National Institute for Health and Care Excellence

Draft for consultation

Falls: assessment and prevention in older people and people 50 and over at higher risk (update)

F Evidence reviews for prevention of falls in community care settings: Exercise, Multicomponent/Multifactorial and Environmental Interventions

NICE guideline <number>

Evidence reviews underpinning recommendations 1.3.1 to 1.3.12 in the NICE guideline

October 2024

Draft for consultation

This evidence review was developed by NICE

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1.1. Review question: What are the most clinically effective and cost-effective interventions for preventing falls in older people in community settings?

1.1.1. Introduction

In 2013 falls cost the NHS £2.3 billion and the human cost to individuals and their families/carers can be devastating and includes distress, pain, loss of confidence and increased mortality (taken from NICE falls guideline 2013). It is therefore important to determine the most clinically effective and also cost-effective methods to prevent falls from occurring.

Currently older people identified with a risk of falling are assessed using a multifactorial risk assessment, this provides individualised identification of components which can then be targeted for intervention. Current recommendations include strength and balance training, home hazard and safety intervention, psychotropic medication review, cardiac pacing (where clinically indicated), participation in falls prevention programmes and education and information giving from the clinician to the person at risk of falling and to their families and carers.

This review was undertaken to ensure that further research in this area was taken into consideration within the recommendations.

1.1.2. Summary of the protocol

For full details see the review protocol in Appendix A.

Table 1: PICO characteristics of review question

Population	People in the community who are: • aged 65 and over • aged 50 to 64 who have a condition or conditions that may put them at higher risk of falling.
Intervention(s)	Any intervention designed to reduce falls in older people in the community. Interventions grouped by: combination (single, multiple or multifactorial); then by type of intervention (descriptors). Possible descriptors include: • Exercise: group and individual • Medication: vitamin D; calcium; HRT • Medication withdrawal • Surgery: cardiac pacemaker insertion; cataract surgery. • Fluid or nutrition therapy • Psychological interventions: CBT

	• Environment/assistive technology: home safety interventions; aids for personal mobility. • Environmental aids for communication, information and signalling e.g. vision improvement. • Body worn aids for personal care and protection: footwear modification. • Knowledge/education interventions Multiple component interventions: combination of single categories of intervention (receive a fixed combination of 2 or more fall prevention interventions from the different categories above) Multifactorial interventions: more than one main category of intervention (assessment of an individual to determine the presence of 2 or more modifiable risk factors for falling, followed by specific interventions targeting those risk factors).
Comparison(s)	Single interventions' comparators: • Usual care/placebo Multicomponent or multifactorial interventions' comparators: • Usual care/attention control • Exercise as a single intervention. Exercise • Usual care/control • Exercise
Outcomes	All outcomes are considered equally important for decision making and therefore have all been rated as critical: • Rate of falls • Number of people sustaining one or more falls • Number of participants sustaining fall-related fractures • Adverse effects of the interventions (composite of all) • Validated health-related quality of life scores e.g. EQ-5D or similar
Study design	Randomised controlled trials (RCTs). There are enough RCTs identified within the area so we will not be including non-randomised studies. For a systematic review (SR) to be included it must be conducted in line with the methodological processes described in the NICE manual. If sufficient details are provided, reviewers will either include the SR fully or use it as the basis for further analyses where possible. If sufficient details are not provided to include a relevant SR, the review will only be used for citation searching. Published NMAs and IPDs will be considered for inclusion.

1.1.3. Methods and process

This evidence review was developed using the methods and process described in Developing NICE guidelines: the manual. Methods specific to this review question are described in the review protocol in appendix A and the methods document.

Declarations of interest were recorded according to NICE's conflicts of interest policy.

Interventions which were included in the Gillespie 2012 Cochrane review were updated in three later Cochrane reviews, Hopewell 2018[105] for multifactorial/multicomponent interventions; Sherrington 2019[210] for exercise and Clemson 2023[41] for environmental interventions.

This review included the three Cochrane reviews which matched the protocol for our question on interventions to prevent falls.[41, 105, 210] Hopewell 2018[105] focused on multifactorial interventions and multicomponent interventions, which were specifically designed to reduce falls in older people living in the community. Sherrington[210] focused on exercise interventions for preventing falls in older people living in the community; and Clemson[41] looked at environmental interventions to prevent falls in older people in the community. All three reviews excluded quasi-randomised studies. Please see additional reviews in F2 for other interventions within a community setting. We have updated the Cochrane reviews to include all recent papers, which were identified in the search, which match the protocol for this review, focusing on multicomponent interventions and multifactorial interventions. Extractions for studies included in the Cochrane can be found within the Cochrane reviews, and any studies updating it can be found in the study extractions in this review.

Population

Hopewell 2018[105], Sherrington 2019[210] and Clemson[41] included some studies where many participants were 60 years or older. Younger participants could be included if the mean age minus one standard deviation was more than 60 years. This differs from the protocol for this review, which included individuals aged 65 years or older or individuals who were between the ages of 50 to 64 years who also had conditions that may put them at higher risk of falling. Similarly to the Cochrane reviews we also included younger participants if the mean age minus one standard deviation was more than 65 years. However, the majority of trials from the Cochrane reviews were in people aged 65 and over. Trials were included where the majority of the participants were living in the community or in places of residence that do not provide health-related care or rehabilitative services. They included studies that recruited participants who were in a hospital initially if they were subsequently discharged to the community (where most of the intervention was provided and falls recorded). Trials in which participants were affected by a particular condition that increases the risk of falls, such as Parkinson's disease, were excluded. The Hopewell[105] and Clemson[41]Cochrane reviews excluded participants post-stroke and those with Parkinson's disease as these were covered in other Cochrane reviews, Canning, 2015[82] and Verheyden 2013[242] Sherrington 2019[210] excluded trials where participants were affected by a particular condition that increases the risk of falls (Parkinson's disease, multiple sclerosis, dementia, hip fracture or severe visual impairment). Hopewell 2018[105] and Sherrington[210] noted that studies with mixed populations (community and higher-dependency places of residence) were eligible for inclusion provided separate data were available for those participants living in the community, or the numbers in higher-dependency residences were very few and balanced in the comparison groups.

Exercise interventions

Sherrington 2019[210] included trials of singular exercise interventions (rather than broader interventions) which measured falls in older people. Exercise programmes were categorised by the ProFaNE taxonomy (Lamb 2021). They included exercise overall and sub-grouped the exercises into the following categories: balance and functional exercises; resistance exercises; flexibility training; 3D (including Tai Chi, Qigong) exercise; 3D (dance); walking programme; endurance training; other kinds of exercise; and multiple categories of exercise. All categories were compared to control (usual care, no change in usual activities or control, where the intervention was not thought to reduce falls). They also looked at the different categories of exercise compared to each other, different modes of delivery and different doses. In accordance with our protocol, we looked at exercise overall compared to control and different types of exercise compared to another type.

Multifactorial or multicomponent interventions

Hopewell 2018[105] defined a multifactorial intervention as one in which interventions from two or more main categories of intervention can be given to participants, but the interventions are linked to each individual's risk profile, determined through a formal assessment process. Due to this individualisation, not all participants will receive the same combination of interventions. Hopewell 2018[105] noted that multifactorial interventions were provided to address a person's identified risk factors. Multicomponent interventions were defined as one in which interventions from two or more main categories of intervention (such as: medication review or balance and gait assessment) are given to all participants of the falls prevention programme.

Hopewell 2018[105] included studies where the intervention was compared with 'usual care', an attention control intervention (i.e. an intervention that is not thought to reduce falls, e.g. general health education) or exercise as a single active falls-prevention intervention. They included exercise as a separate comparator intervention because previous systematic reviews of fall prevention interventions have consistently demonstrated exercise to be the intervention that has the largest and most consistent evidence base (Gillespie 2012[85] and Sherrington 2016b[210]. Hopewell 2018[105] did not include comparisons of different multifactorial interventions or different multiple component interventions, comparisons of any multifactorial versus multiple component interventions, or comparisons where the control was a single active intervention, apart from exercise.

Environmental interventions

When focusing on environmental interventions, Clemson[41] subdivided the findings by either those who were selected to be at a high risk of falling at baseline compared to those were not selected, those whose intervention was delivered by an occupational therapist compared to those whose intervention was not delivered by an occupational therapist, and those received a high amount of tailoring for an intervention compared to those who received limited intervention tailoring. These were not subgroups within the present protocol so only the overall data was reported in this review.

Outcomes

Sherrington 2019[210] had rate of falls (falls per person-year) as the primary outcome whereas Hopewell 2018[105] reported the rate of falls; number of people who have sustained one or more falls (risk of falling) and number of people who have sustained recurrent falls during follow-up. In accordance to our protocol we included the rate of falls and number of fallers (one or more falls). Additional reported outcomes within Hopewell and Sherrington, relevant to our review, included health-related quality of life using a validated scale, the number of people sustaining a fall-related fracture, and adverse events. The number of fallers and number of participants sustaining a fall-related fracture were reported as risk ratio (RR). The health-related quality of life was reported as standardised mean differences (SMDs). When updating this review, we included new findings in the Cochrane's pre-established format.

Rate of falls

Hopewell 2018[105], Sherrington 2019[210] and Clemson 2023[41] used a rate ratio (incidence rate ratio or hazard ratio) and 95% CI if these were reported in the paper. In the event both adjusted and unadjusted rate ratios were reported, the unadjusted estimate was used unless the adjustment was for clustering. If the rate ratio was not reported but appropriate raw data was available, Excel was used to calculate a rate ratio and 95% confidence interval. Where the authors reported the rate of falls (falls per person year) in each group and the total number of falls in participants contributing data, the rate of falls in each group was calculated from the total number of falls and the actual total length of time falls were monitored (person years) for participants contributing data. For the updated review, we included rate ratios and 95% confidence intervals reported in the studies. Where rate ratios and 95% confidence intervals were not reported, these were calculated where possible with available raw data.

Risk of falling

For number of fallers, Hopewell 2018[105] and Clemson 2023 state that the estimate of risk (risk ratio (relative risk) and 95% CI if available was used. Sherrington 2019[210] and Clemson 2023[41] reported the RR, HR for first fall, or odds ratio (OR) and 95%CI if available. If both adjusted and unadjusted estimates were reported, the unadjusted estimate, unless the adjustment was for clustering, was used in both reviews.

Missing data

Hopewell 2018[105], Sherrington 2019[210] and Clemson 2023[41] contacted authors for missing data; Hopewell 2018[105] used the number randomised if no significant loss to follow-up and recorded the reasons for missing data across treatment groups. Sensitivity analyses were conducted to explore the effects of missing data.

Meta-analysis and GRADE

We added studies found subsequent to the Hopewell 2018[105] and Sherrington 2019[210] to their Revman meta-analyses, leaving their data intact. We completed GRADE ratings for all available evidence. We used the Cochrane review's risk of bias ratings and extractions within GRADE but graded the other components according to our methodology.

The Hopewell 2018[105], Sherrington 2019[210] and Clemson 2023[41] Cochrane reviews used the generic inverse variance method in Revman. This enabled pooling of the adjusted and unadjusted treatment effect estimates for rate ratios or risk ratios. For our results to be integrated with the Cochrane review we followed the generic inverse variance method. However, this meant that absolute effects were not reported for some of the data and where we normally base decisions on clinical importance (benefit, harm or no difference) on the point estimate of the absolute values we instead used the relative risk/rate ratio point estimate. For outcomes where absolute values could be established these were used.

The Clemson 2023[41] Cochrane review was published during the development of the guideline and no new studies were found that were relevant for environmental interventions to prevent falls. Therefore, the entire Cochrane review was used as evidence in the committee's decision making and no further analyses were conducted.

Subgroup analysis

For the purpose of the multifactorial/multicomponent review, subgroup analysis by the intensity of the intervention was performed. This process grouped included studies according to assessment and active intervention or assessment and referral or provision of information. This subgroup analysis was performed in the studies with multifactorial interventions for the outcomes rate of falls, number of people sustaining one or more falls, and health-related quality of life. In the Hopewell 2018[105] Cochrane review, health-related quality of life was not initially explored, however due to the presence of heterogeneity, we performed a subgroup analysis based on this outcome.

