Physical activity in older adults 2

Physical exercise interventions to promote healthy ageing in older adults: from research to clinical implementation

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Physical exercise interventions have emerged as a key strategy to promote healthy ageing; however, they remain insufficiently implemented in real-world contexts. In this Series paper, we synthesised the current evidence on the effects of exercise interventions on functional ability and intrinsic capacity—the marker of healthy ageing defined by WHO that encompasses all the individual's mental and physical capacities—among older adults (aged ≥60 years) across diverse settings. The most effective exercise prescription strategies, and ongoing research gaps and implementation barriers, are also discussed. Evidence consistently supports multicomponent exercise programmes, including strength, aerobic, and balance training, as effective strategies to preserve or restore intrinsic capacity and overall functional ability in older adults, ranging from community-dwelling individuals to hospitalised individuals, individuals with frailty, or long-term care residents. Although the most pronounced benefits on intrinsic capacity are observed within the locomotion domain, improvements also extend to the cognitive, psychological, and vitality domains, particularly when exercise is part of a larger multidomain lifestyle intervention (eg, incorporating cognitive training or dietary interventions). In summary, exercise is a cornerstone intervention for healthy ageing, being effective across different levels of functional capacity and care settings. Efforts are needed to promote the widespread implementation of exercise programmes across diverse clinical, community, and care environments.

Introduction

The world population is ageing, which is accompanied by a growing prevalence of chronic diseases, an increased risk of functional impairments, and eventually, long-lasting disability, with important economic and societal implications.[1,2] Indeed, the increase in life expectancy found over the past decades exceeds the gain in the number of years lived in good health, which means that people are living longer but also living more time with disability at a global level.[3] Therefore, identifying strategies that allow individuals to live longer with a better quality of life is essential from both global and individual perspectives.

Physical exercise has proven beneficial for older adults (aged ≥60 years).[4–6] Although controversy exists on whether exercise interventions reduce mortality risk in older adults,[6,7] strong evidence shows that they are effective in preserving functional ability,[8,9] quality of life,[10] and preventing health-related adverse outcomes,[11] with these benefits observed even at the most advanced ages[12] or in those with chronic conditions.[13] However, although exercise is now widely recognised as a promoter of healthy ageing,[14] only a very low proportion of older adults partake in structured exercise.[15,16] Low engagement in exercise is more common specifically in clinically vulnerable older adult populations, such as hospitalised or institutionalised older adults.[17] Furthermore, the most effective exercise regimen (ie, exercise type, frequency, intensity, and duration) to promote functional ability and overall healthy ageing across different older adult populations remains to be established.

This fact is of particular importance because, propelled by WHO's work on healthy ageing,[18] a shift can be seen at present in the care model for older people, from the treatment of diseases towards the maintenance of functional ability, that is, the attributes that allow people to be and do what they have reason to value. Under this framework, healthy ageing is now considered the process of developing and maintaining functional ability that enables wellbeing in older age. In this regard, intrinsic capacity, the composite of all physical and mental capacities of an individual (often assessed through the domains of locomotion, cognition, vitality, psychology, and sensory),[19,20] which strongly associates with functional decline and mortality,[21] has been proposed as a major determinant of functional ability and overall healthy ageing.

In this Series paper, we aimed to synthesise the available evidence on the effects of exercise interventions on functional ability, intrinsic capacity, and its individual domains in older adults in different settings, and to highlight research gaps and discuss potential barriers for its actual implementation in real-life scenarios. This work is part of a Series on physical activity and healthy ageing, including complementary Series papers on the role of physical activity and sedentarism and health outcomes in older adults,[22] and on the effectiveness of different strategies for physical activity promotion in later life.[23]

Community-dwelling older adults

Community-dwelling individuals account for more than 90% of the older adult population.[24] This population is characterised by large heterogeneity, with a huge range of functional ability levels (from robust to bed-bound individuals) and comorbidities.[25] Therefore, the role of exercise could vary depending on the function-related purpose, from primary prevention of functional decline in those with

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Key points

- Physical exercise is an effective strategy for preserving and restoring intrinsic capacity and functional ability, and consequently promoting healthy ageing, with beneficial effects observed across most domains of intrinsic capacity.
- The benefits of physical exercise extend across the entire functional continuum and care settings, from robust community dwellers to acutely hospitalised patients or long-term care residents.
- Tailored multicomponent exercise programmes that integrate progressive strength training, aerobic training, and balance exercises yield the most comprehensive benefits.
- Exercise prescriptions should be individualised to adjust the progression and scale task complexity effectively.
- Translating scientific evidence into widespread practice requires addressing key implementation barriers, including resource shortages (particularly in low-income and middle-income countries) and a paucity of robust economic evaluations for health-care stakeholders.

