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SYSTEMATIC REVIEW

The effectiveness of rehabilitation interventions including outdoor mobility on older adults' physical activity, endurance, outdoor mobility and falls-related self-efficacy: systematic review and meta-analysis

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Abstract

Objective: To determine the effectiveness of community-based rehabilitation interventions which incorporate outdoor mobility on physical activity, endurance, outdoor mobility and falls-related self-efficacy in older adults.
Design: MEDLINE, Embase, CINAHL, PEDro and OpenGrey were searched systematically from inception to June 2021 for randomised controlled trials (RCTs) of community-based rehabilitation incorporating outdoor mobility on physical activity, endurance, outdoor mobility and/or falls-related self-efficacy in older adults. Duplicate screening, selection, extraction and appraisal were completed. Results were reported descriptively and with random-effects meta-analyses stratified by population (proactive [community-dwelling], reactive [illness/injury]).
Results: A total of 29 RCTs with 7,076 participants were identified (66% high bias for at least one domain). The outdoor mobility component was predominantly a walking programme with behaviour change. Rehabilitation for reactive populations increased physical activity (seven RCTs, 587 participants. Hedge's g 1.32, 95% CI: 0.31, 2.32), endurance (four RCTs, 392 participants. Hedges g 0.24; 95% CI: 0.04, 0.44) and outdoor mobility (two RCTs with 663 participants. Go out as much as wanted, likelihood of a journey) at intervention end versus usual care. Where reported, effects were preserved at follow-up. One RCT indicated a benefit of rehabilitation for proactive populations on moderate-to-vigorous activity and outdoor mobility. No effect was noted for falls-related self-efficacy, or other outcomes following rehabilitation for proactive populations.
Conclusion: Reactive rehabilitation for older adults may include walking programmes with behaviour change techniques. Future research should address the potential benefit of a walking programme for proactive populations and address mobility-related anxiety as a barrier to outdoor mobility for both proactive and reactive populations.

Keywords: outdoor mobility, rehabilitation, physical activity, walking, social, older people, systematic review

Key Points

- The proportion of older adults who are mobile outdoors is low, and this declines with illness/injury.
- Loss of outdoor mobility is associated with poor health and social care outcomes.

- Rehabilitation with outdoor mobility increased activity, outdoor mobility and endurance for older adults with illness/injury.
- Rehabilitation for older adults with illness/injury should include walking programmes with behaviour change techniques.
- Evidence was less certain for rehabilitation incorporating outdoor mobility for proactive populations of older adults.

Introduction

Older adults experience a gradual decline in functional capacity which often manifest in functional limitations including mobility limitations [1]. A reduction in outdoor mobility is associated with social withdrawal [2], higher disability in activities of daily living (ADL) [3], transition to care home [4] and mortality [5]. Despite this, between 10.3% (USA) [6] and 15.4% (Finland) [7] of community-dwelling older adults are not mobile outdoors. This decreases further following surgical and non-surgical hospitalisation [8].

Poor rates of outdoor mobility may be due to several influencing factors at both an environmental and individual level [9, 10]. Outdoor mobility is more physically, psychologically and cognitively challenging than mobilising in the controlled environment of a person's own home. There are uneven surfaces, steps and obstructed walkways which present a challenge for strength, balance and coordination [9]. Navigating outdoor environments on foot or by transport requires confidence and self-efficacy [11], as well as the cognitive ability to adapt to ever-changing spaces [12]. As such, outdoor mobility is negatively affected by physical, psychological or cognitive impairment [9, 13].

Optimising outdoor mobility has the potential to preserve and/or improve the quality of life of older adults through increased opportunities for physical activity promoting independence [14] while negating the risks of comorbid disease and illness [3], and social isolation/loneliness [2]. Further, quality of life may be improved among carers of older adults by reducing the need to adapt to increased dependency [15]. As such, several randomised controlled trials (RCTs) of rehabilitation for community-dwelling older adults [16, 17] as well as rehabilitation for community-dwelling older adults with illness or injury [18, 19] include an outdoor mobility component. These components vary from supervised walking programmes [20] to mobility related goal setting [21] and their role in intervention effectiveness is not well understood.

Therefore, this review sought to determine the effectiveness of community-based rehabilitation interventions which incorporate outdoor mobility on physical activity, endurance, outdoor mobility and falls-related self-efficacy in older adults.

Methods

We reported this review according to the Preferred Reporting Items for Systematic Reviews and Meta-Analyses [22]. The protocol is registered on the International Register for Systematic Reviews (PROSPERO ID: CRD4202164082) [23].

Eligibility

We included definitive RCTs of community-based (any setting other than inpatient) rehabilitation interventions which incorporated an outdoor mobility component, and which sought to improve physical activity, endurance, outdoor mobility and/or falls-related self-efficacy against any comparator among adults aged 65 years or older. We defined rehabilitation using the World Health Organisation (WHO) definition as '*a set of interventions designed to optimise functioning and reduce disability in individuals with health conditions in interaction with their environment*' [24]. We considered outdoor mobility components ranging from supervised outdoor walking to outdoor mobility goal setting. We excluded RCTs delivered exclusively in care homes.

Search

We searched five electronic databases: MEDLINE, Embase, CINAHL, PEDro and OpenGrey from database inception to 14 June 2021. We used published terms for the population (older adults) [25–28], the intervention (outdoor mobility) [25, 29], setting [25, 29] and study design (RCTs) [29, 30] (Supplementary File 1). Searches were limited to human and English language.

Selection

We completed title and abstract and full-text screening in duplicate in Covidence [31]. Conflicts were resolved by consensus. We screened reference lists of eligible RCTs. We contacted three authors to determine eligibility.

Quality assessment

We assessed quality in duplicate using the Cochrane Risk of Bias Tool considering bias in selection, performance, detection, attrition and reporting [32].

Extraction

We extracted data in duplicate onto a template adapted from the taxonomy to classify and describe fall-prevention interventions [33] including author, year, location, sample size, eligibility, intervention, comparator, longest follow-up and outcome—measure of central tendency and dispersion for physical activity, endurance, outdoor mobility and/or falls-related self-efficacy at intervention end and final follow-up. Where outcomes were reported as medians and ranges they were converted to means and standard deviations [34]. Where dispersion was presented as 95% confidence intervals they were converted first to standard errors allowing subsequent conversion to standard deviations (standard error

x √sample size = standard deviation) [35]. Conflicts were resolved by consensus.

Synthesis

Analyses were completed in Stata v16 [36]. We used random-effects meta-analyses to calculate effects sizes (Hedge's g (continuous) and Log-Odds Ratios (categorical)). Analyses were stratified by target population—proactive (community-dwelling) or reactive (illness/injury). We interpreted an effect size of 0.2 as small, 0.5 moderate and 0.8 as large [35]. We used I^2 to assess heterogeneity considering 0–40% as unimportant, 30–60% as moderate, 50–90% as substantial and 75–100% as considerable [35]. We reported results not included in meta-analyses (as measures of dispersion/central tendency not provided and/or only 1 RCT for a given outcome) descriptively.

We used the Grading of Recommendations, Assessment, Development and Evaluation (GRADE) criteria to determine the confidence in effect estimates for each outcome [37]. GRADE downgrades RCTs based on risk of bias, inconsistency, imprecision, indirectness and publication bias. Conflicts were resolved by consensus [37].

Results

Selection

We identified 9,775 studies following deduplication. In total 9,694 were excluded on title and abstract screening and a further 47 on full-text screening. We included 33 articles for 28 RCTs in this review i.e. 10 articles reflected five RCTs (Figure 1).

Quality assessment

We present results of the quality assessment in Table 1. The most common reasons for high bias assignment were performance bias ($n = 16$) and detection bias ($n = 7$).