The Sherrington 2019[210] review undertook subgroup analysis for studies that did and did not use and increased risk of falls as an inclusion criterion. This was not part of our protocol so we did not subgroup according to this, but the committee thought that subgroup according to type of exercise was relevant, so we included this.

Declarations of interest were recorded according to NICE's conflicts of interest policy.

Exercise interventions for falls prevention in community care settings

1.1.4. Effectiveness evidence

1.1.4.1. Included studies

A total of 136 randomised controlled studies were included in the review. One Cochrane review (Sherrington 2019) [210] was identified in the search, which included 106 randomised trials, while 25 studies were included to update the review. Forty-seven studies compared balance and functional exercises to control (Arantes, 2015[5]; Arkkukangas, 2015[7]; Barnett, 2003[12]; Boongrid, 2017[21]; Campbell, 1997[28]; Clegg, 2014[37]; Clemson, 2010[40]; Clemson, 2012[39]; Cornillon, 2002[45]; Costa, 2022[46]; Dadgari, 2016[50]; Dangour, 2011[53]; Day, 2002[57]; Duque, 2013[65]; El-Khoury, 2015[67]; Gschwind, 2015[90]; Halvarsson, 2013[95]; Halvarsson, 2016 [96]; Hamrick, 2017[97]; Hirase, 2015[103]; Iliffe, 2015[110]; Iwamoto, 2009[114]; Karinkanta, 2007[119]; Kerse, 2010[122]; Korpelainen, 2006[126]; Kovacs, 2013[127]; Lin, 2007[142]; Liu-Ambrose, 2004[147]; Liu-Ambrose, 2008[146]; Lord, 1995[153]; Lord, 2003[151]; Luukinen, 2007[157]; Madureira, 2007[160]; McMurdo, 1997[165]; Miko, 2017[171]; Morgan, 2004[174]; Nitz, 2004[182]; Oliveira 2024[184]; Reinsch, 1992[193]; Roberston, 2001a[196]; Sakamoto, 2013[203]; Sales, 2017 [204]; Siegrist, 2016[214]; Skelton, 2005[215]; Smulders, 2010[216]; Trombetti, 2011[236]; Weerdesteyn, 2006[254]; Wolf, 1996[260], Yang, 2012[269], 9 compared resistance intervention to control (Ansai, 2015[4]; Carter, 2002[31]; Grahn Krohnhed, 2009[88]; Karinkanta, 2007[119]; Liu-Ambrose, 2004[147], Rogers, 2021[197]; Stanmore, 2019[219]; Woo, 2007[262], Zhang, 2022[270]), 10 compared Tai-Chi to control (Day, 2015[59]; Huang, 2010[106]; Li, 2005[137]; Li, 2018[138]; Logghe, 2009[150]; Taylor, 2012[229]; [235]Voukelatos, 2007[248]; Wolf, 1996[260]; Wolf, 2003[261], Woo, 2007[262]), 1 compared dance to control (Merom, 2016[169]), 1 compared ditangquan exercises to control (Li, 2022)[139] 2 compared walking to control (Ebrahim, 1997;[66] Voukelatos, 2015[248]), 37 compared multiple categories to control (Altamirano, 2022[3]; Ansai, 2015[4]; Bates, 2022[13]; Bernocchi, 2019[17]; Beyer, 2007[18]; Bjerk, 2020[20]; Brown, 2002[23]; Bruce, 2021[24]; Buchner 1997[26]; Bunout, 2005[27]; Cerny, 1998[32]; Clemson, 2012[39]; Coyle, 2020[47]; Delbaere, 2021[61]; Fahlstrom, 2018[71]; Giangregorio, 2018[83]; Gill, 2016[84]; Halvarsson, 2016 [96]; Hauer, 2001[99]; Irez, 2011[113]; Kamide, 2009[118]; Karinkanta, 2007[119]; Kim, 2014[123]; Li, 2018[138]; Liang, 2020[140]; Liu-Ambrose, 2019[145]; Lehtola, 2000[136]; Lytras, 2022[158]; Means, 2005[166]; Ng, 2015[180]; Park, 2008[188]; Rogers, 2021[197]; Rubenstein, 2000[200]; Sherrington, 2020[209]; Suikkanen, 2021[225]; Suzuki, 2004[226]; Uusi-Rasi, 2015[239]), 2 compared step and slip exercises to control (Rogers, 2021[197]; Wang, 2022a[251]), 1 compared virtual reality exercises to control (Yalfani, 2022)[265], 8 compared balance and functional exercise to other balance and functional exercises (Hirase, 2015[103]; Iliffe, 2015[110]; Liston, 2014[144]; Lurie, 2013[156]; Steadman, 2003[222]; Verrusio, 2017[243]; Yamada, 2012[266]; Yamada, 2013[267]), 4 compared balance to resistance exercises (Davis, 2011[55]; Dizdar, 2018[64]; Karinkanta, 2007[119]; Liu-Ambrose, 2004[147]), 2 compared balance to walking exercises (Shigematsu, 2008[212]; Yamada, 2010[268]), 1 compared balance to aerobic exercise (Dizdar, 2018)[64], 3 compared balance to multiple exercises (Clemson, 2012[39], Halvarsson, 2016[96]; Karinkanta, 2007[119]), 2 compared Tai-Chi to balance exercises (Hwang, 2016[109]; Wolf, 1996[260]), 1 compared Tai-Chi to Tai-Chi (Wu, 2010)[263], 1 compared Tai-Chi to resistance exercises (Woo, 2007)[262], 1 compared Tai-Chi to multiple exercises (Li, 2018)[138], 2 compared multiple exercises to resistance exercises (Ansai, 2015[4], Karinkanta, 2007)[119], 4 compared multiple exercises to other multiple exercises (Freibeger, 2007[78]; Kemmler, 2010[121]; Kwok, 2016[129]; LaStayo, 2017)[134], 1 compared individual multiple exercises to group multiple exercises (Jansen, 2013) [115], 1 compared perturbation exercises to balance and functional exercises (Lurie, 2020) [155] and 1 compared resistance exercises to aerobic exercises (Dizdar, 2018) [64].

These are summarised in Table 2 below. Evidence from these studies is summarised in the clinical evidence summary below (Table 3).

See also the study selection flow chart in Appendix C, study evidence tables in Appendix D, forest plots in Appendix E and GRADEpro tables in Appendix F.

1.1.4.2. Excluded studies

See the excluded studies list in Appendix J.

1.1.5. Summary of studies included in the effectiveness evidence

Table 2: Summary of studies included in the evidence review

Study	Intervention and comparison	Population	Outcomes	Comments
Almeida 2013[2]	Balance and strength training Control Total n=119 4-month follow-up	Community dwelling adults Age mean (SD): 79.1 (4.6) years Gender (m/f): 21/99 Brazil	Rate of falls; Number of people experiencing falls; adverse events.	Study identified in Cochrane (Sherrington, 2019) [210]
Altamirano 2022[3]	Balance, strength, gait training (n=222) Control (n=156)	Community dwelling adults with an increased risk of physical falls. Mean age (SD): 78.1 (5.9) years Gender (m/f): 93/285. Setting: 40 general practices, Ecuador.	Rate of falls; number of people experiencing falls; adverse events.	Two-level cluster randomised RCT (general practices and patients).
Ansai 2015[4]	Balance, strength, aerobic training Strength training Control Total n=69 4-month follow-up	Community dwelling adults Mean age (SD): 82.4 (2.4) years Gender (m/f): 68% female Setting: Brazil	Rate of falls; number of people experiencing falls	Study identified in Cochrane (Sherrington, 2019) [210] Aged over 80.
Arantes 2015[5]	Balance training Control (stretching) Total n=30 3-month follow-up Study duration: 12-weeks	Community dwelling adults Mean age (SD): IG 73.9 (7.7); CG: 72.2 (5.7) Gender: 100% female Setting: Brazil	Number of people experiencing falls	Study identified in Cochrane (Sherrington, 2019) [210]

Study	Intervention and comparison	Population	Outcomes	Comments
Arkkukangas 2015[7]	Otago exercise programme/Otago exercise programme motivational interview group plus written recommendations for falls prevention Control group (written recommendations for falls prevention) Total n=45 3-months follow-up Duration of study: 12 weeks	Community dwelling adults Mean age (range): 83 (75-103) Gender: 71% female Setting: 3 different municipalities, Sweden	Rate of falls; number of people experiencing falls	Study identified in Cochrane (Sherrington, 2019).[210] Adverse events not reported in the control group. There were 3 arms 2 arms: the Otago Exercise Programme and Otago exercise programme + motivational interviewing group, where combined in the Sherrington 2019 review.
Ballard 2004[9]	Balance, strength, aerobic training (15 weeks) Balance strength aerobic training (2 weeks) Total n=40 Follow-up 16 months Duration of the study: 64 weeks.	Community dwelling adults Mean age (SD): 72.9 (6) Gender: 100% female Setting: USA	Rate of falls	Study identified in Cochrane (Sherrington, 2019).[210] Adverse events not reported for the control group.
Barker 2016[11]	Group-based Pilates focusing on balance and strength Individual balance and strength exercise Both groups received a fall and fracture prevention information and exercise brochure. Total n=53 Follow-up 6 months. Duration of the study: 24 weeks.	Community dwelling adults Mean age: 69 years Gender (m/f): 100% female Setting: Melbourne, Australia	Rate of falls; number of people experiencing falls.	Study identified in Cochrane (Sherrington, 2019).[210] Adverse events not reported for the control group.

Study	Intervention and comparison	Population	Outcomes	Comments
Barnett 2003[12]	Group-based balance, strength, aerobic training Control Both groups received information on strategies for avoiding falls. Total n=163 Follow-up: 12-months Duration of the study: 52 weeks	Older people identified as at risk of falling Mean age (SD): 74.9 (10.9) years Gender: 67% female Setting: Sydney, Australia	Rate of falls; number of people experiencing falls	Study identified in Cochrane (Sherrington, 2019) [210]
Bates 2022 (BEST at Home)[13]	Balance and lower extremity strength training (n=307) Upper extremity strength training (control) (n=310) Duration of the study: 12-month follow-up	Community dwelling adults Mean age (SD): 72.9 (6.2) years Gender (m/f): 224/393. Setting: New South Wales, Australia	Rate of falls; Number of people experiencing falls: number of fall related fractures, Quality of life	Group-based workshops by physiotherapists to teach exercise to do at home.
Bernocchi 2019[17]	Otago exercise programme (telerehabilitation consisting of a falls prevention programme run by a physiotherapist involving home exercise (strength, balance and walking) and weekly structured phone-call by nurse. (n=141) Control (conventional care) (n=142) Duration of the study: 6-month follow-up	Community dwelling adults with high risk of falls Mean age (SD): 79 (6.6) years. Gender: 116/167 Setting: discharged home after in-hospital rehabilitation.	Time to fall; number of people experiencing falls; Quality of life (EQ-5D).	
Beyer 2007[18]	Balance, strength, flexibility training	Women with a history of falls	Number of people experiencing falls	Study identified in Cochrane

Study	Intervention and comparison	Population	Outcomes	Comments
	Control Total n=65 Follow-up: 12-months Duration of the study: 52 weeks	Age range: 70-90 Gender: 100% female Setting: Copenhagen, Denmark		(Sherrington, 2019).[210] Adverse events not reported in the control group.
Bjerk 2020[20]	Otago exercise Programme N=77 Control N=78 Follow-up: Duration of the study: 3 months intervention; 6 months follow-up	Community dwelling adults Mean age (SD): 82.7 (6.7) years Gender (m/f): 32/123 Setting: Clinical Physiotherapists visiting people in own home. Norway	Quality of life (SF-36)	
Boongrid 2017[21]	Individual Otago exercise programme Control Total n=439 Both groups received fall prevention education and home safety information. Follow-up: 12-months Duration of the study: 52 weeks	Community dwelling adults Mean age (SD): 73.8 (6.7) years Gender (m/f): 83% female Setting: Bangkok, Thailand.	Rate of falls; Number of people experiencing falls; adverse events	Study identified in Cochrane (Sherrington, 2019)[210]
Brown 2002[23]	Group-based balance, strength, aerobic training Control Total n=99 Follow-up: 14-months Duration of the study: 56 weeks	Community dwelling adults Age (years): N=101 aged 75 to 84; N=48 aged 85 to 94. Gender (m/f): 79% female Setting: Western Australia	Number of people experiencing falls	Study identified in Cochrane (Sherrington, 2019)[210]

