Physical activity guidelines for older people: knowledge gaps and future directions

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Physical function (ie, aerobic capacity, gait speed, and muscle strength) has been proposed as a biomarker of healthy ageing, as it is predictive of adverse health events, disability, and mortality. The role of physical exercise as a therapeutic strategy for prevention of both disease and the associated decline in functional capacity has been emphasised repeatedly. Supervised exercise interventions in hospitalised older people (aged ≥75 years) have been proved to be safe and effective in preventing or attenuating functional and cognitive decline. Unfortunately, few studies have explored the potential role of tailored physical activity guidelines to maximise exercise-related effect on function. Also, exercise has not been fully integrated into primary or geriatric medical practice and is almost absent from the core training of most medical doctors and other health-care providers. Physical trainers should be included in health-care systems to help manage physical exercise programmes for older patients. Taking into consideration current evidence about the benefits of exercise for frail older adults, it is unethical not to prescribe physical exercise for such individuals. To promote healthy and dignified ageing, it is therefore essential to help health-care systems to more efficiently implement evidence-based exercise programmes for frail older adults in all community and care settings.

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Introduction

This Personal View asserts that increased knowledge about the effects of exercise interventions to improve age-related intrinsic capacity domains and functional ability in people with frailty would enable an increasingly coherent and holistic approach to treating both fit and frail older (≥65 years) patients. We believe that the physiological justifications for using exercise treatments to increase muscle mass and reduce symptoms of frailty are an example of medical, scientific, and pharmaceutical industry failures to appreciate exercise's major role as a therapeutic agent to prevent and treat both disease and loss of functional capacity.

Functional ability (defined as retention of autonomy that promotes wellbeing as people age), a term established by WHO in its first world report on ageing and health,[1] is the cornerstone of healthy ageing. The interactions between an individual's intrinsic capacity (ie, their mental and physical capacity: cognition and mental health, sensory function, metabolic rate, mobility, and muscle strength) and their socioeconomic and physical environments are crucial in achieving the optimum trajectory to maintain a person's functional ability throughout their life course. Objective physical function tests have been proposed as reliable indicators of overall health and functional status, which is predictive of adverse health events and disability, and is strongly linked to all-cause mortality in older populations (aged ≥65 years) and to functional outcomes in clinical trials.[2] Such tests include gait speed, used alone or in combination with other measures such as the Short Physical Performance Battery[3] (a set of physical function tests including standing balance, normal gait speed, and timed sit-to-stand). In the same way, higher handgrip strength is associated with lower odds of adverse events in most of the intrinsic capacity domains, and with a lower rate of hospitalisation (in men) compared with their peers with a weaker handgrip after adjustment for disease burden.[4] Thus, multimorbidity, including cardiovascular disease, might not be the most important factor modulating individual domains of intrinsic capacity that are responsible for functional decline and diminished ability to complete activities of daily living. Moreover, physical performance measures such as gait speed are not only powerful markers of longevity,[5,6] but also appear to have a more important role in moderating cardiovascular mortality and all-cause mortality compared with other measures of physical activity or function.[7–9] Thus, monitoring and preserving functional capacity in older adults is now a primary focus for clinicians in the management of cardiovascular diseases. Gait speed has been shown to play a mediating role in the adverse effect of sarcopenia (ie, decline in muscle mass and function) on functional dependence, after adjusting for age, sex, and body-mass index.[10] Older adults who presented with characteristics of sarcopenia, but also had a faster gait speed than their fitter peers, showed better functional ability in activities of daily living than those peers, because gait speed mediates the relationship between sarcopenia and ability to complete activities of daily living.[10] However, physical performance measures in mortality studies might have been biased by pre-existing illness (possibly through mechanisms other than decreased physical function related to illness or mortality), given that older participants who reported fast walking speed showed an association between higher systolic blood pressure and mortality, whereas there was no such association in slower walkers.[11] For these reasons, physical function could be a simple and easily collected measure of overall physical health status.

Frailty is another important clinical syndrome used in geriatric medicine. It refers to a distinctive ageing-related health state in which multiple body systems gradually lose their innate capacity, resulting in decreased physiological reserves and resilience in the face of stressors.[12] Physical inactivity is a key contributing factor

for sarcopenia,[13] which appears to be a key contributor to frailty. Over the past few years, frailty has attracted increased interest because of its direct relationship with adverse health outcomes such as physical and functional decline, hospitalisation, disability associated with institutionalisation, reduced quality of life, excess morbidity, and increased mortality. Accordingly, an important understanding about frailty is that, as with chronic diseases, the focus with older patients should be on functionality and not on the diagnosis of disease.