Characteristics of RCTs

Characteristics of the 29 RCTs are available in Table 2. In total 7,076 older adults took part in the RCTs with sample sizes ranging from 28 [38] to 1,256 [39] participants. A total of 10 RCTs targeted proactive (community-dwelling) populations [16, 17, 20, 39–45]. Reactive populations included older adults with a specific condition: hip fracture ($n = 10$) [21, 38, 46–53], stroke ($n = 2$) [18, 54], chronic obstructive pulmonary disease (COPD) ($n = 2$) [55, 56], falls risk ($n = 1$) [57], depressive symptoms ($n = 1$) [17], cancer ($n = 1$) [58], osteoarthritis ($n = 1$) [59] or hypertension ($n = 1$) [19].

RCTs compared interventions with usual care ($n = 15$) [16, 19–21, 39, 45–48, 51–54, 56, 58], education ($n = 8$) [17, 18, 40–42, 50, 55, 59] and sham active controls including seated activities [38] or seated activities and transcutaneous electrical stimulation [49]. One RCT compared a short duration intervention with a longer duration intervention [44]. All included RCTs captured physical activity (objective/self-report), endurance, outdoor mobility and/or falls-related self-efficacy as a primary/secondary outcome measure (Table 2).

Interventions

Detailed descriptors of interventions are available in Table 3. Interventions were home-based ($n = 14$) [18, 21, 41–43, 46–50, 52–54, 58], community-based ($n = 6$) [17, 19, 20, 38, 42, 57] or included both home and community components ($n = 8$) [16, 39, 40, 44, 45, 51, 56, 59]. Intervention durations ranged from 3 weeks [46] to 48 weeks [42], with longest follow-up ranging from 1 month [58] to 24 months [39, 60].

Most RCTs included a walking programme as their outdoor mobility component including unsupervised walking programmes ($n = 10$) [16, 17, 38–40, 43, 44, 46, 47, 58], supervised walking programmes ($n = 10$) [18–20, 48–50, 52, 53, 56, 59] or a 'community mastery' session where negotiating grass, curbs and ramps were practiced ($n = 1$) [57]. The prescribed frequency ranged from walking as one option for exercise [38, 41] to 2- [20, 39, 50, 56], 3- [43, 52, 53, 59], 4- [49], 5- [55, 58] and 7-day walking per week [44]. The frequency was not specified for five RCTs [17, 40, 46, 47, 61].

Most contained one or more behaviour change components including action planning ($n = 1$) [57], tailored goal setting for outcomes ($n = n = 6$) [17, 21, 46–48, 54] or behaviours e.g. increasing activity ($n = 4$) [18, 40, 45, 51], behavioural contracts ($n = 2$) [16, 51], self-monitoring of behaviour ($n = 10$) [16, 19, 21, 39, 42, 43, 45, 55, 58, 59], feedback on behaviour ($n = 8$) [19, 21, 40, 41, 44, 47, 51, 59], monitoring outcomes of behaviour without feedback ($n = 3$) [40, 42, 48], prompts/cues e.g. at home visits/telephone follow-up ($n = 8$) [39, 42, 43, 46, 47, 52–55] and/or social support through group activities ($n = 5$) [17, 20, 41, 57, 59] or to enable mobility e.g. exercise/transport companion ($n = 5$) [19, 21, 43, 47, 54]. Five RCTs included instructions on how to perform the programme [17, 21, 39, 42, 54], while two RCTs provided information on health consequences [51, 57]. Five RCTs provided pedometers [17, 19, 42, 45, 55] and one walking aids [54]. One RCT restructured the physical environment to enable mobility by extending crosswalk times adding cues at intersections, clearing bridges and cutting back foliage [17].

Synthesis

Meta-analyses were completed for physical activity (total, moderate-vigorous), outdoor mobility, endurance and falls-related self-efficacy. Forest plots for all meta-analyses are available in Supplementary File 2. GRADE criteria are available in Table 4. Results from RCTs not included in meta-analyses are available in Supplementary File 3.

Physical activity

There was no effect of rehabilitation interventions for proactive populations which incorporated outdoor mobility on