Physical activity in older adults

Physical activity is a key determinant of health; however, high levels of physical inactivity and sedentary behaviour are seen globally—particularly among older adults. This Series examines the role of physical activity and sedentary behaviour in healthy ageing, the effects of exercise interventions in older adults, and strategies to promote active living in later life.

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the highest functional levels to secondary and even tertiary prevention upon moving down in the functional ability spectrum.[26] Although a non-negligible proportion of older adults in the community have functional impairment,[27] most retain sufficient functional ability to live independently. Therefore, community-based and primary care settings could be particularly suitable for developing physical activity-based interventions, as confirmed by meta-analytical evidence.[28]

Supporting the benefits of exercise on healthy ageing, exercise interventions contribute to the promotion or maintenance of intrinsic capacity in community-dwelling older adults.[29,30] In a multicentre randomised controlled trial (RCT; n=188, mean age 84 years), a 12-week home-based multicomponent physical exercise programme of moderate intensity induced beneficial effects in the locomotion (by 1·4 points in the Short Physical Performance Battery [SPPB]), cognition (by 1·13 points in the Mini-Mental State Examination), psychology (by 1·12 in the Geriatric Depression Scale score), and vitality (by 1·05 kg in the handgrip strength test) domains of intrinsic capacity, which was translated into a significant positive effect on a composite score of intrinsic capacity.[29,30] Beyond these benefits, exercise interventions have proven to enhance quality of life,[31] reduce the incidence of adverse outcomes such as falls and fractures, and decrease the risk of disability for basic activities of daily living, hospitalisation, and institutionalisation[6,11] among older community dwellers.

These results are in line with most available research exploring the effects of exercise on older adults' health, which has mainly focused on physical performance-related endpoints, particularly locomotion. Robust experimental evidence supports the role of exercise as an effective strategy for restoring or maintaining functional ability in community-dwelling older adults.[32] Exercise programmes have been shown to prevent the onset of mobility disability among community-dwelling older adults at risk of disability over a 2-year follow-up,[26] as shown in the large-scale Lifestyle Interventions and Independence for Elders (LIFE) study over 2·6 years (n=1635, aged 70–89 years in the USA), and replicated in the European multicountry study Sarcopenia and Physical fRailty IN older people: multicomponenT Treatment strategies (SPRINTT) over 3 years (n=1519, aged ≥70 years).[33,34] According to the results of these studies, which are among the two largest RCTs of exercise for mobility function in older adults, a moderate exercise programme consisting of supervised group-based multicomponent exercise, including strength, aerobic, balance, and flexibility exercises, could reduce the risk of mobility disability (ie, inability to walk 400 m within 15 min) by approximately 20%.[33,34] As discussed in a following section (see practical applications), some types of exercise, such as strength or power training, can provide greater benefits for physical performance measures.[35,36] However, incorporating other forms of exercise, such as aerobic exercise and balance training, maximises exercise benefits for gait, ambulation, and dual tasking, and exerts benefits beyond the musculoskeletal system and physical performance (eg, cardiovascular health).[9,36]

In contrast to the strong evidence supporting the benefits of exercise for physical performance and locomotion, its effects on cognitive function remain a subject of debate. Various meta-analyses have reported a positive effect of exercise on adults' overall cognition,[8,37] with strength training exerting the greatest benefits.[8,38,39] Of note, a 2024 meta-analysis of 16 RCTs (n=11 402 individuals) reported that long-term (>12 months) exercise interventions of any type were ineffective at improving cognitive outcomes or

preventing dementia and mild cognitive impairment among cognitively healthy community-dwelling older adults.[40] However, significant beneficial effects were observed when exercise was part of a multidomain programme that combined physical exercise with other lifestyle interventions (eg, cognitive training and nutritional counselling), thereby addressing different risk factors associated with cognitive decline or dementia.[40] In the same line, a 2025 network meta-analysis including 109 RCTs (n=23 010 individuals) showed that exercise interventions alone provide slight but significant benefits on global cognition in older adults who are cognitively unimpaired (standardised mean difference=0·14), with larger benefits observed with cognitive interventions alone (0·21) or even larger with interventions that combine exercise and cognitive training (0·26).[41]

The conflicting findings across studies might result from the wide range of populations included and endpoints assessed, and from heterogeneity in exercise interventions, some of which could provide an insufficient stimulus to induce adaptations. Indeed, according to a 2022 systematic review with network meta-analysis, a minimal physical exercise dose of approximately 700 metabolic equivalents of task (METs)-min per week (roughly representing 175 min of brisk walking, which is slightly more than the lower bound of the WHO-recommended level of physical activity, ie, 150 min per week of moderate intensity or 75 min per week of vigorous activity) is needed to obtain clinically relevant changes in the cognitive function of community-dwelling older adults.[42] Notably, this threshold was derived largely from aerobic interventions, and lower doses might suffice when strength or power training is added (eg, 300 METs-min when combining vigorous aerobic and strength exercises, equivalent to 35–50 min per week).[42]