In older adults, particularly those who are prefrail and frail, hospitalisation is strongly linked to functional and cognitive decline, which in turn are associated with sustained disability, institutionalisation, and death.[14–16] This decline in the ability to complete activities of daily living has been called hospital-associated disability, defined as the loss of ability to complete one or more activities of daily living, such as using the toilet, bathing, dressing, transferring from bed to chair, or walking independently following acute hospitalisation.[17] In older people who are hospitalised, supervised exercise interventions have been proved safe and effective for attenuating functional decline and preventing cognitive decline.[15,16] Physical function improvements are mediated by cognitive function enhancements,[18] which highlights the essential role of cognition, specifically executive functions, for maintaining or promoting physical function (eg, balance, gait, and muscle strength) in older people, especially in the case of in-hospital exercise-training programmes.[19] Similarly, it was reported that an individualised multicomponent exercise-training programme for older adults could reverse the loss of ability to complete activities of daily living (ie, toilet use, transfers, mobility, and stair climbing) that frequently occur during hospitalisation.[20] This training-induced modification of the disability trajectory associated with hospitalisation was shown to be independent of changes in the inpatient's physical function as quantified by the Short Physical Performance Battery. Each patient, therefore, whatever their functional level, should receive an individualised prescription of exercise during hospitalisation.[20] Thus, improving or maintaining function becomes the ultimate mission for the medical care of older people. Exercise should be considered as a leading treatment strategy to prevent the functional and cognitive decline in older people that are often associated with prolonged bed rest during hospitalisation. Indeed, it has been shown that the best strategy is to prevent functional decline in the first place, rather than trying to recover function after it has been lost.[16,17]

Physical exercise to optimise functional outcomes in both fit and frail older adults

The role of physical exercise as a therapeutic method to prevent and treat both disease and loss of functional capacity[21] has repeatedly been supported by scientific and medical associations, and WHO.[22] The evidence clearly shows that being physically active and having a healthy diet (coupled with not smoking and moderate alcohol consumption) are integral to the maintenance of health and wellbeing at all ages. Furthermore, as the beneficial effects of exercise are global (ie, acting at both the physiological multisystem and functional capacity level), physical activity interventions are more promising than pharmacological interventions that target single systems (eg, inflammation or anabolic hormones) for managing frailty.[23] However, general guidelines on physical exercise largely focus on prevention of pathologies, with goals that often are not met, especially in older adults. The WHO 2020 guidelines on physical activity and sedentary behaviour[24] suggest that each week, as is recommended for all adults, people aged 65 years and older should engage in 150–300 min of moderate-intensity exercise, or 75–150 min of vigorous-intensity physical activity, or some equivalent combination of moderate-intensity and vigorous-intensity aerobic physical activity, and on 2 or more days do muscle-strengthening activity (eg, strength and resistance training). Other guidelines have suggested that physical activity for older adults should include multicomponent exercise training that emphasises aerobic, balance, and flexibility training and moderate-intensity or greater-intensity strength training three or more times per week to enhance functional ability and prevent falls.[25] To optimise the functional capacity of frail individuals, resistance training programmes should also include exercises that simulate daily activities, such as the sit-to-stand exercise. Explosive resistance training (known as power training) should also be prescribed whenever possible to optimise functional outcomes in both fit and frail older adults. The rationale for explosive resistance training is based on the association between muscle power output and physical function, given the marked loss of muscle power that occurs with ageing (caused by fast twitch fibre atrophy and changes in neural recruitment).[26] Besides being safe for healthy older adults,[27] a properly designed resistance exercise is reasonably free of the potential unwanted side-effects caused by common medications prescribed to patients with multiple comorbidities.[27,28]

Population-level preventive efforts, ideally before the onset of functional decline, have been tested in many countries. Unfortunately, few studies have explored the potential role of tailored physical activity guidelines to maximise exercise-related effects on function, on the ability to complete activities of daily living, or on other domains of intrinsic capacity such as cognitive, psychological, or sensory deficits (eg, vision or hearing), and those typically examined (ie, locomotion or vitality) in older people, which is likely to be related to the paucity of research in the area.[21] Tailored interventions for increasing population-level physical activity should also consider behavioural aspects to ensure adherence and increase motivation for physical activity (eg, to emphasise the wide range of benefits associated with a physically

active lifestyle) and to enhance self-efficacy.[29,30] Boosting social and environmental support for exercise improves people's physical activity levels, for example, exercising with a partner (eg, spouses, friends, and work colleagues), implementing strategies to improve access to physical activity facilities, and modifying public and private spaces (eg, work sites) to promote physical activity and to reduce sedentary behaviors.[29] Maintenance of exercise in older people is often difficult and requires continuous interventions.[29,30] Social support appears to be more successful than specific cognitive restructuring;[29,30] group exercise therapy with an exercise therapist and inclusion of fun activities and time for social interaction work well.[29,30] Alternatively, for people at home, regular follow-up by telephone to ask how the exercise programme is going and to provide friendly support can help people to maintain exercising.[29,30] Creating a gym membership that involves an exercise therapist who regularly interacts with the older person has also been successful.[29,30] Physicians and health-care professionals should also regularly ask the older patient how their exercise programme is going.