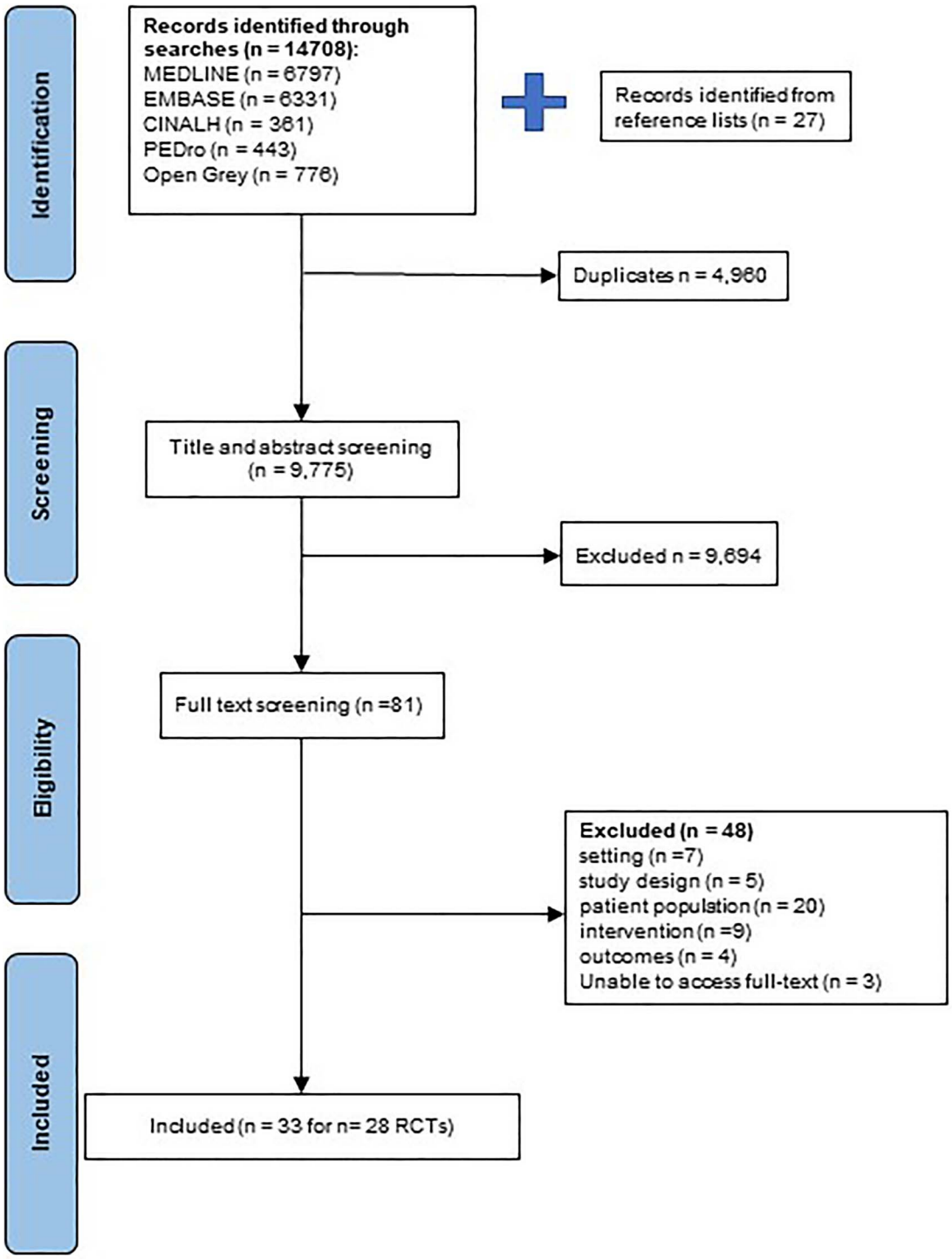
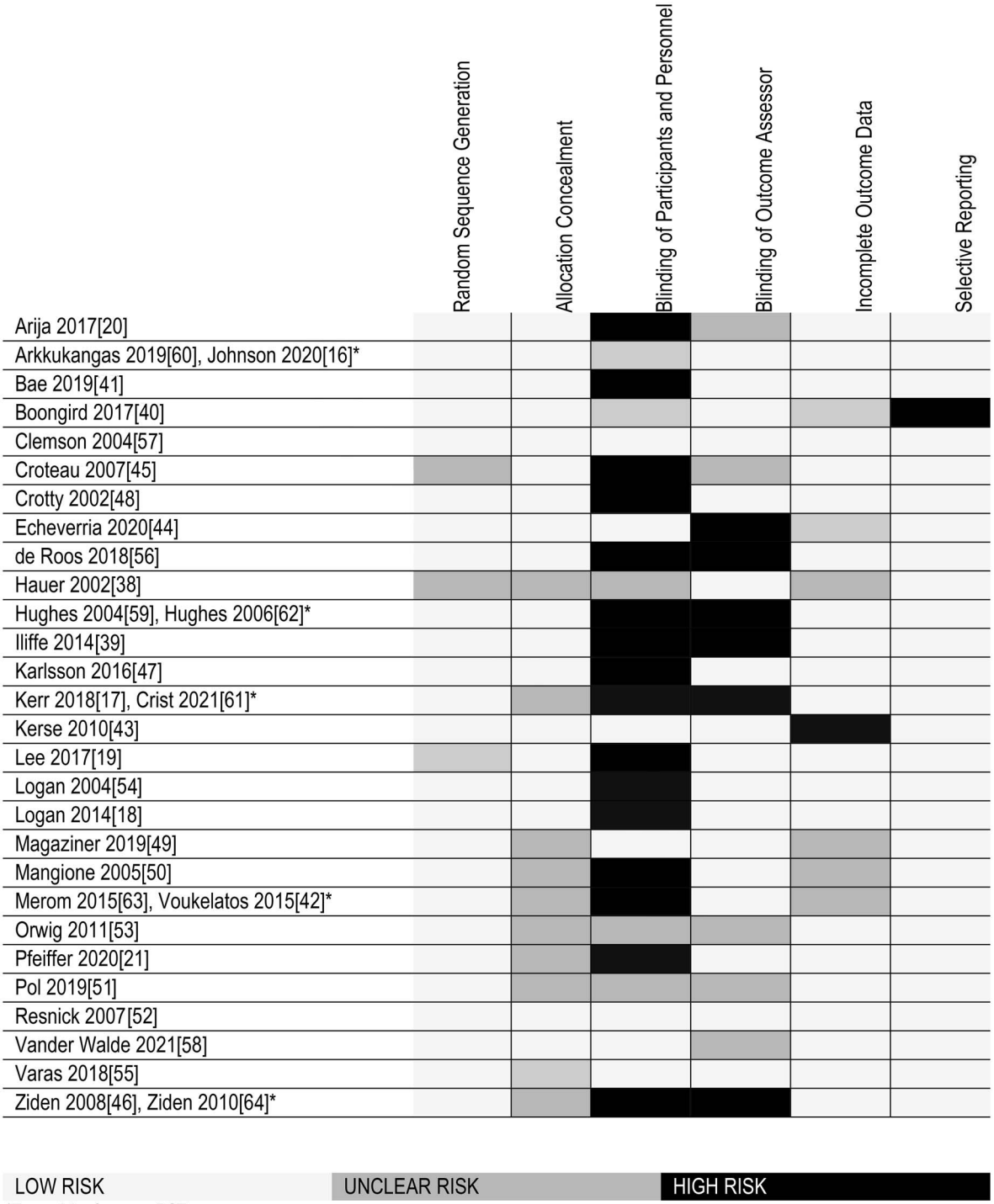


Figure 1. Study selection.

total physical activity at intervention end (five RCTs with 1,704 participants. Hedge's g 0.13, 95% CI: −0.04, 0.30. $I^2 = 69.69$. GRADE: Low) [20, 39, 42, 45, 60] or 12-month follow-up (two RCTs with 756 participants. Hedge's g 0.00, 95% CI: −0.12, 0.12. $I^2 = 0.00$. GRADE: Moderate) [16, 39]. The findings are in keeping with two RCTs not included in the meta-analysis for intervention end [41, 44] and follow-up [44]. Four RCTs evaluated the effectiveness of rehabilitation interventions for proactive populations incorporating outdoor mobility on minutes spent in moderate-vigorous physical activity with inconsistent evidence for an effect [17, 39, 41, 44].

There was a large effect of rehabilitation interventions for reactive populations which incorporated outdoor mobility on total physical activity at intervention end (seven RCTs with 587 participants. Hedge's g 1.32, 95% CI: 0.31,

Table 1. Risk of bias



*Two articles from one RCT

2.32. $I^2 = 96.31$. GRADE: Low) [21, 38, 43, 55, 56, 58, 59] and 12-month follow-up (five RCTs with 449 participants. Hedge's g 0.62, 95% CI: 0.44, 0.80. $I^2 = 0.00$. GRADE: Low) [38, 43, 52, 55, 59]. The finding is in keeping with two RCTs not included in the meta-analysis for intervention end [53] and follow-up [19, 53]. In contrast, Clemson *et al*. reported no difference in the change in physical activity as measured by the Physical Activity Scale for the Elderly from baseline to follow-up for intervention (mean difference (standard deviation (SD)): −13.48 (42.25)) versus control (mean change (SD): −4.40 (36.25)) ($P = 0.06$) [57]. No RCT targeting reactive populations evaluated moderate-vigorous physical activity.

Table 2. Characteristics of randomised controlled trials

Author/year	Location	Sample size I:C	Recruitment	Population	Intervention setting	Comparator	Relevant outcome/s†	Follow-up
Arija 2017 [20]	Spain	260:104	Primary care	Inclusion: primary care catchment, mean age >65 years Exclusion: episode of ischemic heart disease less than 6 months previously, acute episode of arthritis that would limit the ability to walk, lung or heart disease causing dyspnoea	Community	Usual care	International Physical Activity Questionnaire, short version	9 months
Arkkukangas 2019 [60] and Tuvemo Johnson 2021 [16]*	Sweden	61:58:56	Patients who requested walking aids/home care from health centres or municipality	Inclusion: ≥75 years, able to walk independently and understand written and oral information in Swedish, mean age >80 years Exclusion: scoring <25 on the Mini Mental State Examination, ongoing regular physiotherapy, terminal care	Home and healthcare centres	Otago exercise program	Falls Efficacy Scale (Swedish version) The Frandin/Grimby Activity Scale	12 weeks, 12 months and 24 months
Bae 2019 [41]	Japan	41:42	The National Centre for Geriatrics and Gerontology Study of Geriatric Syndromes	Inclusion: mild cognitive impairment, normal general cognitive function, no evidence of functional dependency, no dementia, mean age >65 Exclusion: <65 years, certification of needing care from the long-term care insurance, disability in activities of daily living, history of Parkinson's or Alzheimer's disease, depression, contraindication of exercise by GP, pacemaker, connection to this research, frequent 1–10 km trips outdoors, currently employed, no mild cognitive impairment, missing data	Community	Oral care and nutrition education	Time spent in moderate-to-vigorous physical activity Step count Going outdoors, number of times/day	N/A
Boongird 2017 [40]	Thailand	219:220	N/A	Inclusion: mild to moderate balance dysfunction, mean age >65 Exclusion: moderate to severe cognitive problems, neurological conditions influencing gait and mobility, acute arthritis, unstable or terminal illness that would preclude the planned exercises, not Thai speaking, participating in regular strengthening exercise	Primary care clinics	Falls prevention education	Thai fall efficacy scale	3, 6, 9 and 12 months
Clemson 2004 [57]	Australia	157:153	Promotional material, health referrals, advertisements, mailing lists, department of veteran's affairs, football clubs, community organisations	Inclusion: fallen in the previous year, consider themselves at risk of falling, conversational English, mean age >70 years Exclusion: cognitive problems associated with dementia, homebound, unable to independently leave home	Predetermined community venue	Two social visits from an occupational therapist	Modified Falls-Efficacy Scale Physical Activity Scale for the Elderly	N/A