Study	Intervention and comparison	Population	Outcomes	Comments
Bruce 2021(PreFIT)[24]	Otago exercise programme, lower-limb strength, balance retraining and walking. n=3279 (n=21 GP practices) Control (advice) n=3223 (n=21 GP practices) 18-month follow-up Follow-up: Duration of the study:	Community dwelling adults at higher risk of falling. Whole study population: Mean age (SD): 77.9 (5.7) Gender (m/f): 4653/5150 Setting: 63 GP practices. UK	Rate of falls; number of people experiencing falls; number of people experiencing fall related fractures; quality of life	Health Technology Assessment: three-arm cluster (general practice level) RCT. The other arm is the PreFIT Multifactorial Falls Prevention model
Buchner 1997[26]	Cycling Strength training Endurance and strength training Control Total In=105 Follow-up: 25-months Duration of the study: up to 100 weeks, median 72 weeks.	Community dwelling adults Mean age: 75 years Gender (m/f): 51% female Setting: Seattle, USA	Rate of falls; Number of people experiencing falls	Study identified in Cochrane (Sherrington, 2019)[210]
Bunout 2005[27]	Group-based balance, strength, walking training Control Total n=298 Follow-up: 12-months Duration of the study: 52 weeks	Community dwelling adults Mean age (SD): 75 (5) years Gender: 70% female Setting: Santiago, Chile	Rate of falls; number of people experiencing falls	Study identified in Cochrane (Sherrington, 2019)[210]
Campbell 1997[28]	Individual Otago exercise programme Control (social visit by research nurse and regular phone contact)	Community-dwelling women Mean age (SD): 84.1 (3.1) years Gender: 100% female	Rate of falls; number of people experiencing falls	Study identified in Cochrane (Sherrington, 2019)[210] At least 80 years old inclusion criteria.

Study	Intervention and comparison	Population	Outcomes	Comments
	Total n=233 Follow-up: 24-months Duration of the study: 52 weeks.	Setting: Dunedin, New Zealand		2-year data reported in Campbell 1999
Carter 2002[31]	Group-based strength and gait training class Control Total n=93 Follow-up: 5-months Duration of the study: 20 weeks.	Community-dwelling osteoporotic women Mean age (SD): 69 (3) Gender: 100% female Setting: Vancouver, Canada	Rate of falls; adverse events.	Study identified in Cochrane (Sherrington, 2019)[210]
Cerny 1998[32]	Group-based balance, strength, flexibility, aerobic training Control Total n=28 Follow-up: 6-months Duration of the study: 24-weeks	Community dwelling adults Mean age (SD): 71 (4) years Gender (m/f): NR Setting: California, USA	Number of people experiencing falls	Study identified in Cochrane (Sherrington, 2019)[210]
Clegg 2014[37]	Individual balance and strength training Control Total n=84 Follow-up: 3-months Duration of the study: 12 weeks	Community dwelling adults Mean age (SD): 79 (9.2) Gender: 71% female Setting: Bradford, UK	Rate of falls; number of people experiencing falls; quality of life	Study identified in Cochrane (Sherrington, 2019)[210]
Clemson 2010[40]	Balance and strength training Control Total n=34	Community dwelling adults Mean age (SD): 82 (5.9) years Gender: 47% female Setting: Sydney, Australia	Rate of falls; number of people experiencing falls	Study identified in Cochrane (Sherrington, 2019)[210]

Study	Intervention and comparison	Population	Outcomes	Comments
	Follow-up: 6-months Duration of the study: 24 weeks			
Clemson 2012[39]	Group balance and strength training Individual balance and strength training Control Total n=317 Follow-up: 12-months Duration of the study: 52 weeks	Community dwelling adults Mean age: 83.4 years Gender: 55% female Setting: Sydney, Australia	Rate of falls; number of people experiencing falls; quality of life	Study identified in Cochrane (Sherrington, 2019)[210] Adverse events were reported for intervention group only.
Cornillon 2002[45]	Balance and gait training Control Total n=303 Follow-up: 12-months Duration of the study: 52 weeks	Community dwelling adults Mean age: 71 years Gender: 83% female Setting: St. Etienne, France	Rate of falls; number of people experiencing falls	Study identified in Cochrane (Sherrington, 2019)[210]
Costa 2022[46] Randomised crossover trial	Balance training (Balance exercise circuit) Control (60-minute educational lecture) Total n=35 6-months trial with 3-month follow-up	Community dwelling adults Mean age (SE): IG: 65 years (1.20); CG 65.83 (1.19) Gender: NR Setting: Brazil	Quality of life	
Coyle 2020[47] (On the Move)	Seated strength training (n=152) Control (n=146) Duration of the study: 1 year follow-up	Community dwelling adults Mean age (SD): IG: 79.4 (8.3); CG: 81.3 (7.6) Gender: IG: 15/108; CG: 23/102 Setting: USA	Rate of falls	Secondary analysis of a cluster randomised controlled trial (Brach 2017) which did not have any of the outcomes of interest for this review.

Study	Intervention and comparison	Population	Outcomes	Comments
Dadgari 2016[50]	Individual Otago exercise programme Control (booklet on general health for elderly people) Total n=551 Follow-up: 6-months	Community dwelling adults Mean age (SD): 70.6 (5.1) years Gender (m/f): 49% female Setting: Shahroud, Iran	Rate of falls; number of people experiencing falls	Study identified in Cochrane (Sherrington, 2019)[210]
Delbaere 2021[61]	Balance training (e-health StandingTall balance exercise programme) and health education (n=254) Control (health education) (n=249) Follow-up: 2-years Duration of the study: 24 weeks	Community dwelling adults Mean age (SD): IG: 77.1 (5.5); CG: 77.7 (5.5) Gender (m/f): IG 77/177; CG: 87/162 Setting: Australia	Rate of falls; number of people experiencing falls; quality of life (EQ-5D)	
Dangour 2011[53] Cluster-RCT 2x2 factorial design	Balance and strength training vs control Total n=984 Follow-up: 24 months Duration of the study: 108 weeks	Community dwelling adults Age (range): 65-68 Gender (m/f): 315/669 Setting: Santiago, Chile	Number of people experiencing falls; number of people who experienced fall-related fractures; quality of life	Study identified in Cochrane (Sherrington, 2019)[210]
Davis 2011[55]	Resistance training (1x week) Resistance training (2x week) Balance and toning Total n=155 Follow-up: 9-months Duration of the study: 52 weeks	Community dwelling adults Mean age (range): 70 (65-75) years Gender (m/f): 0/155 Setting: Vancouver, Canada	Rate of falls; adverse events.	Study identified in Cochrane (Sherrington, 2019)[210]

Study	Intervention and comparison	Population	Outcomes	Comments
Day 2002[57]	Group-based balance and strength training Control Total n=272 Follow-up:18-months Duration of the study: 18-months	Community dwelling adults Mean age (SD): 76.1 (5) years Gender (m/f): 109/163 Setting: Melbourne, Australia	Rate of falls; number of people experiencing falls	Study identified in Cochrane (Sherrington, 2019)[210]
Day 2015[59]	Tai-Chi Control (flexibility training) Total n=503 Follow-up: 12-months Duration of the study: 48 weeks	Community dwelling adults Mean age (SD): Gender (m/f): 151/352 Setting: Melbourne, Australia	Rate of falls; number of people experiencing falls	Study identified in Cochrane (Sherrington, 2019)[210]
Dizdar 2018[64]	Balance-coordination training (n=27) Strengthening training (n=28) Aerobic exercises (n=27) Duration of the study: 6-months follow-up	Community dwelling women with osteoporosis Mean age (SD): IG: 57.87 (4.5); IG2: 59.86 (5.5); IG3: 60.91 (6.5) Gender (m/f): 0/75 Setting: presenting to University Clinic Turkey	Number of falls; quality of life (QUALEFFO-41)	
Duque 2013[65]	Virtual reality balance training Control (usual care, general recommendations and care plan on falls prevention) Total n=60 Follow-up: 9-months Duration of the study: 36 weeks	Community dwelling adults Mean age (SD): IG: 79.33 (10); CG: 75 (8) years. Gender (m/f): 23/37 Setting: Penrith, Australia	Rate of falls	Study identified in Cochrane (Sherrington, 2019)[210]

Study	Intervention and comparison	Population	Outcomes	Comments
Ebrahim 1997[66]	Individual brisk walking Control (simple upper limb exercises) Total n=165 Follow-up: 24-months Duration of the study: 2 years	Community dwelling adults Mean age (SD): IG: 66.4 (7.8); CG: 68.1 (7.8). Gender (m/f): 0/165 Setting: London, UK	Rate of falls; number of people experiencing falls; number of people experiencing fall-related fractures	Study identified in Cochrane (Sherrington, 2019) [210]
El-Khoury 2015[67]	Group-based balance and strength training Control Total n=706 Follow-up: 24-months Duration of the study: 104 weeks	Community dwelling adults Mean age (SD): IG: 78.8 (2.8); CG: 79.6 (2.8). Gender (m/f): 0/706 Setting: France	Rate of falls; number of people experiencing falls	Study identified in Cochrane (Sherrington, 2019) [210] Adverse events were only reported for intervention group.
Fahlstrom 2018[71]	Balance and strength exercises (n=87) Control (n=82) Duration of the study: 12-month follow-up	Community dwelling adults Mean age (SD): IG 81 (6.3); CG 82 (6.6) years Gender: IG: 72%; CG: 71% female Setting: Sweden	Rate of falls; quality of life	
Fiatarone 1997[75]	Individual high-intensity progressive resistance training Control (wait-list control) Total n=34 Follow-up: 4-months Duration of the study: 16 weeks	Community dwelling frail older people Mean age (SD): 82 (1) years Gender: 2/32 Setting: USA	Number of people experiencing adverse events of intervention.	Study identified in Cochrane (Sherrington 2019) [210]
Freiberger 2007[78]	Group-based psychomotor programme strength training	Community dwelling adults Mean age (SD): 76.1 (4.1)	Rate of falls; number of people experiencing falls	Study identified in Cochrane (Sherrington, 2019) [210]

Study	Intervention and comparison	Population	Outcomes	Comments
	Group-based balance, strength, flexibility training Total n=134 Follow-up: 24-months Duration of the study: 52-weeks	Gender (m/f): 78/56 Setting: Erlangen, Germany		
Giangregorio 2018[83]	Balance and strength training plus stepping (n=71) Control (n=70) Duration of the study: 12-months follow-up	Community dwelling women with vertebral compression fractures Mean age (SD): IG: 76.4 (6.4); CG: 77 (7.3) Gender (m/f): 0/141 Setting: home exercise programme delivered by a physiotherapist, Canada	Rate of falls; number of people experiencing falls; number of fall related fractures; number of adverse events	
Gill 2016[84]	Group- and home-based balance, strength, flexibility, walking training Control: health education Total n=1635 Follow-up: 42-months Duration of the study: 168 weeks	Community dwelling adults Mean age (SD): IG: 78.7 (5.2); CG: 79.1 (5.2) years. Gender (m/f): 539/1095 Setting: USA	Number of fall related fractures	Study identified in Cochrane (Sherrington, 2019)[210]
Grahn Krohnhed 2009[88]	Strength and balance training Control Total n=65 Follow-up: 12-months Duration of the study: 52 weeks	Community-dwelling osteoporotic women Mean age (range): 71.4 (60 to 81) Gender (m/f): 0/65 Setting: Linkoping, Sweden	Rate of falls; quality of life	Study identified in Cochrane (Sherrington, 2019)[210]