From a mechanistic perspective, both aerobic and strength training have proven effective for increasing neurotrophic factors and can provide beneficial effects on other factors associated with preserved cognitive function in older adults, such as reductions in systemic inflammation and oxidative stress.[43–45] Aerobic exercise can be hypothesised to provide greater benefits on the prevention of cardiometabolic risk factors (eg, obesity) and vascular dysfunction, which are associated with ageing-related cognitive impairment.[45] In turn, strength training and the preservation of skeletal muscle mass and strength might also be beneficial for cognitive function,[46,47] partly because of muscle-released exerkines (ie, myokines), with positive effects on the brain.[48] None the less, the mechanisms by which each exercise modality improves cognitive function and whether these mechanisms differ across modalities remain largely unknown.

Psychological capacity (usually assessed through the levels of depressive symptoms), another domain of intrinsic capacity, is a cornerstone of healthy ageing. Exercise has been proven to reduce depressive symptoms in a dose–response manner in adults and older adults,[49,50] especially among those with the poorest general health,[51] with these benefits being at least comparable with those of antidepressant drugs.[52,53] In a 2025 network meta-analysis of RCTs (80 studies, n=5536, aged 50 years or older), all exercise modalities (strength training, aerobic exercise, mind–body exercises, and multicomponent exercise) reduced depressive symptoms, with the greatest effect observed with strength training.[50] Regarding the optimal dosage, no benefit was observed at less than 390 METs-min per week (approximately 2 h of brisk walking per week), with saturation effects at more than 1000 METs-min per week (approximately 5 h of brisk walking per week).[50] In addition, the optimal duration and frequency of multicomponent exercise programmes for improving depression symptoms have been established as 12–24 weeks and two or more sessions per week.[51]

The antidepressant effects of exercise are thought to arise from a combination of biological and psychosocial pathways. Biologically, exercise promotes neuroplasticity, attenuates systemic inflammation and oxidative stress, and modulates the hypothalamic–pituitary–adrenal axis and monoaminergic neurotransmission.[54] Psychosocially, regular exercise can improve mood by enhancing self-efficacy, self-esteem, and the sense of mastery, particularly in group-based programmes, by fostering social engagement and reducing isolation, factors of special relevance in older adults. However, as with cognition, these mechanisms are not yet fully established and probably act in combination rather than through a single dominant pathway.[55]

Finally, the vitality domain is conceptually defined as the body's ability to maintain energy, metabolic balance, and physiological homoeostasis. However, its operationalisation remains controversial.[56] Exercise interventions positively affect various markers of the vitality domain of intrinsic capacity (eg, handgrip strength[57] and inflammatory profile[58]) in community-dwelling older adults. In contrast, the effects of exercise on nutritional status markers of vitality are not extensively documented and remain elusive to meta-analytical evidence. Similarly, the potential effects of exercise on the sensory domain of intrinsic capacity (ie, hearing and vision) have not been gathered in systematic reviews, with or without meta-analysis, and have not been investigated in large exercise trials among community-dwelling older adults, such as LIFE and SPRINTT.

Therefore, in community-dwelling older adults, participation in a multicomponent exercise programme with a focus on muscle strengthening and aerobic activities (lasting more than 3 months, ≥2 sessions per week) might maximise the benefits of exercise on intrinsic capacity promotion.

Hospitalised older adults

Hospitalised older adults are particularly clinically vulnerable. Periods of hospitalisation as a consequence of acute medical illness are associated with several negative health consequences in older adults, including functional decline,

even when the cause of the hospitalisation is successfully treated.[59] Approximately a third of older adults have hospital-associated disability, conventionally defined as losing the ability to perform one or more basic activities of daily living at discharge,[60] which is associated with an increased risk of long-term disability, institutionalisation, and mortality.[61–63] Hospitalisation periods are also associated with acute delirium and an increased risk of cognitive decline, regardless of baseline cognitive function.[64,65] Thus, strategies aimed at reducing the adverse effects of acute hospitalisation in older patients should be a priority.[59]

Hospitalised older adults spend most of their time in bed even when they can walk independently,[66] and nearly 75% of them do not walk at all during hospitalisation.[67] These low levels of physical activity might contribute to the adverse consequences associated with hospitalisation,[68] suggesting that exercise interventions might help to preserve function in hospitalised patients. Meta-analytical evidence indeed suggests that in-hospital exercise interventions provide significant beneficial effects on functional ability in activities of daily living and physical performance without affecting patients' risk of falls, admission length, or mortality risk.[69,70] A 2023 meta-analysis reported a minimal effective dose of approximately 40 min per day of light-effort activities (eg, slow walking, mobility exercises), with optimal doses of 70 min per day; and approximately 25 min per day of moderate-effort activities (eg, resistance bands, aerobic exercises such as stationary cycling), with optimal doses of 40 min per day, to reduce hospital-acquired disability risk in patients aged 70 years or older.[71]