(*Continued*)

Table 2. Continued

Author/year	Location	Sample size I:C	Recruitment	Population	Intervention setting	Comparator	Relevant outcome/s†	Follow-up
Croteau 2007 [45]	USA	95:84	Health, educational, and social programmes in the community	Inclusion: able to ambulate independently, able to walk at velocity and/or with appropriate gait patterns necessary to permit adequate pedometer readings, wears appropriate clothing, physician approval, mean age >70 years	Community	Wait-list controls instructed to continue with their usual activity	Daily step counts	12 weeks, 24 weeks
Crotty 2002 [48]	Australia	34:32	Acute hospital	Inclusion: hip fracture, medically stable, physical and mental capacity, expected home discharge Exclusion: inadequate social support, no telephone, outside catchment, mean age >80 years	Home	Routine care	Falls Efficacy Scale	4 months
de Roos 2018 [56]	The Nether-lands	26:26	Primary general care practices and hospital	Inclusion: Clinically stable COPD (GOLD Stage II COPD—≤50% FEV_1 < 80%), score of ≥2 on Medical Research Council Dyspnoea Scale, mean age >70 years Exclusion: Exercise-restricting, non-COPD related complaints (e.g. severe cardiac or MSK issues)	Primary physiotherapy care centre and home	Usual care	Daily physical activity (minutes per day) 6-min Walk test	10 weeks
Echeverria 2020 [44]	Spain	27:28	Internal Medicine and Neurology services of University Hospital of Araba	Inclusion: ≥70 years, scored ≥20 on the Mini Mental State Examination, able to walk at least 4 m independently, mean age >80 years Exclusion: Chronic kidney disease, severe dementia, autoimmune neuromuscular disease, acute myocardial infarction, bone fracture in the last 3 months, refusal to sign informed consent	Hospital and home	Short-term program	6-min walk test Time in moderate-vigorous physical activity steps per day	24 weeks
Hauer 2002 [38]	Germany	15:13	Inpatient rehabilitation	Inclusion: hip fracture, ≥75 years, female, mean age >80 years Exclusion: severe cognitive/cardiovascular/musculoskeletal disease, acute neurological impairment, unstable chronic/terminal illness, major depression	Outpatient geriatric rehabilitation unit	Seated activities	Physical activity questionnaire for elderly people	3 months
Hughes 2004 [59] Hughes 2006 [62]*	USA	80:70	Newsletter, announcements in the local media, presentations to local senior groups	Inclusion: clinical presence of lower extremity joint osteoarthritis, mean age >70 years Exclusion: <60 years, participating in an aerobic exercise programme, have had uncomplicated hip or knee surgery within the previous 6 months or complicated surgery within the past year, have received steroid injections in either knee or hip within the previous 3 months; a diagnosis of rheumatoid arthritis, moderate to severe cognitive impairment; severe, limiting cardiovascular disease, active thrombophlebitis, recent pulmonary embolus, acute systemic illness, poorly controlled diabetes, people with other health conditions precluding exercise.	Senior centres, senior housing residences	'The Arthritis Helpbook', a list of community exercise programmes, self-care materials and handouts	6-min walk test Maintenance of Physical Activity (minutes per week)	2, 6, 9, and 12 months

(*Continued*)

Table 2. Continued

Author/year	Location	Sample size I:C	Recruitment	Population	Intervention setting	Comparator	Relevant outcome/s†	Follow-up
Iliffe 2014 [39]	UK	411:387:458	General practices, mailed invitations, telephone contact	Inclusion: commitment to participate for the duration of the study, availability of suitable community venue, ≥65 years, able to walk independently indoors and outdoors, physically able to take part in a group exercise class, eligible to participate in the trial, mean age >70 years Exclusion: significant cognitive impairment, three or more self-reported falls in the previous year, resting blood pressure >180/100 mmHg, tachycardia >100 bpm, uncontrolled hypertension as considered by GP, drop in blood pressure during exercise, psychiatric conditions preventing participation in an exercise class, uncontrolled medical problems, conditions requiring a specialist exercise program, unable to maintain a seated upright position, unable to move independently indoors, not living independently, receiving long-term physiotherapy, already in an exercise program.	Home	Free to participate in any other exercise as they normally would	Proportion meeting target of ≥150 min of moderate-vigorous physical activity per week (Community Health Activities Model Program for Seniors scale) Physical Activity Scale for the Elderly Falls-related self-efficacy	6, 12, 18 and 24 months
Karlsson 2016 [47]	Sweden	107:98	Geriatric ward	Inclusion: hip fracture, ≥70 years, living in the municipality of Umeå, lives in ordinary housing or residential care facilities, dementia and cognitive impairments were included, mean age >80 years Exclusion: pathological fractures and those whose hip fracture occurred in hospital	Home	Conventional geriatric care and rehabilitation	Walking ability indoors and outdoors	3 and 12 months
Kerr 2018 [17] and Crist 2021 [61]*	USA	151:156 and 150:155	Flyers, presentations, participant testimonials from previous sites, encouragement from site staff and peers	Inclusion: >65 years, timed up and go <30 s, able to walk 20 m without assistance, no falls in previous 12 months that resulted in hospitalisation, able to talk over the phone, no plans to move in the next 12 months, completion of post-consent comprehension test, mean age >80 years Exclusion: dementia or cognitive impairment	Continuing Care Retirement Communities	Education on successful ageing and four general health calls	Physical activity (minutes of moderate-vigorous per day) Time spent in four mutually exclusive domains further from home (GPS)	3, 6, 9 and 12 months
Kerse 2010 [43]	New Zealand	97:96	Invitation from primary care practitioner	Inclusion: ≥75 years, community dwelling, able to communicate in English, complete assessments, no severe dementia or unstable medical conditions preventing participation in physical activity, mean age >80 years Exclusion: dementia/cognitive impairment, living in residential care, terminal illness, unable to communicate in English, unstable medical condition	Home	Social visits	Auckland Heart Study Physical Activity Questionnaire	6 and 12 months

(*Continued*)