Yet exercise has not become fully integrated into primary or geriatric medical practice, and is almost absent from the core training of most medical doctors and other health-care professionals. Physical trainers should also be included in the health-care system to help plan and implement physical exercise programmes for older patients. Currently, there are no data that show the best combination of physical exercise doses in terms of frequency, intensity, and type (ie, muscle strengthening, cardiovascular, balance, or flexibility) to optimise physical function in older people; establishing such evidence is a task for the next decade.

Vivifrail multicomponent exercise programme tailored to each patient's functional capacity

Similar to pharmaceutical therapies, inter-individual variability and dose–response heterogeneity with regards to changes in fitness and improvements in health outcomes have been described for some, but certainly not all, diseases and syndromes. Several types or doses of exercise that are promoted for older adults (eg, mild calisthenics and slow-paced walking) have little or no discernible effect on physical fitness but might yield benefits in domains of intrinsic capacity. A physiological non-response to exercise for one outcome does not signify non-response for all outcomes. Researchers in both exercise and medicine have recognised and sought to understand the substantial variability in patient response to physical exercise interventions. Individual interactions of physiological, molecular (eg, genetics, epigenetics, transcriptomics, and metabolic factors), and environmental factors are being investigated as potential mediators to explain the absence of response to exercise in some people.[31] A previous study[16] in older patients after acute hospitalisation highlighted the heterogeneity and wide inter-individual variability in cognitive and physical function outcomes in response to an exercise intervention or usual care in this population. Therefore, the study found that exercise response for functional capacity could not predict similar changes in other clinical outcomes, including muscle strength and cognition.[16,18]

Search strategy and selection criteria

We searched MEDLINE, Embase, Cochrane Central Register of Controlled Trials, and Web of Science on Feb 28, 2021 for articles published in English between Jan 1, 2000, and Feb 15, 2021, using the keywords "exercise", "aging", and "geriatric". The final references list was generated on the basis of article originality and relevance to the broad scope of this Personal View.

In an attempt to improve physical and functional capacity, prevent frailty, and reduce the risk of falls, Izquierdo and colleagues[32,33] developed the Vivifrail multicomponent tailored exercise programme to focus on providing physical training for older adults and to design strategies to promote and prescribe tailored physical exercise. Vivifrail prescribes a physical exercise passport that can be individualised to the older adult's functional capacity (eg, serious limitation, moderate limitation, or slight limitation—evaluated using the Short Physical Performance Battery and a walking speed test) and a Vivifrail assessment of the patient's risk of falling. This prescribed physical exercise can be implemented during unsupervised sessions.[32,33]

For more on **Vivifrail** see https://vivifrail.com

In the era of precision medicine, this area of investigation is crucial for defining the threshold and optimal levels of activity necessary for health promotion and disease management. It should be recognised that what is suitable for prevention might be entirely inadequate for treatment, as is also the case with pharmacological management of chronic diseases. For example, aspirin could reduce the risk of ischaemic heart disease, but a host of potent drugs and surgery might be required once coronary occlusive disease is present and symptomatic. Although a global concept of exercise as medicine prevails, it is important to recognise that just as not all medicines cure cancer, not all modes of physical exercise (eg, continuous aerobic, high-intensity interval training, or muscle strengthening exercises) have the same effects on diseases and physical function. A future major challenge is understanding how precision exercise prescriptions might improve population health, because both individual and public health approaches are required. Taking into consideration the current evidence about the benefits of exercise in frail older adults, it is unethical to not prescribe physical exercise to these individuals,[34] because not doing so means doing harm by withholding indicated and effective treatment. It is therefore essential to promote healthy and dignified ageing by helping

health-care systems to more efficiently implement evidence-based exercise programmes for frail older adults in all community and aged care settings.

Contributors

MI drafted the original manuscript. MI, GD, and JEM wrote, reviewed, and edited this manuscript.

Declaration of interests

We declare no competing interests.

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