However, some concerns remain about the clinical relevance of these benefits when combining different studies and intervention types.[70] Indeed, some trials have found no benefits for activities of daily living with programmes consisting solely of mobility exercises (eg, walking and increasing time out of bed),[72,73] whereas multicomponent interventions, including both mobility and strengthening exercises, seem to provide the greatest benefits. For instance, different trials have found that a multicomponent exercise intervention performed daily during hospitalisation improves functional ability in activities of daily living and physical performance, as assessed using SPPB.[68,74] Studies in acutely hospitalised patients with low functional status, including many of them with impaired mobility, have shown that even simple multicomponent interventions solely consisting of walking (aerobic component) and rising from a chair (strength component) are effective for decreasing the incidence of hospital-acquired disability at discharge, with the greatest benefits observed in those with the worst functional status at admission.[75,76] More comprehensive multicomponent interventions (eg, including lower-body and upper-body strength training exercises with elastic bands or weight machines, in addition to balance and walking exercises) also proved to reduce the risk of hospital-acquired disability not only at discharge but also at 3 months after discharge, in addition to attenuating declines in ambulatory capacity.[77]

Although mixed results exist regarding the benefits of exercise in the prevention of delirium or cognitive decline during hospitalisation,[78,79] exercise has been shown to improve cognitive function after discharge.[79] Indeed, a 2025 multicentre RCT reported that an in-hospital multicomponent exercise intervention enhanced overall intrinsic capacity and each intrinsic capacity domain in acutely hospitalised older adults.[80] In summary, evidence suggests that even minimal doses of multicomponent exercise, comprising strength and aerobic exercises, could help to preserve physical function and overall functional ability in hospitalised older adults. Notwithstanding, further research is needed to develop exercise interventions or other mimetics (eg, electrical stimulation)[81] to preserve functional ability in patients with low functional ability, such as those who are bedridden. From a pragmatic standpoint, these interventions are most likely to be sustainable when integrated within existing physiotherapy and care pathways rather than when delivered as parallel programmes.

Institutionalised older adults

The number of older adults living in long-term care facilities (LTCFs), such as nursing homes, is growing.[82] Institutionalised older adults are a particularly clinically vulnerable population, characterised by high rates of polypharmacy, functional disability, presence of major geriatric syndromes, and poor health status.[83] Although these individuals spend most of their time sitting or lying down and rarely participate in exercise training or physical activity,[17,84] exercise has been shown to positively affect the functional ability of institutionalised older adults[85,86] and some of the individual domains of intrinsic capacity. For example, a 2023 network meta-analysis of 105 studies (n=11 609) conducted in nursing homes and other LTCFs showed beneficial effects of exercise on functional ability (Barthel Index) and various physical function measures (eg, muscle strength, locomotion, and other physical performance measures).[87] Of note, no specific exercise type was superior to others, probably because of the high heterogeneity across studies. However, most evidence was derived from studies applying aerobic, strength or multicomponent interventions, whereas few trials applied balance exercises alone (and indeed the benefits observed for balance interventions alone were not significant).[87] The most consistent beneficial effects were observed when exercising 110–225 min per week (which can be achieved through three 60-min sessions per week, or exercising daily for 15–30 min).[87] This meta-analysis also reported that the benefits might be of even greater magnitude in individuals with cognitive impairment, functional dependence, or in those with frailty, illustrating that even older adults with the lowest functional reserve are capable to benefit from exercise training.[87] Indeed, various studies have shown that even in institutionalised nonagenarians with frailty, exercise training (primarily including muscle strength or power training) can improve relevant outcomes, such as

functional mobility and muscle strength, and reduce the risk of falls.[88,89]

Regarding other intrinsic capacity-related outcomes, a 2024 RCT involving 86 nursing home residents (aged 70 years or older; mean age 83 years) with frailty showed that a 12-week moderate-intensity multicomponent exercise programme induced significant benefits not only on measures of functional ability and physical function (eg, SPPB, muscle strength, and power), but also on cognitive function.[86] Similarly, exercise is an effective intervention in the management of depressive symptoms among institutionalised older adults,[90,91] with its benefits exceeding those of antidepressant drug-based interventions.[92] Indeed, a 2025 meta-analysis of 16 studies conducted in older adults with prefrailty or frailty living in nursing home facilities concluded that exercise training benefits not only physical performance or mobility, but also cognitive function, depression, and quality of life.[90,93] In turn, less evidence exists on other intrinsic capacity domains, such as vitality or the sensory domain.[94]

LTCF residents usually represent the lowest end of the functional capacity spectrum. Even in this clinically vulnerable population, exercise interventions, with an emphasis on strength or power and balance activities, could condition a positive functional evolution.