Table 2. Continued

Author/year	Location	Sample size I:C	Recruitment	Population	Intervention setting	Comparator	Relevant outcome/s†	Follow-up
Lee 2007 [19]	Taiwan	102:100	Eligible individuals identified and contacted from healthcare database	Inclusion: resident in local township, mild to moderate hypertension (resting systolic blood pressure between 140 mmHg and 179 mmHg), mean age >70 years Exclusion: Unable to walk regularly, high blood pressure	Community, home and/or telephone	Usual care	Self-Efficacy for Exercise Scale	6 months
Logan 2004 [54]	UK	86:82	GP registers	Inclusion: clinical diagnosis of stroke in the last 36 months, mean age >70 years	Home	Routine care and transport leaflets	Outdoor mobility satisfaction Number of journeys made outside the house	4 and 10 months
Logan 2014 [18]	UK	287:281	General practices, primary care therapy teams, community stroke teams, outpatient clinics	Inclusion: stroke at least 6 weeks previously, wished to get out of the house more often, mean age >70 years Exclusion: not able to comply with the protocol and therapy programme, being in active rehabilitation	Home	Verbal advice, packs of local travel information	Number of journeys made outside the house Satisfaction with outdoor mobility	6 months, 12 months
Magaziner 2019 [49]	USA	105:105	Clinic/health centres	Inclusion: hip fracture, community dwelling, ambulatory prefracture, <300 m in 6-min walk test at randomisation, mean age >80 years Exclusion: medically unstable, pathological fracture, low potential to benefit, practical impediments to participation	Home	Seated activities and TENS	6-min walk test	4 months
Mangione 2005 [50]	USA	13:17:11	Physiotherapy practice	Inclusion: hip fracture, ≥65 years, living at home, discharged from physiotherapy, able to travel for assessment, mean age >75 years Exclusion: MMSE<20, unstable angina, uncompensated congestive heart failure, metabolic conditions that limit training, residual hemiplegia, Parkinsons Disease, life expectancy of <6 months, nursing home dwelling	Home	Routine care and written materials	6-min walk test	3 months
Orwig 2011 [53]	USA	91:89	Acute hospital	Inclusion: hip fracture, ≥65 years, female, community dwelling, ambulatory unaided prefracture, mean age >80 years Exclusion: <20 MMSE, pathological fracture, cardiovascular/neurologic/respiratory diseases/conditions which increased risk of falls limiting exercising home alone, bone disease, metastatic cancer, cirrhosis, end-stage renal disease, hardware in contralateral hip	Home	Routine care	Yale Physical Activity Scale	2,6, and 12 months

(*Continued*)

Table 2. Continued

Author/year	Location	Sample size I:C	Recruitment	Population	Intervention setting	Comparator	Relevant outcome/s†	Follow-up
Pfeiffer 2020 [21]	Germany	57:58	Inpatient rehabilitation	Inclusion: hip fracture, community-dwelling, positively screened for fear of falling, mean age >80 years Exclusion: cognitive impairment, severe communication deficiencies	Inpatient rehabilitation and home	Routine care	Short Falls Efficacy Scale Daily walking duration	3 months
Pol 2019 [51]	Nether-lands	87:76:77	Nursing and community care facilities	Inclusion: hip fracture, ≥65 years, living alone, MMSE ≥15 Exclusion: MMSE <15, terminal illness, awaiting nursing home placement, mean age >80 years	Home, nursing and community care facilities	Routine care	Falls Efficacy Scale International	1, 4 and 6 months
Resnick 2007 [52]	USA	51:54:52:51	Acute hospital	Inclusion: hip fracture, ≥65 years, female, community dwelling, clearance from surgeon, mean age ≥80 years Exclusion: MMSE <20, medical problems that increase falls risk when exercising home alone, walking unaided prefracture, pathological fracture	Home	Routine care	Self-efficacy for walking/exercise scale The Yale Physical Activity Survey	2, 6 and 12 months
VanderWalde 2021 [58]	USA	27:27	Dept of Radiation Oncology at the West Cancer Center and Research Institute	Inclusion: ≥65 years, English speaking, stage 0–3 breast cancer, exercise less than 120 min per week, scheduled to receive either whole breast or regional radiotherapy with curative intent, mean age >65 years Exclusion: those who exercise ≥120 min per week, too unhealthy to walk safely	Home	Standard fractionated radiotherapy		1 month
Varas 2018 [55]	Spain	21:19	Hospital at Universidad Autonoma de Madrid	Inclusion: COPD diagnosis, no exacerbation 4 weeks prior to the study, exertional dyspnoea, habitual low physical activity level (<30 min of moderate intensity exercise per day) mean age >65 years Exclusion: difficulty walking, CVD (except high BP), participated in a PR programme in the 12 months prior	Community	Exercise education, pedometer with general recommendations to walk more every day	Exercise capacity—Endurance Shuttle test Physical activity (average number of steps/day)	10 weeks, 3 and. 12 months
Voukelatos 2015 [42] and Merom 2015 [63]*	Australia	191:194 145:170	Newspaper advertisements, personal and professional referrals, sampling from Australian electoral roll	Inclusion: ≥65 years, inactive (<120 min exercise per week), able to walk at least 50 m, able to communicate in English, walk unaided or with manual assistance for 50 m, mean age >70 years Exclusion: neurological conditions limiting participation or cognitive impairment	Home	Health education	Falls Efficacy Scale-International Incidental and Planned Exercise Questionnaire	2 months and 12 months
Ziden 2008 [46] and Ziden 2010 [64]*	Sweden	48:54	Community-dwelling patients with hip fracture in the central or western parts of Goteborg	Inclusion: hip fracture, ≥65 years, able to speak and understand Swedish, mean age >80 years Exclusion: severe medical illness with expected survival of <1 year, severe drug or alcohol abuse, mental illness, or severe cognitive impairment	Home	Conventional Care	Falls efficacy Scale, Swedish version	1, 6 and 12 months

I: Intervention C: Control COPD: Chronic Pulmonary Disease *Two articles for one RCT †Relevant to current systematic review

Table 3. Intervention descriptors

Author year	Supervised/ unsupervised	Type	Duration	Frequency	Intensity	Psychological	Environment/ assistive technology	Knowledge	Outdoor
Arija 2017 [20]	supervised	socio-cultural activities and walking itineraries (average 5 km circuits) accompanied and monitored by healthcare professionals	9 months	2 walking sessions per week, socio-cultural activities once per month	120 min/week walking (396 METs min/week)	no	no	walking itineraries	outdoor sociocultural activities, walks encouraged in and around the city
Arkkukangas 2019 [60], **Tuvemo Johnson 2021** [16]*	supervised	a: Otago exercise programme and walking programme b: Otago exercise programme, walking programme, and motivational interviewing	12 weeks	a and b: exercise three times per week b: motivational interviewing five sessions	a and b: exercise 30 min	b: motivational interviewing	ankle weight	exercise manual with pictures and description of each exercise	walks encouraged in between exercise days
Bae 2019 [41]	supervised	four to five participants and two staff per group. Stretching, physical cognitive and social activities tailored to preference and available community resources near their residence.	24 weeks	twice weekly	90 min	social activities; group based	accelerometer	no	outdoor activity of choice e.g. walking, visiting temple, shopping
Boongird 2017 [40]	unsupervised following 1 h demonstration; telephone progress monitoring	modified Otago program and a walking plan	12 weeks	exercise six times weekly; twice weekly walking	20 min exercises; 30 min walking	weekly planners	video disc recorder	fall prevention education, exercise manual	walks encouraged 2 x 30 min weekly
Clemson 2004 [57]	supervised	12 participants in each group. Lower limb balance and strengthening, community mobility and discrete skills. One session included a community mastery experience during which community mobility and discrete skills e.g. negotiating grass or curb ramps were practiced.	7 weeks	once weekly	120 min	group based. Reflections and sharing accomplishments, action planning, weekly homework	no	coping with visual loss and regular screening, medication management, environmental and behavioural home safety, community safety	community mobility session
Croteau 2007 [45]	supervised and unsupervised	intervention consisting of pedometer usage, counselling, and self-monitoring	24 weeks (12 week intervention, 12 week maintenance)	monthly group sessions, daily walking	Individually tailored - step count 5% greater than participants baseline	counselling, goal setting, identifying strategies to increase step count	pedometer	step calendar, list of sample strategies to increase physical activity	list of walking strategies included outdoor mobility (e.g. talking dog for walks, walking with a friend)

(*Continued*)