Study	Intervention and comparison	Population	Outcomes	Comments
Grede 2024[89]	Walking programme (n=114) Control (n=110) Duration of the study: 12-month follow-up	Community dwelling adults Median age (IQR): IG: 84 (80-90); CG: 85 (79-90) years Gender: IG: 22/92; CG: 24/86 Setting Germany	Number of fallers; quality of life	
Gschwind 2015[90]	Individual balance and strength training using exergames Control Total n=153 Follow-up: 6-months Duration of the study: 24 weeks	Community dwelling adults Mean age (SD): 74.7 (6.3) years Gender (m/f): 60/93 Setting: Cologne, Germany; Valencia, Spain; Sydney, Australia	Rate of falls; quality of life; adverse events	Study identified in Cochrane (Sherrington, 2019) [210]
Hager 2024[92]	Balance and strength training program (n=166) Multiple exercise programme (Otago) (n=158) Control (n=81) Follow-up: 12 months Duration of the study: 52 weeks	Community dwelling adults Mean age (SD): 79(7) years Gender (m/f): 104/300 Setting: Switzerland	Rate of falls	
Haines 2009[94]	Home-based strength and balance training Control Total n=53 Follow-up: 6-months Duration of the study: 26 weeks	Community dwelling adults Mean age (SD): 80.7 (7.7) years Gender (m/f): 21/32 Setting: Brisbane, Australia	Rate of falls; number of people experiencing falls; quality of life	Study identified in Cochrane (Sherrington, 2019). [210] Adverse events were not reported for the control group.
Halvarsson 2013[95]	Group-based progressive balance training Control	Community dwelling adults	Number of people experiencing falls	Study identified in Cochrane (Sherrington, 2019) [210]

Study	Intervention and comparison	Population	Outcomes	Comments
	Total n=59 Follow-up: 15-months Duration of the study: 65 weeks	Mean age (range): 77 (67-93) years Gender (m/f): 17/42 Setting: Stockholm, Sweden		
Halvarsson 2016 [96]	Group-based progressive balance training Group-based balance training and walking Control Total n=96 Follow-up: 3-months Duration of the study: 60 weeks	Community dwelling adults Mean age (range): IG:76 (67-86); CG: 75 (66-84) years Gender (m/f): 2/94 Setting: Stockholm, Sweden	Number of people experiencing falls	Study identified in Cochrane (Sherrington, 2019) [210]
Hamrick 2017[97]	Home yoga and relaxation training Relaxation Total n=43 Follow-up: 6-months Duration of the study: 26-weeks	Community dwelling adults Mean age (range): 69.9 (60-88) years Gender (m/f): 9/34 Setting: Wisconsin, USA	Rate of falls; number of people experiencing falls	Study identified in Cochrane (Sherrington, 2019) [210]
Hauer 2001[99]	Group-based balance and strength training Control Total n=57 Follow-up: 6-months Duration of the study: 26-weeks	Community-dwelling women Mean age (SD): 82 (4.8) Gender (m/f): 0/57 Setting: Germany	Number of people experiencing falls; adverse events	Study identified in Cochrane (Sherrington, 2019) [210]
Helbostad 2004[100]	Group balance and strength training Individual balance and strength training	Community dwelling adults Mean age (SD): 81 (4.5) Gender (m/f): 15/62	Rate of falls; number of people experiencing falls	Study identified in Cochrane (Sherrington, 2019) [210]

Study	Intervention and comparison	Population	Outcomes	Comments
	Total n=77 Follow-up: 12-months Duration of the study: 52 weeks	Setting: Trondheim, Norway		
Hirase 2015[103]	Group-based balance training (on foam rubber pad) Balance training (on even surface) Control Total n=93 Follow-up: 4-months Duration of the study: 16-weeks	Community dwelling adults Mean age (SD): IG1: 82.1 (5.5); IG2: 82 (5.7); CG 82.2 (6.3) Gender (m/f): 28/65 Setting: Nagasaki and Unzen, Japan	Rate of falls	Study identified in Cochrane (Sherrington, 2019)[210]
Huang 2010[106] Cluster RCT	Group-based Tai-Chi Control (usual care) Total n=115 Follow-up: 5-months Duration of the study: 20-72 weeks	Community dwelling adults Mean age (SD): 71.5 (0.6) years in those not lost to follow-up Gender (m/f): 80/35 Setting: Taipei, Taiwan	Number of people experiencing falls; quality of life	Study identified in Cochrane (Sherrington, 2019)[210]
Hwang 2016[109]	Individually supervised Tai-Chi Supervised balance and strength training Total n=456 Follow-up:18-months Duration of the study: 72-weeks	Community dwelling adults Mean age: 72 Gender (m/f): 150/306 Setting: Taipei, Taiwan	Rate of falls; number of people experiencing falls	Study identified in Cochrane (Sherrington, 2019)[210]
Iliffe 2015[110] Cluster-RCT	Individual Otago exercise programme	Community dwelling adults	Rate of falls; number of people experiencing falls;	Study identified in Cochrane (Sherrington, 2019)[210]

Study	Intervention and comparison	Population	Outcomes	Comments
	Group-based modified Otago exercise programme Control Total n=1254 Follow-up: 18-months Duration of the study: 96-weeks	Mean age (range): 73 (65-94) Gender (m/f): 477/777 Setting: London and Nottingham, UK	quality of life; adverse events	
Irez 2011[113]	Group-based Pilates Control (usual activity) Total n=60 Follow-up: 3-months Duration of the study: 12-weeks	Community-dwelling women Mean age (SD): IG: 72.8 (6.7); CG: 78 (5.7) years Gender (m/f): 0/60 Setting: Turkey	Rate of falls	Study identified in Cochrane (Sherrington, 2019)[210]
Iwamoto 2009[114]	Group-based balance and gait training Control Total n=68 Follow-up: 5-months Duration of the study: 20-weeks	Community dwelling adults Mean age (SD): 76.4 (5.6) Gender (m/f): 7/61 Setting: Tokyo, Japan	Number of people experiencing falls; adverse events	Study identified in Cochrane (Sherrington, 2019)[210]
Jansen 2023[115] Multicentre study	Individual exercise programme (n=156) Group exercise programme (n=153) Duration of the study: 12-month follow-up	Community dwelling adults Mean age (SD): 78.7 (0.3) years Gender: 73.5% female Setting: Heidelberg and Stuttgart, Germany	Rate of falls	
Kamide 2009[118]	Individual balance and strength training	Community-dwelling women	Number of people experiencing falls	Study identified in Cochrane (Sherrington, 2019)[210]

Study	Intervention and comparison	Population	Outcomes	Comments
	Control Total n=57 Follow-up: 6-months Duration of the study: 52-weeks	Mean age (SD): 71 (3.6) Gender (m/f): 0/57 Setting: Kanagawa, Japan		
Karinkanta 2007[119]	Group-based balance and agility training Group-based balance and strength training Group-based resistance training Control (usual activity) Total n=149 Follow-up:12-months Duration of the study: 52-weeks	Community-dwelling women Mean age (SD): IG1: 72.9 (2.3); IG2: 72.9 (2.2); IG3: 72.7 (2.5); CG: 72 (2.1) years Gender (m/f): 0/149 Setting: Tampere, Finland	Rate of falls; number of fall related fractures	Study identified in Cochrane (Sherrington, 2019)[210]
Kemmler 2010[121]	Group-based balance, gait, flexibility, strength training Group-based low-intensity balance and endurance training Total n=246 Follow-up: 18-months Duration of the study: 72-weeks	Community dwelling adults Mean age (SD): 69 (4) years Gender (m/f): 0/246 Setting: Erlangen-Nuremberg, Germany	Rate of falls; umber of people experiencing falls; adverse events.	Study identified in Cochrane (Sherrington, 2019)[210]
Kerse 2010[122]	Individual Otago exercise programme Control Total n=193	Community dwelling adults Mean age (SD): 81.1 (4.4) years Gender (m/f): 81/112 Setting: Auckland, New Zealand	Rate of falls; number of people experiencing falls; quality of life	Study identified in Cochrane (Sherrington, 2019)[210]

Study	Intervention and comparison	Population	Outcomes	Comments
	Follow-up:12-months Duration of the study:52 weeks			
Kim 2014[123]	Group-based balance and strength training Control (health education) Total n=105 Follow-up:12-months Duration of the study: 52 weeks	Community-dwelling women Mean age (SD): IG: 77.83 (4.21); CG 77.83 (4.15) Gender (m/f): 0/105 Setting: Tokyo, Japan	Number of people experiencing falls; number of fall related fractures	Study identified in Cochrane (Sherrington, 2019) [210]
Korpelainen 2006[126]	Group-based balance and strength training Control (twice yearly seminars on nutrition, health, medical treatment and fall prevention) Total n=160 Follow-up: 30 months Duration of the study: 130 weeks	Community dwelling women Mean age (SD): 73 (1.2) Gender (m/f): 0/160 Setting: Oulu, Finland	Rate of falls; number of fall related fractures	Study identified in Cochrane (Sherrington, 2019). [210] Adverse events were not reported for the control group.
Kovacs 2013[127]	Balance and strength training Control Total n=76 Follow-up:12 months Duration of the study: 52 weeks	Community-dwelling women Mean age (SD): IG: 68.5 (5.3); CG: 68.3 (6.4) Gender (m/f): 0/76 Setting: Budapest, Hungary	Rate of falls; number of people experiencing falls	Study identified in Cochrane (Sherrington, 2019) [210]
Kwok 2016[129]	Group-based balance and strength training (group) Balance and strength training (using gaming console)	Community dwelling adults Mean age: 80 years Gender (m/f): 12/68 Setting: Singapore	Rate of falls; number of people experiencing falls; adverse events.	Study identified in Cochrane (Sherrington, 2019) [210]

Study	Intervention and comparison	Population	Outcomes	Comments
	Total n=80 Follow-up: 12 months Duration of the study: 52 weeks			
Kyrdalen 2014[131]	Group-based Otago exercise programme (group) Individual Otago exercise programme (individual) Total n=125 Follow-up: 3 months Duration of the study: 12 weeks	Community dwelling adults Mean age (SD): 82.5 (5.7) years Gender (m/f): 34/91 Setting: Singapore	Number of people experiencing falls; quality of life	Study identified in Cochrane (Sherrington, 2019)[210]
LaStayo 2017[134]	Traditional resistance training Resistance training focused on negative work Total n=134 Follow-up: 12 months. Duration of the study: 52 weeks	Community dwelling adults Mean age (SD): 76.1 (7.18) Gender (m/f): 47/87 Setting: Utah, USA	Rate of falls; number of people experiencing falls	Study identified in Cochrane (Sherrington, 2019)[210]
Latham 2003[135]	Strength exercises Control (attention control) Total n=243 Follow-up: 6 months Duration of the study: 26 weeks	Community-dwelling frail adults Mean age: 79 years Gender (m/f): 114/129 Setting: Auckland, New Zealand and Sydney, Australia	Rate of falls; Number of people experiencing falls; quality of life; adverse events	Study identified in Cochrane (Sherrington, 2019)[210] Two other arms included Vitamin D and Vitamin D control.
Lehtola 2000[136]	Group-based balance and flexibility training	Community dwelling adults	Rate of falls	Study identified in Cochrane (Sherrington, 2019)[210]

Study	Intervention and comparison	Population	Outcomes	Comments
	plus walking and home practice. Control (usual care) Total n=131 Follow-up: 10 months Duration of the study: 40 weeks	Mean age (SD): IG 72.3 (1.6); CG: 72.4 (1.6). Gender (m/f): 26/105 Setting: Finland		
Li 2005[137]	Group-based Tai-Chi Control (low-level stretching) Total n=256 Follow-up: 6 months Duration of the study: 52 weeks	Community dwelling adults Mean age (SD):77.5 (5) Gender (m/f): 77/179 Setting: Legacy Health System, Portland Oregan USA.	Rate of falls; number of people experiencing falls; adverse events	Study identified in Cochrane (Sherrington, 2019)[210]
Li 2018[138]	Tai-Chi (Tai ji quan) (n=224) Multimodal exercise (n=223) Control (Stretching) (n=223) Duration of the study: 24-week trial	Community dwelling adults Mean age (SD): 77.7 (5.6 years. Gender (m/f): IG1: 78/146; IG2: 143/80; IG3: 147/76. Setting: Community facilities, USA	Rate of falls; number of people experiencing falls	
Li 2022[139]	Ditangquan exercises (protective techniques for a safe landing; muscle memory training; training in a simulated real-world environment to protect themselves (n=35) Control (conventional exercises under guidance of	Community dwelling adults with sarcopenia Mean age (SD): IG: 80.57 (8.93); CG: 77.89 (10.38). Gender (m/f): 21/49. Setting: 3 institutions in Shanghai, China.	Rate of falls; number of people experiencing falls.	