Tailored exercise prescription in older adults: practical recommendations

Exercise is one of the most powerful interventions for promoting healthy ageing. However, different exercise types, volumes, frequencies, and intensities can modify the resulting benefits. Individual characteristics, such as the level of functional independence, exercise history, presence of comorbidities, and individual preferences, can also condition the appropriate exercise prescription (see the study by Izquierdo and colleagues for a comprehensive summary of exercise prescription for older adults).[26]

Exercise characteristics

Different exercise types are associated with complementary benefits (figure 1). Aerobic exercise has traditionally received the greatest attention, mostly because of its beneficial effects on cardiorespiratory function (eg, maximum oxygen uptake) and cardiovascular risk factors (eg, body mass and waist circumference), as compared with that offered by other exercise types.[95] According to WHO, older adults are recommended to perform at least 150–300 min of moderate-intensity aerobic activity per week (such as brisk walking, water aerobics, or cycling on level ground), or 75–150 min of vigorous-intensity aerobic activity (such as running or cycling fast or uphill), or a combination thereof.[96] Some evidence suggests that a higher aerobic exercise intensity might provide greater benefits on cardiorespiratory function than lower intensities,[97] and indeed, high-intensity interval aerobic exercise (characterised by alternating high-intensity activity bouts with low-intensity recovery periods) might provide more benefits than moderate-intensity continuous exercise on this indicator.[98] However, although high-intensity aerobic exercise might provide slightly superior benefits—or at least in a more time-efficient manner—both moderate-intensity and high-intensity aerobic programmes can be effective, and factors such as the risk of injury, adherence, and exercise enjoyment, and the individual's overall health and fitness levels can condition the prescription.[97]

Although high cardiorespiratory fitness and good cardiovascular health are of relevance in functionally independent adults (eg, community dwellers), as people age, exponential declines in muscle mass and function are observed,[99] and their ability to perform aerobic exercise and their overall physical function decrease substantially. This occurrence makes other exercise types, particularly strength training, increasingly relevant in older adults with low levels of functional ability, such as institutionalised and acutely hospitalised ones. Importantly, the benefits of strength training are not restricted to the maintenance or increase of muscle strength or mass, but extend to the cardiovascular and cardiometabolic health realms.[100] Indeed, in the WHO recommendations, older adults are encouraged to complement aerobic activities with other types of exercise (ie, including muscle-strengthening activities) at least three days per week.[96] The benefits of strength exercise training for older adults have been widely documented in recent decades.[101] Even functionally dependent individuals remain capable of undertaking some forms of strength exercise[88] and even the so-called power training, which consists of performing strength training at a high voluntary velocity.[89] Power training has proven to be more effective than traditional strength exercises[102] for improving performance in functional tests (eg, sit-to-stand test, timed up-and-go test) in older adults (65-81 years of age).[103] Thus, as proposed in the Global consensus on optimal exercise recommendations released in 2025 for older adults, training with moderate-to-high loads (60–80% of one-repetition maximum) at the highest possible velocity might be the most effective intervention for improving physical function, even in older adults with frailty.[26] In addition, activities to improve balance should be incorporated into the management of individuals with a heightened risk of falling.[104]

Regarding exercise volume, although even minimal doses of aerobic physical activity could be beneficial for health than being inactive,[105] a dose–response association exists between aerobic training volume and major health outcomes, such as cardiorespiratory fitness. For instance, a 26-week RCT observed increasing benefits of moderate-intensity aerobic exercise among community-dwelling older adults (aged ≥65 years), with participants performing 225 min per week, improving their maximum oxygen uptake more than those performing lower volumes (control=–4·4%, 75 min per week=+6·4%, 150 min per week=+8·7%, 225 min per week=+11·0%).[106] However, the optimal volume of strength training remains controversial. Indeed, meta-analytical evidence from a 2025 study shows

	Strength training	Aerobic training	Balance training
			
Definition	Exercises performed against a resistance and focused on increasing muscle strength or power and mass.	Exercises that use large muscle groups, can be maintained continuously, and are rhythmic in nature.	Exercises that are designed to improve an individual's ability to withstand challenges from postural sway or destabilising stimuli.
Subtypes	**Resistance training:** exercises that require to exert force against a resistance, such as objects, own body weight, elastic bands, water, or immovable objects. **Power training:** resistance exercises in which the aim is to apply the maximum amount of force as fast as possible.	**Continuous:** sustained effort, usually at a steady-state consistent intensity. **High-intensity interval training:** short bouts of high-intensity exercise, lasting from seconds to minutes, interspersed with rest periods.	**Static:** ability of individuals to remain standing and stable. **Dynamic:** ability to maintain postural stability and orientation while the body parts are in motion.
Expected adaptations	↑Muscle function (strength and power) ↑Muscle mass ↑Muscle metabolism	↑ Cardiorespiratory fitness ↑ Cardiovascular health ↑ Muscle metabolism ↓ Body fat	↑Proprioception ↑Postural control