Table 3. Continued

Author year	Supervised/ unsupervised	Type	Duration	Frequency	Intensity	Psychological	Environment/ assistive technology	Knowledge	Outdoor
Crotty 2002 [48]	supervised	gait, balance, functional tasks, general physical activity	individually tailored	individually tailored	individually tailored	goal setting	home risk assessment, modifications, mobility aids	no	author confirmed outdoor mobility training included
de Roos 2018 [56]	supervised and unsupervised	incremental treadmill walking, cycling and extremity resistance exercise, education sessions, instructions to walk	10 weeks	two times per week	10 min incremental treadmill walking, cycling and resistance exercise Self-paced walking programme	no	no	instructions on exercise compliance and the importance staying active	≥30 min walking 1 day per week
Echeverria 2020 [44]	Supervised (hospital group session) and unsupervised (individual home program)	SGB: 6 weeks at hospital +18 weeks at home LGB: 12 weeks at hospital +12 weeks at home Group = strength, power, balance, walking Individual = Otago Program e.g. balance, strength, walks	24 weeks	Hospital: 2 x 1 h per week Home: walk 15–60 min daily	Strength training: weeks 1–3 40–50% 1RM, weeks 4 onwards 60–70% 1RM	No	No	No	home component included 7 days of walking recommendations aimed at perform outdoor walking without assistance.
Hauer 2002 [38]	supervised	gait, balance and functional training, strength/resistance, general physical activity.	3 months	145 min 3 days/week	70–0% max workload	no	no	no	author confirmed outdoor mobility training included
Hughes 2004 [59] **Hughes 2006** [62]*	supervised	Fit and strong intervention: flexibility exercises, resistance training, walking, group discussion and education	8 weeks	90 min sessions, three times per week	Individually tailored	goal setting and systematic feedback on progress made, identify strategies for self-efficacy adherence	no	Performance records shared with participants. Exercise log, The Arthritis helpbook, and health education.	outdoor walking
Iliffe 2014 [39]	supervised and unsupervised	a: Otago exercise and walking programme b: community centre postural stability instructor led exercise programme, Otago home exercise, and walking programme	24 weeks	a: three times per week; and at least twice weekly walking b: one group exercise class, twice weekly home exercise; and at least twice weekly walking	a: 30 min home exercise; walking 30 min at moderate pace b: 1 h group exercise, 30 min home exercise, walking 30 min moderate pace	coping strategies to reduce risk of complications from a long lie after a fall.	a: ankle cuff weights	a and b: instruction booklet	walks encouraged 2 x 30 min weekly
Karlsson 2016 [47]	supervised	comprehensive geriatric assessment, gait, balance and functional training, strength/resistance, general physical activity, monitoring -pain, wound care, medication, nutrition. Intervention specified walking ability indoors and outdoors.	10 weeks	initially daily home visits	na	no	home risk assessment, modifications, assistive devices	no	walking indoors and outdoors with physiotherapist

(*Continued*)

Table 3. Continued

Author year	Supervised/ unsupervised	Type	Duration	Frequency	Intensity	Psychological	Environment/ assistive technology	Knowledge	Outdoor
Kerr 2018 [17] **Crist 2021** [61]*	supervised and unsupervised	group walks led by staff and peer leaders from 6 weeks to 6 months, led by peer-leaders alone from 6 to 12 months. Goal setting for step count to achieve during group walks and independently.	12 months		all participants encouraged to achieve a 3,000 step increase from baseline in first 12 weeks and maintain this for remainder of study.	four counselling phone calls in first 8 weeks to identify barriers and set goals. Goals achieved celebrated in group sessions. Progress charts of steps taken every two weeks for first 6 months. Weekly step logs.	pedometers	step counts for common locations around their area, and walking maps for their local community. Nine group education sessions led by research staff and peer-leaders for information e.g. local activity classes, safe walking tips, barriers and benefits of PA, goal setting, social support, disease specific recommendations.	encouraged to walk around community
Kerse 2010 [43]	supervised and unsupervised	Otago exercise programme, progressive resistance training, progressive balance training, and walking programme	6 months	three times per week; six visits in first 2 months, seventh at month, eighth at month 6	walking 30 min; 60 min visits	calendars to record physical activity; functional goal setting; encouraged to identify a social companion for exercise	no	no	regular walking 3 x weekly and functional goal setting e.g. prune the roses
Lee 2007 [19]	supervised	Community-based walking intervention underpinned by self-efficacy theory delivered by a public health nurse	6 months	individually tailored (median = 6)	NA	discuss ideas for overcoming perceived barriers, verbal encouragement; recognise interpretations of physiological and emotional responses to walking, identify performance accomplishments	pedometer	advise about regular walking and a walking log, shared practical information about pleasant walking routes and others experiences of success	community-based walking
Logan 2004 [54]	supervised	assessment of barriers to outdoor mobility, mobility goal setting and tailored interventions to achieve goals	up to 3 months	seven times	tailored	advice, encouragement, mobility goal setting, overcoming fear/apprehension by e.g. supervised mobility	walking aids, adaptations as needed	leaflets describing local mobility services, information on e.g. resuming driving, alternatives to cars and buses	intervention based on mobility goals e.g. getting public transport
Logan 2014 [18]	supervised	additional rehabilitation, exercise, practical activities, psychological interventions to improve confidence and targeted information; a treatment manual	4 months	according to participants preference, maximum 12 visits	Individually tailored	goal planning, checklist of benefits and barriers of going outside, motivational and confidence-building strategies	Walking aids, referrals for additional equipment as needed	example of skills needed for outdoor mobility, case vignettes of treatment plans, personalised pack of local travel information	intervention based on mobility goals (e.g. long walk of >100 m), included a protocol for a first outing walking and practicing outdoor mobility

(*Continued*)

Table 3. Continued

Author year	Supervised/ unsupervised	Type	Duration	Frequency	Intensity	Psychological	Environment/ assistive technology	Knowledge	Outdoor
Magaziner 2019 [49]	supervised	gait, balance and functional training, strength/resistance, endurance	4 months	60 min every other day	Strength:3x8 repetitions at eight repetition max Endurance: 50% heart rate max or 3–5/10 perceived exertion	no	no	no	intervention specified outdoor ambulation (if able) on flat surface or up and down steps
Mangione 2005 [50]	supervised	group 1: strength/resistance, group 2: endurance	3 months	30–40 min x2/week month 1 and 2, then x1/week month 3	Strength: eight repetition max Endurance: 65-75% heart rate max or 3–5/10 perceived exertion	no	no	no	intervention specified outdoor and indoor walking included in endurance training
Orwig 2011 [53]	supervised x3/week month 1 and 2, x2/week month 3 and 4, x1/1-2 weeks for remainder	strength/resistance, endurance, flexibility, cognitive behavioural interventions	12 months	strength x2/week 30 min aerobic x3/week	Strength: 3 × 10 repetitions x 11 exercises TheraBand at individual level	motivational phone calls	no	no	author confirmed aerobic activity incorporated outdoor walking
Pfeiffer 2020 [21]	supervised (eight sessions) and unsupervised	cognitive behavioural interventions, gait, balance, and functional training, strength/resistance	3 months	30–60min ≥2/week	NA	no	home risk assessment, modifications	written exercise programme with photos and instructions or recorded instructions with music player, exercise diary	intervention targeting mobility-based goals example specifies travelling by bus using a wheeled walker
Pol 2019 [51]	supervised and unsupervised	cognitive behavioural interventions, gait, balance and functional training	3 months	60 min/week coaching, on discharge: four phone calls over 10 weeks	NA	no	home risk assessment, modifications	information and education sessions on importance of physical activity	specified monitoring of outdoor physical activity; appendix describes case addressing poor outdoor mobility in goal setting
Resnick 2007 [52]	supervised	strength/resistance, endurance, flexibility	12 months	Strength: x2/week Aerobic: 30 min x3/week	NA	goal setting, group 2 + 3: verbal encouragement, removal of unpleasant sensations, cueing	no	group 2 + 3 booklet on exercise benefits after hip fracture	author confirmed aerobic activity incorporated outdoor walking

(*Continued*)