Study	Intervention and comparison	Population	Outcomes	Comments
	professionals) (n=35) Both groups had educational sessions on causes of falls, related risk factors, balanced self-assessment, selection of Auxiliary aid and changes in the living environment to reduce the risk of falls. Duration of the study: 24-week trial			
Liang 2020[140]	Balance and strength training (n=30) Strength training (n=30) Duration of the study: 12-week trial	Community dwelling adults with sarcopenia Mean age (SD): IG: 87.3 (6); CG 86.8 (4.7). Gender (m/f): IG 15/15; CG 19/11 Setting: China	Number of people experiencing falls	Adverse events not reported for both arms
Lin 2007[142]	Individual balance, strength, flexibility training Control (social visit by health worker and fall prevention pamphlets) Total n=100 Follow-up: 6 months Duration of the study: 16 weeks	Community dwelling adults Mean age: 76.5 Gender (m/f): 49/51 Setting: Taiwan	Rate of falls; quality of life	Study identified in Cochrane (Sherrington, 2019)[210]
Liston 2014[144]	Group-based modified Otago exercise programme Group-based modified Otago exercise programme	Community dwelling adults Mean age: IG1: 77.8 years; IG2: 76.7 years. Gender (m/f): 3/18 Setting: London, UK	Rate of falls	Study identified in Cochrane (Sherrington, 2019)[210]

Study	Intervention and comparison	Population	Outcomes	Comments
	(partially supervised) Total n=21 Follow-up: 6 months Duration of the study: 24 weeks			
Liu-Ambrose 2004[147]	Supervised high-intensity resistance training Supervised agility training Control (sham exercises – stretching, deep breathing, relaxation, posture education) Total n=104 Follow-up: 6 months Duration of the study: 25 weeks	Community-dwelling osteoporotic women Mean age (SD): 79 (3) Gender (m/f): 0/104 Setting: British Colombia, Canada	Rate of falls; adverse events	Study identified in Cochrane (Sherrington, 2019)[210]
Liu-Ambrose 2008[146]	Individual Otago exercise programme Control Total n=74 Follow-up:12 months Duration of the study: 52 weeks	Adults with a history of falls Mean age (SD): 82.2 (6.3) (in 59 participants who completed) Gender (m/f): 17/42 Setting: Vancouver, Canada	Rate of falls	Study identified in Cochrane (Sherrington, 2019)[210]
Liu-Ambrose 2019[145]	Otago exercise programme (n=173) Control (usual care) (n=172) Duration of the study: 12-month follow-up	Community-dwelling adults with a history of falls Mean age (SD): 81.6 (6.1) years. Gender (m/f): 114/231 Setting: fall prevention clinic,	Rate of falls number of people experiencing falls; fall-related fractures;	No adverse events reported for control group Rate ratio data taken from Liu-Ambrose 2021 (secondary analysis) adjusted for sex

Study	Intervention and comparison	Population	Outcomes	Comments
		home-based exercise program. Canada.		
Logghe 2009[150]	Group-based Tai-Chi Control (fall prevention brochure) Total n=269 Follow-up: 12 months Duration of the study: 52 weeks	Community dwelling adults Mean age (SD): 77 (4.6) Gender (m/f): 78/191 Setting: industrial towns in western Netherlands	Rate of falls; number of people experiencing falls	Study identified in Cochrane (Sherrington, 2019)[210]
Lord 1995[153]	Group-based balance, strength, gait training. Control Total n=197 Follow-up: 12 months Duration of the study: 52 weeks	Community-dwelling women Mean age (SD): 71.6 (5.4) Gender (m/f): 0/197 Setting: Australia	Rate of falls; Number of people experiencing falls	Study identified in Cochrane (Sherrington, 2019)[210]
Lord 2003[151] Cluster-RCT	Group-based Balance, strength, gait training Control Total n=551 Follow-up: 12 months Duration of the study: 52 weeks	Community dwelling adults Mean age (SD): 79.5 (6.4) Gender (m/f): 77/474 Setting: retirement villages, Sydney, Australia	Rate of falls; number of people experiencing falls	Study identified in Cochrane (Sherrington, 2019)[210]
Lurie 2013[156]	Physical therapy and treadmill training Physical therapy Total n=64 Follow-up: 3 months Duration of the study: 12 weeks	Community dwelling adults Mean age: 80 years Gender (m/f): 26/38 Setting: USA	Number of people experiencing falls	Study identified in Cochrane (Sherrington, 2019)[210]

Study	Intervention and comparison	Population	Outcomes	Comments
Lurie 2020[155]	Perturbation exercise (n=253) Balance and functional exercise (n=253) Duration of the study: 12-month follow-up	Community dwelling adults at high falls risk Mean age (range): IG: 78 (65-96); CG 78 (65-95). Setting: 8 outpatient physical therapy clinics. USA	Rate of falls; number of people experiencing falls	
Luukinen 2007[157]	Individual balance and gait training Control (asked to visit GP without written intervention form) Total n=486 Follow-up: 16 months Duration of the study: 16 months median falls follow-up	Community dwelling adults Mean age (SD): 88 (3) years Gender (m/f): 102/384 Setting: Oulu, Finland	Rate of falls; number of people experiencing falls	Study identified in Cochrane (Sherrington, 2019)[210]
Lytras 2022[158]	Video-supported Otago exercise programme (n=75) Control (no specific exercise intervention but a leaflet with general gentle home exercises) (n=75) Duration of the study: 12-month follow-up	Community dwelling adults who previously experienced a fall Median age (range): 70 (67-74) Gender (m/f): 17/133 Setting: outpatient physical therapy, Greece	Rate of falls; number of people experiencing falls; adverse events	
Madureira 2007[160]	Group-based balance and walking training Control (osteoporosis treatment, instructions to prevent falls and 3-monthly clinic visits) Total n=66	Community-dwelling women with osteo-metabolic diseases Mean age (SD): 74 (4.7) Gender (m/f): 0/66 Setting: Sao Paulo, Brazil	Rate of falls	Study identified in Cochrane (Sherrington, 2019)[210]

Study	Intervention and comparison	Population	Outcomes	Comments
	Follow-up: 12 months Duration of the study: 52 weeks			
McMurdo 1997[165]	Group-based balance training Control Total n=118 Follow-up: 24 months Duration of the study: 104 weeks	Community-dwelling women Mean age (range): 64.5 (60-73) Gender (m/f): 0/118 Setting: Dundee, Scotland UK	Rate of falls; number of people experiencing falls; number of fall related fractures	Study identified in Cochrane (Sherrington, 2019) [210]
Means 2005[166]	Group-based balance, strength, flexibility, gait training. Control Total n=338 Follow-up: 6 months Duration of the study: 26 weeks	Community dwelling adults Mean age: 73.5 Gender (m/f): 145/193 Setting: Arkansas, USA	Rate of falls; number of people experiencing falls	Study identified in Cochrane (Sherrington, 2019). [210] Adverse events were not reported for the control group.
Merom 2016[169]	Group-based social dancing. Control (usual activities) Total n=530 Duration of the study: 12-month follow-up	Adults living in retirement village. Mean age: >80 years: 39% Gender (m/f): 79/451 Setting: Sydney, Australia	Rate of falls; number of people experiencing falls; quality of life	Study identified in Cochrane (Sherrington, 2019). [210] Adverse events were not reported for the control group. Cluster-RCT
Miko 2017[171]	Individual, partially supervised balance training Control Total n=100 Follow-up: 12 months Duration of the study: 52 weeks	Community-dwelling women Mean age (SD): IG 69.3 (4.6); CG 69.1 (5.3) Gender (m/f): 0/100 Setting: Hungary	Rate of falls; number of people experiencing falls	Study identified in Cochrane (Sherrington, 2019) [210]

Study	Intervention and comparison	Population	Outcomes	Comments
Mirelman 2016[172]	Individual, supervised treadmill training Individual, supervised treadmill plus virtual reality training Total n=152 Follow-up: 6 months Duration of the study: 26 weeks	Community dwelling adults Mean age: 82.6 Gender (m/f): 99/53 Setting: Belgium, Israel, Italy, the Netherlands, and the UK	Quality of life; adverse events	Study identified in Cochrane (Sherrington, 2019)[210]
Morgan 2004[174]	Group-based balance, strength, gait training. Control (usual activities) Total n=294 Follow-up: 12 months Duration of the study: 52 weeks	Community dwelling adults Mean age (SD): 80.5 (7.5) years Gender (m/f): 85/209 Setting: community and assisted-living facilities Florida, USA.	Number of people experiencing falls	Study identified in Cochrane (Sherrington, 2019)[210]
Morrison 2018[175]	Group-based balance training. Home-based strength, balance, aerobic training Total n=65 Follow-up: 3 months Duration of the study: 12 weeks	Community dwelling adults Mean age (SD): 66.99 (5.42) Gender (m/f): 34/31 Setting: Virginia, USA	Rate of falls; number of people experiencing falls	Study identified in Cochrane (Sherrington, 2019)[210]
Ng 2015[180]	Group-based balance and strength training. Control Total n=98 Follow-up: 12 months	Community dwelling adults Mean age (SD): 70 (4.7) Gender (m/f): 38/60 Setting: Singapore	Number of people experiencing falls; adverse events.	Study identified in Cochrane (Sherrington, 2019)[210]

Study	Intervention and comparison	Population	Outcomes	Comments
	Duration of the study: 52 weeks			
Nitz 2004[182]	Group-based balance training. Control (group-based gentle exercise and stretching) Total n=73 Follow-up: 6 months Duration of the study: 24 weeks	Community dwelling adults Mean age (SD): 75.8 (7.8) Gender (m/f): 6/67 Setting: Brisbane, Australia	Rate of falls; adverse events	Study identified in Cochrane (Sherrington, 2019)[210]
Oliveira 2024[184] Cluster RCT	Balance and strength (n=290) Control (n=315) Follow-up: 12 months Duration of study: 52 weeks	Community dwelling adults Mean age (SD): 74(8) years Gender: 70% women Setting: Australia	Rate of falls; number of fallers; quality of life; adverse events	
Park 2008[188]	Strength training Control Total n=50 Follow-up: 11 months Duration of the study: 48 weeks	Community dwelling adults Mean age (SD): 68.35 (3.47) years Gender (m/f): 0/50 Setting: Korea	Number of people experiencing falls	Study identified in Cochrane (Sherrington, 2019)[210]
Reinsch 1992[193] Cluster-RCT	Group-based balance and strength training. Control Total n=230 Follow-up: 12 months Duration of the study: 52 weeks	Community dwelling adults Mean age (SD): 74.2 (6) years Gender (m/f): 46/184 Setting: Los Angeles, USA	Number of people experiencing falls	Study identified in Cochrane (Sherrington, 2019)[210] Adverse events were reported as pain, bruise, minor injury in the intervention group and pain, bruise and minor injury in the control group.
Resnick 2002[194]	Individual or group-based walking with nurse visits for goals	Women living in a retirement village	Quality of life	Study identified in Cochrane (Sherrington, 2019)[210]

Study	Intervention and comparison	Population	Outcomes	Comments
	Control Total n=20 Follow-up: 6 months Duration of the study: 26 weeks	Mean age (SD): 88 (3.7) years Gender (m/f): 0/20 Setting: Baltimore, USA		
Rikkonen 2023[195]	Multiple categories of exercise (n=457) Control (n=457) Duration of study: 2 years follow-up	Home-dwelling women Mean age (SD): 76.5 (3.3) years Gender: 100% female Setting: Finland	Rate of falls; number of fallers; number of fractures	
Robertson 2001a[196]	Individual Otago exercise programme Control Total n=240 Follow-up: 12 months Duration of the study: 52 weeks	Community dwelling adults Mean age (SD): 80.9 (4.2) Gender (m/f): 77/163 Setting: West Auckland, New Zealand	Rate of falls; Number of people experiencing falls; Number of fall related fractures	Study identified in Cochrane (Sherrington, 2019)[210]
Rogers 2021[197]	Step and hip strengthening training (n=25) Step training (n=25) Hip strengthening (n=26) Control (n=26) Duration of the study: 12-weeks training; 12-month follow-up	Community dwelling adults Mean age (SD) IG1: 73.6 (6.5); IG2 73.7 (6.3); IG3 72.5(7.2); IG4 70.8 (4.4) Gender (m/f): IG1:10/7; IG2: 8/12; IG3: 7/12; IG4 6/16. Setting: University of Maryland School of Medicine, USA.	Rate of falls; number of people experiencing falls	
Rubenstein 2000[200]	Group-based balance, strength, endurance training. Control (usual activities) Total n=59	Community-dwelling men Mean age: 74 Gender (m/f): 59/0 Setting: California, USA	Rate of falls; number of people experiencing falls; quality of life; adverse events.	Study identified in Cochrane (Sherrington, 2019)[210]

