[82] A forthcoming document will give further consideration to this proposal by identifying recommendations for an integrated, system-based approach to the provision of physical activity opportunities for older adults in Ontario.

Key Loop Resources on Physical Activity in Older Adults

Webinars

Attract, Adapt, Implement and Sustain an Evidence Informed Exercise Program to Prevent Falls- An Initiative Funded by the Canadian Health Research Foundation (2023)
Delivered by Dr. Danielle Bouchard, a Professor in the Faculty of Kinesiology at the University of New Brunswick Fredericton, this webinar provides an overview of the Attract, Adapt, Implement and Sustain (AAIMS) project. The purpose of the project is to better understand how to: 1. attract people who currently do not participate in fall prevention exercise programs; 2. adapt the programs currently offered that do not meet the recommendations;
3. offer a program that follows recommendations if needed; and 4. keep offering a program in community settings. The webinar can be viewed at:
https://www.youtube.com/watch?v=YRYZPOLKRDE

World Falls Guidelines (2023)
Delivered by Dr. Manuel Montero-Odasso, Canadian researcher and first author on the World Guidelines for Falls Prevention and Management for Older Adults, this webinar provides an overview of the World Falls Guidelines Task Force recommendations for Fall Prevention and Management in Older Adults. These recommendations include the Task Force Working Group 4 recommendations for exercise and physical activity in the prevention of falls. The webinar can be viewed at: https://www.youtube.com/watch?v=A9UOfFBOOCQ

Do fall prevention community exercise programs for older adults in Canada meet evidence-based recommendations? (2021)
Co-presented by Alexie Touchette, a research coordinator in the Department of Community Health Sciences at the University of Manitoba, and Dr. Kathryn Sibley, an Associate Professor in the Department of Community Health Sciences at the University of Manitoba, this webinar discussed the major findings from a national self-report survey study which explored current practice in fall prevention community exercise programs targeted for older adults across Canada and the extent to which current practice incorporated evidence-based fall prevention recommendations. In addition, the webinar addressed the impact of COVID-19 on group-based exercise programs and considerations for online delivery. The webinar can be viewed at:
https://www.youtube.com/watch?v=EHw4NB8mF1k

Evidence summaries

Best practice exercise interventions to prevent falls in people with dementia (2020)
Geared to health professionals, this summary reports on available best practices in exercise to prevent falls in people with dementia. Additional information is provided on the specific risk factors for falls in this population, and the exercise or physical activity interventions that are shown in the research literature to be effective.

https://www.fallsloop.com/knowledge-products/1019/best-practice-exercise-interventions-to-prevent-falls-in-people-with-dementia

Content and training standards for exercise classes in ADP with people with dementia (2020)
This summary report reviews standards for exercise class provision in Adult Day Programs (APDs) for clients with cognitive impairment in terms of content of classes and training of instructors. Topics addressed in the report include competencies for instructors (e.g., training and certification), content for classes, and dosage for class provision (length of class, times per week, etc.)
https://www.fallsloop.com/knowledge-products/1018/content-and-training-standards-for-exercise-classes-in-adp-with-people-with-dementia

Exercise interventions with frail older adults in acute care
This summary reports on evidence-based best practices in exercise interventions with frail older adults in acute care settings. It includes a list of key findings on this topic and links to relevant research articles and guidelines. https://www.fallsloop.com/knowledge-products/1015/exercise-interventions-with-frail-older-adults-in-acute-care

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