Table 3. Continued

Author year	Supervised/ unsupervised	Type	Duration	Frequency	Intensity	Psychological	Environment/ assistive technology	Knowledge	Outdoor
Vander Walde 2021 [58]	unsupervised	walking programme	tailored	from 3 days to 5 days/week	from 15 min to 30 min	walking diary	no	exercise workbook; information of exercise to improve fatigue during radiotherapy	encouraged 150 min walking per week
Varas 2018 [55]	supervised and unsupervised	exercise training and plan to increase physical activity level	8 weeks	walking 5 days a week	walking for 30–60 min (incremental cycles of 15–20 min) at individualised predetermined speeds	weekly phone calls for encouragement, objective setting, analyse reasons of noncompliance	pedometer	activity diary to note gait and steps per day	walking programme
Voukelatos 2015 [42] **Merom 2015** [63] *	unsupervised	walking programme: stage 1 -12 weeks focused on frequency and duration, stage 2 -12 weeks focused on intensity, and stage 3 -24 weeks of maintenance	12 weeks	3 times per week	30 min	seven telephone coaching sessions at weeks 1, 3, 6, 12, 16, 24, and 36 walking diary	encouraged to use a pedometer	walking manual sent by post at 0, 12 and 24 weeks with guidance for each stage	progressive walking intervention undertaken at participants preferred location
Ziden 2008 [46]**,2010** [64]*	supervised and unsupervised	general physical activity, cognitive behavioural interventions, involvement of family in discharge planning. Physiotherapy intervention focused on improving outdoor mobility.	3 weeks	individually tailored	individually tailored	goal setting and motivation	no	no	physiotherapy intervention focussed on outdoor mobility

*two articles from one RCT

Table 4. Outcomes in the proactive and reactive population according to grading of recommendations assessment, development and evaluation (GRADE)

Proactive population			
Outcomes	Hedge's g (CI)	Number of participants (studies)	Quality of evidence (GRADE)
physical activity, intervention end	0.13 (−0.04, 0.30)	1,704 (5)	⊕⊕⊖⊖[ac] Low
physical activity, 12- month follow-up	0.00 (−0.12, 0.12)	756 (2)	⊕⊕⊕⊖[d] Moderate
falls-related self-efficacy intervention end	−0.03 (−0.11, 0.05)	1,816 (3)	⊕⊕⊕⊖[e] Moderate
falls-related self-efficacy 24-month follow-up	0.63 (−0.16, 1.43)	681 (2)	⊕⊖⊖⊖[abd] Very low
Reactive population			
Outcomes	**Hedge's g (CI)**	**Number of participants (studies)**	**Quality of evidence (GRADE)**
physical activity, intervention end	1.32 (0.31, 2.32)	587 (7)	⊕⊕⊖⊖[af] Low
physical activity, 12- month follow-up	0.62 (0.44, 0.80)	449 (5)	⊕⊕⊖⊖[af] Low
endurance, intervention end	0.24 (0.04, 0.44)	392 (4)	⊕⊕⊕⊖[g] Moderate
falls-related self-efficacy intervention end	0.27 (−0.18, 0.71)	429 (4)	⊕⊖⊖⊖[abg] Very low
able to mobilise outdoor, intervention end*	0.90 (−1.03, 2.82)	285 (2)	⊕⊖⊖⊖[abg] Very low
able to mobilise outdoor, final follow-up*	0.18 (−0.38, 0.75)	253 (2)	⊕⊖⊖⊖[abg] Very low
satisfied with outdoor mobility, intervention end*	0.66 (−0.28, 1.60)	663 (2)	⊕⊖⊖⊖[abi] Very low
satisfied with outdoor mobility, final follow-up*	0.46 (−0.27, 1.19)	600 (2)	⊕⊖⊖⊖[abi] Very low

*Log Odds Ratio (CI) [a]Inconsistency, $I^2 > 45\%$ [b]Imprecision [c]Risk of Bias: random sequence generation, allocation concealment, blinding of outcome assessor, blinding of participants and personnel [d]Risk of Bias: blinding of outcome assessor, blinding of participants and personnel [e]Risk of Bias: blinding of outcome assessor, allocation concealment, blinding of participants and personnel [f]Risk of Bias: random sequence generation, allocation concealment, incomplete outcome data, blinding of outcome assessor, blinding of participants and personnel [g]Risk of Bias: allocation concealment, blinding of outcome assessor, blinding of participants and personnel [i]Risk of Bias: blinding of participants and personnel CI: confidence interval. GRADE Working Group grades of evidence High quality ⊕⊕⊕⊕: Further research is very unlikely to change our confidence in the estimate of effect. Moderate quality ⊕⊕⊕⊖: Further research is likely to have an important impact on our confidence in the estimate of effect and may change the estimate. Low quality ⊕⊕⊖⊖: Further research is very likely to have an important impact on our confidence in the estimate of effect and is likely to change the estimate. Very low quality ⊕⊖⊖⊖: We are very uncertain about the estimate.

Endurance

Echeverria *et al*. investigated the effect of rehabilitation interventions for proactive populations which incorporated outdoor mobility on walking endurance. They noted an increase in 6-min walk test distance for both intervention groups at intervention end (mean metres(m) (SD): short-term group baseline 324 m (135) intervention end 372 m (118); long-term group baseline 321 m (117) intervention end 383 m (110)) [44]. No difference in 6-min walk test distance was noted between intervention end and 24-week follow-up [44].

Rehabilitation interventions for reactive populations which incorporated outdoor mobility had a small effect on walking endurance at intervention end (four RCTs with 392 participants. Hedges g 0.24; 95% CI: 0.04, 0.44, $I^2 = 0.00$. GRADE: Moderate) [49, 50]. The finding is in keeping with one RCT not included in the meta-analysis for intervention end and follow-up [55]. In contrast, Hughes *et al*. [62] noted no between-group difference in 6-min walk test distance at 12-month follow-up (mean metres (SD): intervention 1281.53(502.93), control 1106.53(484.10)).

Outdoor mobility

Crist *et al*. [61] assessed the effect of a 12-month rehabilitation intervention for a proactive population incorporating outdoor mobility on the time spent walking (as a proportion of total time) in four mutually exclusive domains—home, campus, neighbourhood and beyond neighbourhood. Baseline mean (standard deviation) total walking time in minutes/day was 83.8 (45.4) for the intervention and 72.7(48.0) for the control group [61]. The intervention group increased daily walking from baseline to 3 months by 21.48 min/day (95% confidence interval (CI) 12.0, 31.0), while the control group saw no change in walk time (data not provided) [61]. The intervention increase was observed for non-home domains at 3 months (linear regression coefficient = 11.48, 95% CI: 1.7, 21.3), which was sustained over 12 months

[61]. In contrast, Bae et al. [41] noted no between-group difference in the change in number of times participants went outdoors per day at the end of their 24-week intervention ($P = 0.18$).

Two RCTs showed a moderate effect which failed to reach statistical significance of rehabilitation interventions for reactive populations which incorporated outdoor mobility on satisfaction with outdoor mobility at intervention end (two RCTs with 663 participants. Log Odds-Ratio 0.69, 95% CI: −0.18, 1.57. $I^2 = 81.44$. GRADE: Very low) and 10–12-month follow-up (two RCTs with 600 participants. Log Odds-Ratio 0.48, 95% CI: −0.22, 1.18. $I^2 = 70.41$. GRADE: Very low) [18, 54]. Two RCTs showed a large effect which failed to reach statistical significance of rehabilitation interventions for reactive populations which incorporated outdoor mobility on ability to mobilise outdoors at intervention end (two RCTs with 285 participants. Log Odds-Ratio 0.90, 95% CI: −1.03, 2.82. $I^2 = 91.42$. GRADE: Very low) and a small effect which failed to reach statistical significance at 12-month follow-up (2 RCTs with 253 participants. Log Odds-Ratio 0.18, 95% CI: −0.38, 0.75. $I^2 = 8.04$. GRADE: Very low) [46, 47].