Study	Intervention and comparison	Population	Outcomes	Comments
	Follow-up: 3 months Duration of the study: 12 weeks			
Sakamoto 2013[203]	1-leg stand balance training Control Total n=1365 Follow-up: 6 months Duration of the study: 26 weeks	Community dwelling adults Mean age (SD): IG males: 80.5 (4.1); females 80.1 (4); CG male 80.7 (4); female: mean 80.5 (4.1) Gender (m/f): 246/1119 Setting: Japan	Rate of falls; number of people experiencing falls; number of fall related fractures	Study identified in Cochrane (Sherrington, 2019)[210] Adverse events not reported in the control group.
Sales 2017[204]	Group-based balance, strength, mobility, flexibility training. Control (usual activities) Total n=66 Follow-up: 12 months Duration of the study: 52 weeks	Community dwelling adults Mean age (SD): 73 (8.3) Gender (m/f): 20/46 Setting: Australia	Rate of falls; number of people experiencing falls; quality of life	Study identified in Cochrane (Sherrington, 2019).[210] Adverse events not reported in the control group.
Sherrington 2014[211]	Balance and strength training Control Total n=340 Duration of the study: 12-month follow-up	Community dwelling adults Mean age (SD): 81.2 (8) Gender (m/f): 88/252 Setting: Sydney, Australia	Rate of falls; number of people experiencing falls; quality of life	Study identified in Cochrane (Sherrington, 2019).[210] Adverse events not reported for control group.
Sherrington 2020[209] (RESTORE trial)	Balance and strength training + stepping (n=168) Control (n=168) Duration of the study: 12-month follow-up	Community dwelling adults who had had a fall-related leg or pelvic fracture. Mean age (SD): IG 77.6 (8.9); CG: 77.8 (8.6) years Gender (m/f): IG: 43/125; CG: 39/129	Rate of falls; number of fall related fractures;	Adverse events not reported for control group.

Study	Intervention and comparison	Population	Outcomes	Comments
		Setting: home-based intervention.		
Shigematsu 2018[212]	Group-based stepping training Group-based walking Total n=68 Follow-up: 8 months Duration of the study: 52 weeks with 32 weeks follow-up after intervention	Community dwelling adults Mean age (SD): 69 (3) Gender (m/f): 26/43 Setting: Kawage, Mie, Japan	Rate of falls; number of people experiencing falls; adverse events.	Study identified in Cochrane (Sherrington, 2019)[210]
Siegrist 2016[214]	Group-based balance, strength, power, gait training. Control Total n=378 Follow-up: 12 months Duration of the study: 52 weeks	Community dwelling adults Mean age (SD): 78.1 (5.9) Gender (m/f): 94/284 Setting: Munich, Germany	Rate of falls; number of people experiencing falls; adverse events.	Study identified in Cochrane (Sherrington, 2019)[210] Cluster-RCT
Skelton 2005[215]	Group-based Falls management Exercise - balance and strength training. Control Total n=81 Follow-up: 9 months Duration of the study: 123 weeks on average	Community-dwelling women Mean age (SD): 72.8 (5.9) Gender (m/f): 0/81 Setting: United Kingdom	Rate of falls; number of people experiencing falls; adverse events	Study identified in Cochrane (Sherrington, 2019)[210]
Smulders 2010[216]	Group-based balance and gait training. Control Total n=96	Community dwelling adults Mean age (SD): 71 (4.7) Gender (m/f): 94% female	Rate of falls; number of people experiencing falls; number of fall related fractures; quality of life	Study identified in Cochrane (Sherrington, 2019)[210]

Study	Intervention and comparison	Population	Outcomes	Comments
	Follow-up: 12 months Duration of the study: 52 weeks	Setting: Nijmegan, Netherlands		
Stanmore 2019[219] Cluster RCT	Exergames and standard care (n=56) Standard care alone (n=50) Duration of the study: 3 months follow-up	Adults living in sheltered housing Mean age (SD): IG: 77.9 (8.9); CG: 77.8 (10.2) years Gender (m/f): IG: 11/45; CG: 12/38	Rate of falls; quality of life	
Steadman 2003[222]	Standard, individualised physiotherapy and balance training Control: conventional physiotherapy Total n=199 Follow-up: 1 month Duration of the study: 24 weeks	Community dwelling adults Mean age (SD): 82.7 (5.6) Gender (m/f): 6/90 Setting: London, UK	Rate of falls	Study identified in Cochrane (Sherrington, 2019)[210]
Sturnieks 2024[224]	Balance and strength training (n=91) Control (n=123) Follow-up: 12 months Duration: 52 weeks	Community dwelling adults, 65 years and over Mean age (SD): IG: 72.6 (5.7); CG: 72.5 (5.5) years Gender (m/f): IG 74/178; CG: 73/182 Setting: Australia	Rate of falls; number of fallers	
Suikkanen 2021[225]	Balance and strength training (n=150) Control (usual care) (n=149) Duration of the study: 12-month follow-up	Community dwelling adults meeting at least one frailty phenotype criteria. Mean age (SD): IG: 82.2 (6.3); CG 82.7 (6.3). Gender (m/f): 75/229 Setting: Home-based	Rate of falls	

Study	Intervention and comparison	Population	Outcomes	Comments
		programme, Finland		
Suzuki 2004[226]	Group-based balance, strength, gait training. Control (pamphlet and advice on falls prevention) Total n=52 Follow-up: 20 months Duration of the study: 87 weeks	Community-dwelling women Mean age (SD): 78 (3.9) Gender (m/f): 0/52 Setting: Tokyo, Japan	Rate of falls; number of people experiencing falls	Study identified in Cochrane (Sherrington, 2019)[210]
Taylor 2012[229]	Group-based Tai-Chi (2x week) Group-based Tai-Chi (1x week) Control (group-based seated gentle lower-limb exercise, stretching, low-level strength and low-level CV exercise) Total n=684 Follow-up: 17 months Duration of the study: 68 weeks	Community dwelling adults Mean age (SD): Gender (m/f): 73% female Setting: Auckland, Christchurch and Dunedin, New Zealand	Rate of falls; number of people experiencing falls	Study identified in Cochrane (Sherrington, 2019)[210]
Trombetti 2011[236] RCT (cross-over at 6 months)	Group-based balance and gait training Control (received intervention after 6 months) Total n=134 Follow-up: 6 months Duration of the study: 26 weeks	Community dwelling adults Mean age (SD): 75.5 (6.9) Gender (m/f): Setting: Geneva, Switzerland	Rate of falls; number of people experiencing falls; adverse events	Study identified in Cochrane (Sherrington, 2019)[210]
Uusi-Rasi 2015[239]	Group-based balance and strength training.	Community-dwelling women	Rate of falls; number of people	Study identified in Cochrane

Study	Intervention and comparison	Population	Outcomes	Comments
	Control (usual activity) Total n=205 Follow-up: 24 months Duration of the study: 104 weeks	Mean age (SD): 74 (3) Gender (m/f): 0/205 Setting: Tampere, Finland	experiencing falls; adverse events	(Sherrington, 2019) [210]
Verrusio 2017[243]	Individual, supervised balance and gait training Individual supervised walking Total n=150 Follow-up: 12 months Duration of the study: 52 weeks	Community dwelling adults Mean age (SD): 64.9 (4.6) Gender (m/f): 53% female Setting: Rome, Italy	Number of people experiencing falls	Study identified in Cochrane (Sherrington, 2019) [210]
Vogler 2009[246]	Home-based seated lower-limb strength training Home-based strength training Control (social visits) Total n=180 Follow-up: 12 months Duration of the study: 12 weeks	Community dwelling adults Mean age (SD): 80 (7) Gender: 83% female Setting: Sydney, Australia	Number of people experiencing falls	Study identified in Cochrane (Sherrington, 2019). [210] Adverse events noted as musculoskeletal symptoms in all groups: lower back, hip, knee pain in all groups.
Voukelatos 2007 [247]	Group-based Tai-Chi Control Total n=702 Follow-up: 6 months Duration of the study: 24 weeks	Community dwelling adults Mean age (SD): 69 (6.5) Gender: 84% female Setting: Sydney, Australia	Rate of falls; Number of people experiencing falls	Study identified in Cochrane (Sherrington, 2019) [210]
Voukelatos 2015[248]	Individual walking programme	Community dwelling adults	Rate of falls; number of people	Study identified in Cochrane

Study	Intervention and comparison	Population	Outcomes	Comments
	Control (mailed and telephone calls on information on health issues) Total n=386 Follow-up: 12 months Duration of the study: 48 weeks	Mean age (range): 73.2 (65-90) Gender: 74% female Setting: Sydney, Australia	experiencing falls; quality of life	(Sherrington, 2019) [210]
Wang 2022a[252]	Treadmill slip training (n=73) Control (n=70) 6-month follow-up Duration of the study: 6-month follow-up	Community dwelling adults Mean age (SD): IG: 72.5 (6.2); CG 72.9 (6.1) years. Gender (m/f): IG 25/45; CG 23/40. Setting: laboratory session USA.	Number of people experiencing falls	
Weerdesteyn 2006[254]	Group-based balance and gait training Control Total n=58 Follow-up: 7 months Duration of the study: 28 weeks	Community dwelling adults Mean age (SD): 74 (6) Gender: 77% female Setting: Nijmega, the Netherlands	Rate of falls; number of people experiencing falls	Study identified in Cochrane (Sherrington, 2019) [210]
Wolf 1996[260]	Group-based Tai-Chi Individual, computerised balance training Control Total n=200 Follow-up: 8 months Duration of the study: 87 weeks	Community dwelling adults Mean age (SD): 76.2 (4.7) Gender: 81% female Setting: Atlanta, USA	Rate of falls	Study identified in Cochrane (Sherrington, 2019) [210]

Study	Intervention and comparison	Population	Outcomes	Comments
Wolf 2003[261] Cluster-RCT	Group-based Tai-Chi Control Total n=311 Follow-up: 11 months Duration of the study: 48 weeks	Community dwelling adults Mean age (SD): 80.9 (6.2) Gender: 94% female Setting: Atlanta, USA	Rate of falls; number of people experiencing falls; adverse events.	Study identified in Cochrane (Sherrington, 2019)[210]
Woo 2007[262]	Group-based Tai-Chi Group-based resistance training. Control Total n=180 Follow-up: 12 months Duration of the study: 52 weeks	Community dwelling adults Mean age (SD): 69 (2.6) Gender (m/f): 90/90 Setting: Hong Kong, China	Number of people experiencing falls	Study identified in Cochrane (Sherrington, 2019)[210]
Wu 2010[263]	Individual Tai-Chi (videoconferencing) Group Tai-Chi Individual Tai-Chi (DVD) Total n=64 Follow-up: 4 months Duration of the study: 15 weeks	Community dwelling adults Mean age (SD): 75.4 (7) Gender: 84% female Setting: Burlington, Vermont, USA	Rate of falls	Study identified in Cochrane (Sherrington, 2019)[210]
Yalfani 2022[265]	Virtual reality (n=13) Control (n=12) Duration of the study: 8-week trial	Community dwelling women with Chronic low back pain Mean age (SD): IG 68 (2.94); 67.08 (2.9 (years). Gender (m/f): 0/25. Setting: sports rehabilitation laboratory, Iran	Quality of life (SF-36)	Virtual reality training program on pain, fall risk and quality of life but does not report falls.