Figure 1: **Types of exercises and expected adaptations**

that a low strength training volume (approximately 30 weekly sets for the whole body or 12 weekly sets for programmes focused on the lower limbs) improves older adults' physical function measures (eg, timed up-and-go test, 6-min walking test).[107] For this reason, minimal dose approaches to strength training have been proposed in 2024, particularly for individuals who do not engage in any strength training yet.[108] In older adults, a dose of two sessions of less than 60 min per week, including one single set of three–ten exercises has been reported as a potentially effective strategy (see the study by Fisher and colleagues for more details).[109] However, a 2023 trial in older adults (>60 years old) with frailty observed a linear relationship between strength training volume and intensity and several physical function tests (eg, muscle strength, 6-min walking test, sit-to-stand test), in line with a 2024 meta-analysis.[110] Taken together, although minimal doses of strength training could be effective, higher training volumes might induce additional benefits, at least to some extent, as far as an optimal intensity can be maintained.[111]

In practical terms, based on the available evidence, the most effective programmes for improving the functional ability of older adults should ideally include multicomponent exercises.[26] The combination of exercise with other risk-factor modifying strategies, such as cognitive stimulation, nutritional optimisation and supplementation, and health education might maximise the benefits.[112,113]

Tailoring exercise prescription

Exercise recommendations should be customised to specific goals and needs.[26] In populations of highly functioning older adults living in the community, exercise programmes should be oriented to the maintenance of functional levels; therefore, aerobic and strength training aimed at maximising cardiorespiratory fitness and muscle function might be the objective (figure 2). Upon progressing down the disability cascade, the objectives of the exercise programme might be more specific to the individual's functional and disease profile. In individuals with the lowest functional ability, such as LTCF residents, the design of the exercise programme should focus on preserving muscle function to maintain or restore the muscle strength and power required for performing basic activities of daily living. In this population, balance and gait training are also important, given their poor balance control and heightened risk of falls and fractures.

Efforts have been made to ease the classification of participants in levels of functional status with the aim of individualising exercise prescriptions. A practical route should begin with a brief functional triage once medical contraindications have been ruled out. Gait speed and the SPPB have been widely used in clinical practice; can be completed in a few minutes; and predict disability, hospital admission, and mortality.[114–116] These scores can then be used to anchor prescriptions (see an example in figure 3). For instance, lower-functioning individuals (SPPB $\leq$6) could start with chair-rises with support, single joint-strength exercises, and then step to gait tasks; for individuals with moderate functioning (SPPB 7–9), loaded sit-to-stands, multi-joint strength exercises, step-ups, and interval walking could be included; and for individuals with the highest levels of physical function (SPPB $\geq$10), power exercises, longer aerobic intervals, cognitive–motor dual tasking, and multidirectional balance challenges might be included. In accordance with the Global consensus guidelines,[26] strength training intensity can progress from an initial 50% to 70–80% of the one-repetition maximum (equivalent to a rating of perceived exertion of 15–18 over 20), starting with two sessions per week (each including eight–ten exercises targeting major muscle groups, with one to three sets of eight–12 repetitions per exercise) and progressing to three sessions per week. Regarding aerobic

Exercise interventions for older adults

Synthesis of evidence-based practical recommendations across care settings

Community-dwelling individuals	Hospitalised older adults	Individuals living in long-term care facilities
Objectives: Promotion of intrinsic capacity, improvement of physical performance, and prevention of functional decline.	**Objectives:** Prevention of hospital-associated disability.	**Objectives:** Reversal of functional decline and impairments in intrinsic capacity.
Evidence: -Prevents functional decline. -Benefits on the locomotion and psychology domains, and potential benefits on cognitive function and vitality (particularly when applied as part of a multidomain intervention with cognitive and dietary components). -Insufficient evidence on the sensory domain.	**Evidence:** -Prevents hospital-associated disability. -Benefits on the locomotion, psychology, and vitality domains. -Mixed evidence for the prevention of cognitive impairment or delirium. -Insufficient evidence on the sensory domain.	**Evidence:** -Improves functional ability. -Benefits on the locomotion, cognition, psychology, and vitality domains. -Insufficient evidence on the sensory domain. -Effective even in very old individuals, individuals with frailty, or individuals with cognitive impairment.
Practical recommendations: -Frequency: ≥2 sessions per week. -Intensity: moderate to vigorous (when safe). -Type: multicomponent, prioritising both aerobic and strength or power training. -Dose: WHO recommendations as minimal dosage.	**Practical recommendations:** -Frequency: daily during hospital stay. -Intensity: moderate (when safe). -Type: at minimum, mobility exercises to avoid prolonged bed rest. If possible, then include multicomponent exercise prioritising strength or power training. -Dose: at least 25 min per day of moderate effort or 40 min per day of light effort.	**Practical recommendations:** -Frequency: ≥2 sessions per week. -Intensity: moderate to vigorous (when safe). -Type: no single type superior in meta-analyses, but experts' recommendation is to include multicomponent exercise prioritising strength or power and balance training. -Dose: at least 110–225 min per week.