Logan *et al*. [54] 2004 noted a higher proportion of participants got out of the house as much as they wanted for the intervention when compared with the control group at 4-month (rate ratio 1.72, 95% CI 1.25 to 2.37) and 10-month follow-up (rate ratio 1.74, 95% CI 1.24 to 2.44) (baseline count(%): intervention 24(28), control 32(39)). Similar effects were noted for Logan 2014 where the intervention group were more likely to make a journey outdoors than the control group at 6-month (rate ratio 1.42, 95% CI 1.14 to 1.67) and 12-month follow-up (rate ratio 1.76, 95% CI 1.36 to 1.95) (baseline count(%) for getting out of house as much as wanted: intervention 18(6.3), control 20(7.1)) [18].

Falls-related self-efficacy

There was no effect of rehabilitation interventions for proactive populations which incorporated outdoor mobility on falls-related self-efficacy at intervention end (three RCTs with 1,816 participants. Hedge's g − 0.03 95% CI: −0.11, 0.05. $I^2 = 0.00$. GRADE: Moderate) [39, 42, 60] Two rehabilitation interventions had a moderate effect but it failed to reach statistical significance at 24-month follow-up (two RCTs with 681 participants. Hedge's g 0.63 95% CI: −0.16, 1.43. $I^2 = 96.66$. GRADE: Very low) [16, 39]. The findings are in keeping with two RCTs not included in the meta-analysis for intervention end [63] and follow-up [40].

There was a small effect which failed to reach statistical significance of rehabilitation intervention for reactive populations which incorporated outdoor mobility on falls-related self-efficacy at intervention end (four RCTs with 429 participants. Hedge's g 0.27 95% CI: −0.18, 0.71. $I^2 = 84.50$. GRADE: Very low) [21, 46, 48, 52]. The absence of an effect is in keeping with two RCTs not included in the meta-analysis [51, 57]. Two RCTs reported conflicting evidence for an effect on falls-related self-efficacy at follow-up [51, 64].

Discussion

Summary of evidence

We identified 33 articles for 28 RCTs. Rehabilitation interventions for reactive populations which incorporated an outdoor mobility component improved physical activity, outdoor mobility and endurance at intervention end and final follow-up compared with usual care. No effect was noted for rehabilitation interventions for proactive populations which incorporated an outdoor mobility component on total physical activity, or endurance or falls-related self-efficacy. The confidence in effect estimates from meta-analysis ranged from moderate to very low due to concerns with risk of bias, inconsistency and imprecision. Evidence from one RCT indicated a potential benefit of rehabilitation interventions for proactive populations which incorporated an outdoor mobility component on minutes spent in moderate to vigorous activity at intervention end, and outdoor mobility at intervention end and follow-up, versus control.

Interpretation

Rehabilitation interventions for reactive populations which incorporate outdoor mobility saw a large effect on physical activity at intervention end with a moderate effect sustained at 12-month follow-up. The quality of the evidence was low indicating further research is required to replicate the results. All interventions which saw a beneficial effect on outcomes compared with control groups (88%) included a walking programme. Walking was recently reported as older adults preferred exercise [9]. The structure of programmes varied across RCTs from unsupervised to supervised, and with target frequencies of optional [38, 41] to 7-days a week [44]. The interventions by Kerse and Varas incorporated explicit prescription of walking 3–5 days per week for 30-min and demonstrated large effects on physical activity at the end of the intervention and 12-month follow-up [43, 55]. The review results suggest a walking programme may be a key component of community-rehabilitation with a dose–response relationship.

Walking programmes may also be beneficial for rehabilitation programmes for proactive populations. For proactive populations, Crist *et al*. [61] noted an increase in the time the intervention group spent walking outside their home on completion of a walking programme compared with the control group which was sustained at 12-months. The walking programme included walking maps for the local area and targeted change at the individual, interpersonal and community levels with both individual and group walks prescribed [61]. Arija *et al*. [20] saw a beneficial effect of their intervention on physical activity at intervention end versus control. Their intervention group received walking itineraries and attended a monthly sociocultural activity

including visits to museums and libraries, cultural exhibitions, tourist attractions and dance lessons [20]. These RCTs suggest a possible interaction between walking programme and social intervention components on physical activity and outdoor mobility outcomes adding weight to the potential benefit of integrated care for community-dwelling older adults [65].

Most RCTs identified by the current review operationalised their outdoor mobility intervention component as a walking programme, with few including assistive devices or transport. For the RCTs by Logan *et al*. [18, 54], the intervention targeted a broader definition of outdoor mobility which included walking, use of assistive devices (walking aids, mobility scooters), resuming driving and taking a taxi or public transport. Participants were supported by up to seven [54] or 12 [18] sessions with an occupational therapist to build confidence during practice of outdoor mobility. From the meta-analyses in the current review, Logan's interventions may lead to greater satisfaction with outdoor mobility at intervention end and 12-month follow-up, but the confidence interval did not exclude the potential for a small loss in satisfaction and the quality of the evidence was graded as very low indicating uncertainty in the estimate. Further, compared with the control group, participants in the intervention groups took more outdoor journeys [54] and were more likely to make an outdoor journey [18] at intervention end and 10–12-month follow-up. These interventions were evaluated among older adults post-stroke who may face different physical, psychological and cognitive barriers to outdoor mobility compared with other patient groups [66]. Similar interventions in different target groups are warranted to determine their effectiveness in supporting older adults to achieve the World Health Organisation's definition of functional ability as 'all the health-related attributes that enable people to be and to do what they have reason to value' [67].

For the current review, most interventions incorporated a behaviour change technique. Evidence from an umbrella review suggests that behaviour change techniques are effective at improving physical activity among community-dwelling older adults [68]. This also applies to rehabilitation interventions for reactive populations where behaviour change techniques were more effective at improving real-world walking habits after stroke than exercise alone [69]. However, for the current review no intervention included a component explicitly targeting anxiety related to outdoor mobility or fear of falling. This might explain why there was no effect of interventions on falls-related self-efficacy for either proactive or reactive populations. Given that fear of falling is negatively associated with outdoor mobility behaviour [13, 63] future RCTs should include an intervention component to explicitly target improvements in falls-related self-efficacy [70, 71].

Limitations

First, we searched five electronic databases; however, we excluded protocols, pilot/feasibility RCTs, non-randomized trials, which may have underestimated the extent of relevant evidence. Second, we excluded conference proceedings and those not published in English which may have introduced publication bias. Third, we included community-based RCTs of older adults irrespective of target population. We also employed a broad definition of 'outdoor mobility' ranging from supervised outdoor walking to goal setting. We employed random-effects meta-analysis to account for expected variation between populations and interventions and stratified meta-analyses by proactive/reactive populations. Despite this, we noted heterogeneity for some analyses which contributed to the very low to moderate grading of recommendations limiting the generalisability of the review findings. We did not explore this heterogeneity further e.g. by different types of interventions or outcome measures due to the small number of RCTs in each meta-analysis [35].

Conclusions

Rehabilitation interventions for reactive populations which incorporated an outdoor mobility component led to sustained improvements in physical activity, outdoor mobility and endurance among older adults. In most RCTs the outdoor mobility component comprised a walking programme and was accompanied by behaviour change techniques. These intervention components may be considered for community-based reactive rehabilitation for older adults who wish to increase their outdoor mobility. The quality of the evidence ranged from very low to moderate and should be replicated in future research. Future research should also seek to confirm/refute the benefit of a walking programme for proactive populations observed in RCTs not incorporated in meta-analysis of the current review. Further, no improvements in falls-related self-efficacy were noted across RCTs which may relate to the absence of intervention components directly addressing mobility-related anxiety. This should also be addressed by future research.

Supplementary Data: Supplementary data mentioned in the text are available to subscribers in *Age and Ageing* online.

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