Study	Intervention and comparison	Population	Outcomes	Comments
Yamada 2010[268]	Group-based trail walking Group-based indoor walking Total n=60 Follow-up: 12 months Duration of the study: 12 months	Community dwelling adults Mean age (SD): NR Gender (m/f): NR Setting: Kyoto, Japan	Rate of falls; number of people experiencing falls	Study identified in Cochrane (Sherrington, 2019).[210] Adverse events: muscle ache and fatigue in both arms of the trial.
Yamada 2012[266]	Group-based balance, strength, flexibility, gait training plus walking (2x session) Group-based balance, strength, flexibility, gait training plus walking (6x session) Total n=157 Follow-up: 12 months Duration of the study: 52 weeks	Community dwelling adults Mean age: 86 Gender: 81% female Setting: Japan	Rate of falls; number of people experiencing falls; number of fall related fractures	Study identified in Cochrane [210] Adverse events: muscle ache and fatigue in both arms of the trial.
Yamada 2013[267]	Group-based balance, strength, flexibility, gait training plus stepping mat. Group-based balance, strength, flexibility, gait training plus indoor walking. Total n=264 Follow-up: 12 months Duration of the study: 52 weeks	Community dwelling adults Mean age (SD): IG 76.2 (8.5); CG: 77.2 (7.6) Gender: 57% female Setting: Japan	Rate of falls; number of people experiencing falls; number of fall related fractures	Study identified in Cochrane [210] Adverse events: muscle ache and fatigue in both arms of the trial.

Study	Intervention and comparison	Population	Outcomes	Comments
Yang 2012 [269]	Individual Otago exercise programme Control (fall-prevention information booklet and usual activities) Total n=165 Follow-up: 6 months Duration of the study: 24 weeks	Community dwelling adults Mean age (SD): IG: 81 (5.9); CG 80.1 (6.4) Gender: 44% female Setting: Melbourne, Australia	Number of people experiencing falls; quality of life	Study identified in Cochrane (Sherrington, 2019) [210]
Zhang 2022[270]	Resistance exercises (n=36) Control (n=36) Duration of the study: 12-week programme	Community dwelling adults with osteoporosis Mean age (SD): 68.4 (4.7) years Gender (m/f): 11/57 Setting: recruited from outpatient department and clinical wards; home-based exercise program, China	Quality of life	Study looked at falling efficacy, not falls. Adverse events not reported for control arm

1 See Appendix D for full evidence tables.

2 ### 1.1.6. Summary of the effectiveness evidence

3 **Table 3: Clinical evidence summary: Exercise versus control – Rate of falls**

Outcomes	№ of participants (studies) Follow-up	Certainty of the evidence (GRADE)	Relative effect (95% CI)	Anticipated absolute effects		Comments
				Risk with control	Risk difference with Exercise	
Rate of falls - overall analysis	24512 (80 RCTs) [a]	⊕◯◯◯ Very low[b,c,d]	**Rate ratio 0.74** (0.69 to 0.80)	-	-	MID: 0.8 to 1.25 (precision: CI crosses 1 MID) **Benefit of exercise**
Rate of falls - subgrouped by exercise	9618 (43 RCTs)	⊕◯◯◯ Very low[b,d]	**Rate ratio 0.76**	-	-	MID: 0.8 to 1.25 (precision: CI

Outcomes	№ of participants (studies) Follow-up	Certainty of the evidence (GRADE)	Relative effect (95% CI)	Anticipated absolute effects		Comments
				Risk with control	Risk difference with Exercise	
type - Balance and functional exercises vs control			(0.70 to 0.82)			crosses 1 MID) **Benefit of exercise**
Rate of falls - subgrouped by exercise type - Resistance exercise vs control	485 (7 RCTs)	⊕◯◯◯ Very low[b,c,d]	**Rate ratio 0.78** (0.42 to 1.48)	-	-	MID: 0.8 to 1.25 (precision: CI crosses 2 MIDs) **No difference**
Rate of falls - subgrouped by exercise type - 3D exercise (Tai Chi) vs control	3254 (10 RCTs)	⊕◯◯◯ Very low[b,c,d]	**Rate ratio 0.74** (0.56 to 0.97)	-	-	MID: 0.8 to 1.25 (precision: CI crosses 1 MID) **No difference**
Rate of falls – subgrouped by exercise type – 3D exercise (Ditangquan) vs control	71 (1 RCT)	⊕◯◯◯ Very low[c,e]	**Rate ratio 0.12** (0.02 to 0.90)	-	-	MID: 0.8 to 1.25 (precision: CI crosses 1 MID) **Benefit for exercise**
Rate of falls - subgrouped by exercise type - 3D exercise (dance) vs control	522 (1 RCT)	⊕◯◯◯ Very low[c,d,e]	**Rate ratio 1.34** (0.98 to 1.83)	-	-	MID: 0.8 to 1.25 (precision: CI crosses 1 MID) **Harm for exercise**
Rate of falls - subgrouped by exercise type - Walking programme vs control	493 (3 RCTs)	⊕◯◯◯ Very low[b,c,d]	**Rate ratio 0.92** (0.52 to 1.65)	-	-	MID: 0.8 to 1.25 (precision: CI crosses 2 MIDs) **No difference**
Rate of falls - subgrouped by exercise type - Multiple categories of exercise vs control	9951 (24 RCTs)[a]	⊕◯◯◯ Very low[b,c,d]	**Rate ratio 0.71** (0.61 to 0.83)	-	-	MID: 0.8 to 1.25 (precision: CI crosses 1 MID) **Benefit of exercise**

a. Rate ratio calculated from number of falls for Li, 2022 and Lytras, 2022 as they didn't report rate ratio for falls in the study

b. Downgraded by 2 increments due to high risk of bias in studies (lack of blinding participants, lack of blinding of outcome assessments and selective reporting)

Outcomes	№ of participants (studies) Follow-up	Certainty of the evidence (GRADE)	Relative effect (95% CI)	Anticipated absolute effects		Comments
				Risk with control	Risk difference with Exercise	
c. Downgraded by 1 or 2 increments for unexplained heterogeneity.						
d. Downgraded by 1 or 2 increments as confidence interval crosses 1 or 2 MIDs (0.8 and 1.25 for dichotomous outcomes)						
e. Downgraded by 1 increment due to high risk of bias in study (lack of blinding of outcome assessments)						

Table 4: Clinical evidence summary: Exercise versus control – Number of fallers

Outcomes	№ of participants (studies) Follow-up	Certainty of the evidence (GRADE)	Relative effect (95% CI)	Anticipated absolute effects		Comments
				Risk with control	Risk difference with Exercise	
Number of fallers - overall analysis	24065 (81 RCTs)	⊕⊕◯◯ Low[a]	**RR 0.86** (0.82 to 0.90)	-	-	MID: 0.8 to 1.25 (precision: CI crosses 1 MID) **No difference**
Number of fallers - sub grouped by exercise type - Balance and functional exercises vs control	10260 (41 RCTs)	⊕⊕◯◯ Low[a]	**RR 0.86** (0.82 to 0.91)	-	-	MID: 0.8 to 1.25 (precision: CI crosses 0 MIDs) **No difference**
Number of fallers - sub grouped by exercise type - Resistance exercise vs control	321 (4 RCTs)	⊕◯◯◯ Very low[a,b]	**RR 0.84** (0.65 to 1.08	-	-	MID: 0.8 to 1.25 (precision: CI crosses 1 MID) **No difference**
Number of fallers - sub grouped by exercise type - 3D exercise (Tai Chi) vs control	3124 (9 RCTs)	⊕◯◯◯ Very low[a,b]	**RR 0.78** (0.68 to 0.88)	-	-	MID: 0.8 to 1.25 (precision: CI crosses 1 MID) **Benefit of exercise**
Number of fallers - sub grouped by exercise type - 3D exercise (dance) vs control	522 (1 RCT)	⊕⊕◯◯ Low[b,c]	**RR 1.35** (0.83 to 2.20)	-	-	MID: 0.8 to 1.25 (precision: CI crosses 1 MID) **Harm for exercise**

Outcomes	№ of participants (studies) Follow-up	Certainty of the evidence (GRADE)	Relative effect (95% CI)	Anticipated absolute effects		Comments
				Risk with control	Risk difference with Exercise	
Number of fallers - sub grouped by exercise type - Multiple categories of exercise vs control	9233 (25 RCTs)	⊕◯◯◯ Very low[a,b]	**RR 0.87** (0.78 to 0.98)	-	-	MID: 0.8 to 1.25 (precision: CI crosses 1 MID) **No difference**
Number of fallers - sub grouped by exercise type - Walking programme vs control	1104 (5 RCTs)	⊕◯◯◯ Very low[a,b]	**RR 0.91** (0.80 to 1.04)	-	-	MID: 0.8 to 1.25 (precision: CI crosses 1 MID) **No difference**
Number of fallers - sub grouped by exercise type - Step and slip exercises vs control	184 (2 RCTs)	⊕◯◯◯ Very low[b,d]	**RR 1.1** (0.8 to 1.5)	-	-	MID: 0.8 to 1.25 (precision: CI crosses 1 MID) **No difference**
Number of fallers - subgrouped by exercise type - 3D exercise (ditangguan) vs control	70 (1 RCT)	⊕⊕◯◯ Low[b,c]	**RR 0.13** (0.02 to 0.95)	-	-	MID: 0.8 to 1.25 (precision: CI crosses 1 MID) **Benefit of exercise**

a. Downgraded by 2 increments due to high risk of bias in studies (lack of blinding participants, lack of blinding of outcome assessments and selective reporting)

b. Downgraded by 1 increment as confidence interval crosses 1 MID (0.8 and 1.25 for dichotomous outcomes)

c. Downgraded by 1 increment due to high risk of bias in studies (lack of blinding of outcome assessments)

d. Downgraded by 2 increments due to high risk of bias in studies (lack of blinding participants, lack of information regarding randomization)

Table 5: Clinical evidence summary: Exercise versus control - Number of people experiencing fall related fractures

Outcomes	№ of participants (studies) Follow-up	Certainty of the evidence (GRADE)	Relative effect (95% CI)	Anticipated absolute effects		Comments
				Risk with control	Risk difference with Exercise	
Number of people who experienced one or more fall-related fractures-	12863 (16 RCTs)	⊕◯◯◯ Very low[a,b]	**RR 0.83** (0.64 to 1.06)	-	-	MID: 0.8 to 1.25 (precision: CI crosses 1 MID)

Outcomes	№ of participants (studies) Follow-up	Certainty of the evidence (GRADE)	Relative effect (95% CI)	Anticipated absolute effects		Comments
				Risk with control	Risk difference with Exercise	
overall analysis						**Benefit of exercise**
Number of people who experienced one or more fall-related fractures - sub grouped by exercise type - Balance and functional exercises vs control	2139 (7 RCTs)	⨁◯◯◯ Very low[a,c]	**RR 0.44** (0.25 to 0.76)	-	-	MID: 0.8 to 1.25 (precision: CI crosses 1 MID) **Benefit of exercise**
Number of people who experienced one or more fall-related fractures - sub grouped by exercise type - Resistance exercise vs control	73 (1 RCT)	⨁◯◯◯ Very low[c,d]	**RR 0.97** (0.14 to 6.49)	-	-	MID: 0.8 to 1.25 (precision: CI crosses 2 MIDs) **No difference**
Number of people who experienced one or more fall-related fractures - sub grouped by exercise type - Walking programme vs control	97 (1 RCT)	⨁◯◯◯ Very low[a,c]	**RR 0.66** (0.11 to 3.76)	-	-	MID: 0.8 to 1.25 (precision: CI crosses 2 MIDs) **Benefit of exercise**
Number of people who experienced one or more fall-related fractures - sub grouped by exercise type - Multiple categories of exercise vs control	10568 (9 RCTs)	⨁◯◯◯ Very low[a,b]	**RR 0.93** (0.72 to 1.21)	-	-	MID: 0.8 to 1.25 (precision: CI crosses 2 MIDs) **No difference**

a. Downgraded by 2 increments due to high risk of bias in studies (lack of blinding participants, lack of blinding of outcome assessments and selective reporting)