Figure 2: **Exercise recommendations for older adults in different settings**

(eg, gait) training, volume should be increased from 5–10 min per session to 15–30 min, progressively scaled to reach the recommended 150–300 min per week. Re-evaluation of capacities should be conducted periodically to adjust programme parameters so that exercise provides a sufficient stimulus without harming an individual's health. Importantly, an individual's previous medical records (diseases and medications) should be checked and considered when designing the exercise programme (for a full review, see the study by Izquierdo and colleagues).[117]

In summary, individually tailored physical exercise constitutes an effective strategy for maximising function in the overall population of community-dwelling older adults, contributing to an attenuation in declines in function during hospitalisations, and reducing or slowing down the progress of dependency levels in LTCF residents.

Bridging the gap to real-world exercise implementation

Despite strong evidence supporting the benefits of exercise in preserving functional ability and promoting healthy ageing, the message conveyed to older adults still often reduces to simply staying active. Exercise interventions are rarely implemented, and when they are, adherence among older adults is usually low. Therefore, efforts are needed to ease the implementation of these interventions across different settings.

Exercise interventions delivered as part of research studies are frequently conducted without engagement with future delivery partners, so real-world implementation becomes a challenge. One of the primary barriers to

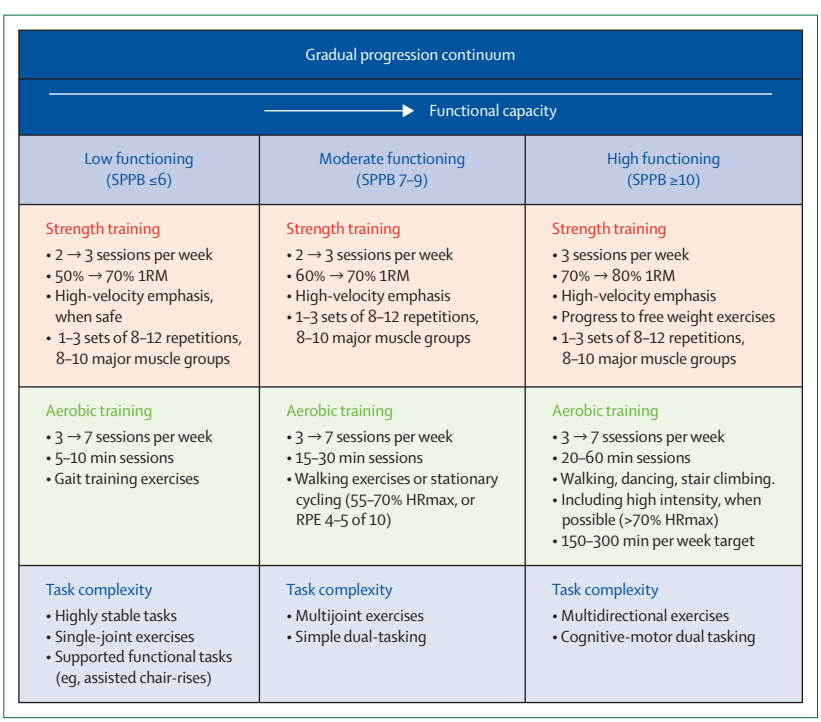


Figure 3: **Examples of individually tailored multicomponent exercise prescription and progression**
The continuum categorises older adults into three distinct functional levels on the basis of their baseline SPPB scores. 1RM=one-repetition maximum. HRmax=maximum heart rate. RPE=rating of perceived exertion. SPPB=Short Physical Performance Battery.

implementing exercise-based interventions into standard care plans is the low evaluation of their cost-effectiveness. Different trials have reported that supervised exercise

Search strategy and selection criteria

A search was performed on Nov 12, 2025 in MEDLINE (via PubMed) and Web of Science to identify relevant systematic reviews with meta-analysis or randomised clinical trials (RCTs) written in the English language and exploring the effects of exercise on functional ability or intrinsic capacity domains of older adults in different settings (community, hospital, and long-term care facilities). The search combined the term "exercise" and other related terms (eg, "physical activity", "training") and those related to the outcomes of interest, such as "intrinsic capacity", "functional ability", "locomotion", "physical function", "cognition", "depression", "vitality", "vision", or "hearing". Given the non-systematic nature of the literature selection strategy, this narrative review is prone to selection bias. However, to ensure a high level of evidence, we prioritised meta-analyses published over the last decade, while also highlighting landmark large-scale RCTs on exercise interventions for older people with a specific focus on those evaluating their effects on intrinsic capacity, to provide clinical context.

interventions not only improve physical performance measures (eg, SPPB) or quality of life in older adults but also reduce cost of care.[118–120] However, more evidence is warranted, particularly in resource-constrained settings. Incorporating robust economic evaluations is essential to raise awareness among policy makers, health-care professionals, patients, and the general public—not only of the health benefits of exercise but also of its potential to enhance the sustainability of health care and social welfare systems.[121–123]

Given that primary care physicians are often the first point of contact for individuals to discuss their health, promoting exercise in this setting is of relevance, as supported by strong meta-analytical evidence.[28,124] Indeed, the global action plan for physical activity endorsed by WHO highlights the need to strengthen the training and provide resources to health professionals so that competent assessments and provision of physical activity advice can be given in routine practice.[125] However, wide variability still exists in the proportion of physicians who assess physical activity or promote the same, or both, which seems to be due (at least partly) to a perceived paucity of resources and effective tools.[126,127] For this reason, interventions that enable physicians to promote physical exercise are key.

A further key consideration is that most of the evidence discussed in this Series paper originates from high-income countries, and rarely reaches low-income settings or socioeconomically underserved populations.[128,129] This fact represents a major limitation, given that population ageing is occurring fastest in low-income and middle-income countries, which are projected to host approximately 80% of the world's older adults in the coming decades.[130] Adapting and testing low-cost, scalable, and context-sensitive delivery models (eg, community health worker-led, group-based, or technology-assisted programmes) in these settings should, therefore, be a research and policy priority, so that the benefits of exercise for healthy ageing can be realised equitably worldwide.

Another key issue that remains poorly understood is the strategies that might maximise adherence to exercise programmes in older populations. In controlled trials, adherence among older adults is high, generally 70–85%,[131] as observed in SPRINTT, albeit with substantial variability across centre-based and home-based sessions.[132] The availability of supervision during exercise programmes has been identified as a key factor moderating adherence,[133] and preliminary evidence suggests that these programmes could yield greater benefits in some outcomes (eg, physical function, quality of life), as compared with unsupervised interventions.[134] However, these findings need to be confirmed in larger trials and in different populations and contexts. Solutions that might maximise exercise adherence among older adults in real life remain underexplored; therefore, more real-world implementation studies are needed. In the last decades, technologies have been increasingly adopted as exercise prescription or supervision-assisting tools. App-guided home programmes could reduce the barriers users might find to adhere to exercise. Trials of digital interventions in older adults have shown small to moderate improvements in steps, chair-rise ability, and balance, as compared with minimal care.[135,136] Despite these benefits, mobile apps that prescribe physical exercise to older individuals have limitations. A 2023 review found that of the 15 exercise app analyses, only one (ie, VIVIFRAIL) was based on scientific evidence.[137] Therefore, the effectiveness of other exercise apps needs to be tested. Of note, these apps should be tailored to older users' cognitive and physical needs, ideally involving older individuals in the co-design of the app.

Conclusions

Physical exercise appears as a cornerstone intervention for healthy ageing and the preservation of intrinsic capacity across diverse older populations. Evidence consistently supports multicomponent exercise programmes that combine strength and aerobic exercises (and in some cases, balance training) as effective strategies to maintain or restore functional ability, mobility, cognitive and psychological health, even among individuals with frailty or institutionalised individuals. However, translation into practice remains low because of poor adherence, insufficient personalisation, and weak integration within health-care systems. Implementation research and robust economic evaluations are urgently needed to support large-scale adoption. Exercise prescriptions should ideally be tailored to functional status, supervised by trained professionals, and integrated into care pathways in different care settings. Embedding exercise within ageing policies and health systems could extend healthy life expectancy, reduce disability, and improve population wellbeing worldwide.

Contributors

JLS-S, PLV, MI, TL-A, BV, YR, and PdSB conceptualised the narrative review, wrote the initial draft, and contributed to revisions. JLS-S and PLV designed the figures. All authors had final responsibility for the decision to submit the manuscript for publication.

Declaration of interests
TL-B received peer-reviewed funding from national and provincial funding agencies to conduct trials of exercise and cognitive health in older adults, but these funding agencies did not play an active role in the direction of research. RY reports consultancy fees from Longeveron, Biophytis, and is a shareholder of SARQOL Société Privée à Responsabilité Limitée, a spin-off of the University of Liège. YR and PdSB received consulting fees from Pfizer for individual consultancy and lectures in the context of ageing, and from Compagnie Europeenne des Bains for writing a manuscript on the use of spa therapy in the context of osteoarthritis. As invited speakers, all authors received reimbursement from universities for speaking on topics related to exercise and health.

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