Outcomes	№ of participants (studies) Follow-up	Certainty of the evidence (GRADE)	Relative effect (95% CI)	Anticipated absolute effects		Comments
				Risk with control	Risk difference with Exercise	
b. Downgraded by 1 increment as confidence interval crosses 1 MID (0.8 and 1.25 for dichotomous outcomes)						
c. Downgraded by 2 increments as confidence interval crosses 2 MIDs (0.8 and 1.25 for dichotomous outcomes)						
d. Downgraded by 2 increments due to high risk of bias in studies (lack of blinding participants, selective reporting and reporting bias)						

1 **Table 6: Clinical evidence summary: Exercise versus control - Adverse events**

Outcomes	№ of participants (studies) Follow-up	Certainty of the evidence (GRADE)	Relative effect (95% CI)	Anticipated absolute effects		Comments
				Risk with control	Risk difference with Exercise	
Number of people sustaining adverse events	3971 (23 RCTs)	⊕⊕◯◯ Low[a]	**RD 0.04** (0.03 to 0.06)	37 per 1,000	**40 fewer per 1,000** (30 fewer to 60 more)	MID: 0.8 to 1.25 (precision: CI crosses 2 MIDs) **no difference**
a. Downgraded by 2 increments due to high risk of bias in studies (lack of blinding participants, lack of information regarding adherence)						
b. Downgraded by 2 increment as confidence interval crosses 2 MIDs (0.8 and 1.25 for dichotomous outcomes)						

2 **Table 7: Clinical evidence summary: Exercise vs control - Quality of life (general)**

Outcomes	№ of participants (studies) Follow-up	Certainty of the evidence (GRADE)	Relative effect (95% CI)	Anticipated absolute effects		Comments
				Risk with control	Risk difference with Exercise	
Health-related quality of life- overall analysis	3661 (16 RCTs)	⊕◯◯◯ Very low[a,b,c]	-	-	SMD **0.18 SD higher** (0.05 higher to 0.31 higher) [e]	MID: -0.5 to +0.5 (precision: CI crosses 0 MIDs) **No difference**
Health-related quality of life - sub grouped by exercise type - Balance and functional exercises vs control	1892 (9 RCTs)	⊕⊕◯◯ Low[a]	-	-	SMD **0.09 SD higher** (0.02 lower to 0.2 higher) [e]	MID: -0.5 to +0.5 (precision: CI crosses 0 MIDs) **No difference**
Health-related quality of life	174 (2 RCTs)	⊕⊕◯◯ Low[a]	-	-	SMD **0.51 higher** (0.22	MID: -0.5 to +0.5 (precision:

Outcomes	№ of participants (studies) Follow-up	Certainty of the evidence (GRADE)	Relative effect (95% CI)	Anticipated absolute effects		Comments
				Risk with control	Risk difference with Exercise	
- sub grouped by exercise type – Resistance vs control					higher to 1.24 higher) [e]	CI crosses 1 MID) **No difference**
Health-related quality of life - sub grouped by exercise type - Walking programme vs control	313 (1 RCT)	⊕⊕◯◯ Low[a]	-	-	SMD **0.08 higher** (0.14 lower to 0.3 higher) [e]	MID: -0.5 to +0.5 (precision: CI crosses 0 MIDs) **No difference**
Health-related quality of life - sub grouped by exercise type - Virtual reality vs control	25 (1 RCT)	⊕◯◯◯ Very low[a,e]	-	-	SMD **2.1 higher** (1.09 higher to 3.11 higher) [e]	MID: -0.5 to +0.5 (precision: CI crosses 2 MIDs) **Benefit of exercise**
Health-related quality of life - subgrouped by exercise type - Multiple categories vs control	245 (1 RCT)	⊕⊕◯◯ Low[a,c]	-	-	SMD **0.44 higher** (0.19 higher to 0.7 higher) [e]	MID: -0.5 to +0.5 (precision: CI crosses 0 MIDs) **No difference**

a. Downgraded by 2 increments due to high risk of bias in studies (lack of blinding participants, lack of blinding of outcome assessments and selective reporting)

b. Downgraded by 1 increment for unexplained heterogeneity

c. Downgraded by 2 increments for serious unexplained heterogeneity

d. Downgraded by 2 increments as confidence interval crosses 2 MIDs (0.5 lower and 0.5 higher for SMDs)

e. Outcome reported as SMD in line with Cochrane

Table 8: Clinical evidence summary: Exercise versus control - Quality of life (Mental component)

Outcomes	№ of participants (studies) Follow-up	Certainty of the evidence (GRADE)	Relative effect (95% CI)	Anticipated absolute effects		Comments
				Risk with control	Risk difference with Exercise	
Health-related	7155 (11 RCTs)	⊕◯◯◯ Very low[a,b,c]	-	-	SMD **0.45 SD higher**	MID: -0.5 to +0.5

Outcomes	№ of participants (studies) Follow-up	Certainty of the evidence (GRADE)	Relative effect (95% CI)	Anticipated absolute effects		Comments
				Risk with control	Risk difference with Exercise	
quality of life mental component - overall analysis					(0.07 higher to 0.84 higher)[f]	(precision: CI crosses MID) **No difference**
Health-related quality of life mental component - sub grouped by exercise type - Balance and functional exercises vs control	949 (5 RCTs)	⊕◯◯◯ Very low[a,b,d]	-	-	SMD **1.11 SD higher** (0.46 lower to 2.69 higher)[f]	MID: -0.5 to +0.5 (precision: CI crosses 2 MIDs) **Benefit of exercise**
Health-related quality of life mental component - sub grouped by exercise type - Multiple categories of exercise vs control	7112 (3 RCTs)	⊕◯◯◯ Very low[b,d,e]	-	-	SMD **0.24 lower** (0.62 lower to 0.15 higher)[f]	MID: -0.5 to +0.5 (precision: CI crosses 2 MIDs) **No difference**
Health-related quality of life mental component - sub grouped by exercise type - Resistance exercise vs control	65 (1 RCT)	⊕◯◯◯ Very low[c,e]	-	-	SMD **0.55 higher** (0.05 higher to 1.05 higher)	MID: -0.5 to +0.5 (precision: CI crosses 1 MID) **Benefit of exercise**
Health-related quality of life mental component - sub grouped by exercise type - 3D exercise (Dance) vs control	521 (1 RCT)	⊕◯◯◯ Very low[e]	-	-	SMD **0.11 higher** (0.07 lower to 0.28 higher)[f]	MID: -0.5 to +0.5 (precision: CI crosses 0 MIDs) **No difference**
Health-related	17 (1 RCT)	⊕◯◯◯ Very low[d,e]	-	-	SMD **0.04 higher**	MID: -0.5 to +0.5

Outcomes	№ of participants (studies) Follow-up	Certainty of the evidence (GRADE)	Relative effect (95% CI)	Anticipated absolute effects		Comments
				Risk with control	Risk difference with Exercise	
quality of life mental component - subgrouped by exercise type - Walking vs control					(0.92 lower to 1.01 higher) [f]	(precision: CI crosses 0 MIDs) **No difference**

a. Downgraded by 2 increments due to high risk of bias in studies (lack of blinding participants, lack of blinding of outcome assessments and selective reporting)

b. Downgraded by 2 increments for serious unexplained heterogeneity.

c. Downgraded by 1 increment as confidence interval crosses 1 MID (0.5 lower and 0.5 higher for SMDs)

d. Downgraded by 2 increments as confidence interval crosses 2 MIDs (0.5 lower and 0.5 higher for SMDs)

e. Downgraded by 2 increments due to high risk of bias in studies (lack of blinding participants, lack of blinding of outcome assessments and high risk of bias in reported outcomes)

f. Outcome reported as SMD in line with Cochrane

Table 9: Clinical evidence summary: Exercise versus control - Quality of life (Physical component)

Outcomes	№ of participants (studies) Follow-up	Certainty of the evidence (GRADE)	Relative effect (95% CI)	Anticipated absolute effects		Comments
				Risk with control	Risk difference with Exercise	
Health-related quality of life physical component - overall analysis	8942 (13 RCTs)	⊕◯◯◯ Very low[a,b,c]	-	-	SMD **0.26 higher** (0.01 lower to 0.52 higher) [e]	MID: -0.5 to +0.5 (precision: CI crosses 1 MID) **No difference**
Health-related quality of life physical component - sub grouped by exercise type - Balance and functional exercises vs control	949 (5 RCTs)	⊕◯◯◯ Very low[a,b,c]	-	-	SMD **0.12 lower** (0.64 lower to 0.40 higher) [e]	MID: -0.5 to +0.5 (precision: CI crosses 1 MID) **No difference**
Health-related quality of life physical component - sub grouped by exercise	7167 (4 RCTs)	⊕◯◯◯ Very low[a,b,d]	-	-	SMD **0.69 higher** (0.02 lower to 1.35 higher) [e]	MID: -0.5 to +0.5 (precision: CI crosses 2 MIDs)

Outcomes	№ of participants (studies) Follow-up	Certainty of the evidence (GRADE)	Relative effect (95% CI)	Anticipated absolute effects		Comments
				Risk with control	Risk difference with Exercise	
type - Multiple categories of exercise vs control						**Benefit of exercise**
Health-related quality of life physical component - sub grouped by exercise type - Resistance exercise vs control	287 (2 RCTs)	⊕◯◯◯ Very low[a,b,d]	-	-	SMD **0.49 higher** (0.88 lower to 1.87 higher) [e]	MID: -0.5 to +0.5 (precision: CI crosses 2 MIDs) **No difference**
Health-related quality of life physical component - sub grouped by exercise type - Walking programme vs control	17 (1 RCT)	⊕◯◯◯ Very low[a,d]	-	-	SMD **0.43 higher** (0.55 lower to 1.41 higher) [e]	MID: -0.5 to +0.5 (precision: CI crosses 2 MIDs) **No difference**
Health-related quality of life physical component - sub grouped by exercise type - 3D exercise (Dance) vs control	522 (1 RCT)	⊕⊕◯◯ Low[a]	-	-	SMD **0.08 lower** (0.25 lower to 0.09 higher)[e]	MID: -0.5 to +0.5 (precision: CI crosses 0 MIDs) **No difference**

a. Downgraded by 2 increments due to high risk of bias in studies (lack of blinding participants, lack of blinding of outcome assessments and high risk of bias in reported outcomes)

b. Downgraded by 2 increments for serious unexplained heterogeneity.

c. Downgraded by 1 increment as confidence interval crosses 1 MID (0.5 lower and 0.5 higher for SMDs)

d. Downgraded by 2 increments as confidence interval crosses 2 MIDs (0.5 lower and 0.5 higher for SMDs)

e. Outcome reported as SMD in line with Cochrane

Table 10: Clinical evidence summary: Exercise based intervention versus a different exercise based intervention

Outcomes	№ of participants (studies) Follow-up	Certainty of the evidence (GRADE)	Relative effect (95% CI)	Anticipated absolute effects		Comments
				Risk with exercise	Risk difference with Exercise	
Rate of falls, different types of exercise compared - Balance and functional exercises vs balance and functional exercises	1038 (6 RCTs)	⊕◯◯◯ Very low[a,b,c]	Rate ratio 0.88 (0.52 to 1.47)	-	-	MID: 0.8 to 1.25 (precision: CI crosses 2 MIDs) **No difference**
Rate of falls, different types of exercise compared - Balance and functional exercises vs resistance exercises	342 (3 RCTs)	⊕◯◯◯ Very low[c,d]	Rate ratio 0.91 (0.60 to 1.40)	-	-	MID: 0.8 to 1.25 (precision: CI crosses 2 MIDs) **No difference**
Rate of falls, different types of exercise compared - Balance and functional exercises vs walking	126 (2 RCTs)	⊕◯◯◯ Very low[c,e]	Rate ratio 0.57 (0.25 to 1.29)	-	-	MID: 0.8 to 1.25 (precision: CI crosses 2 MIDs) **Benefit of balance and functional exercise**
Rate of falls, different types of exercise compared - Balance and functional exercises vs multiple categories of exercise	513 (2 RCT)	⊕⊕◯◯ Low[f,g]	Rate ratio 0.84 (0.71 to 1.01)	-	-	MID: 0.8 to 1.25 (precision: CI crosses 1 MID) **No difference**
Rate of falls, different types of exercise compared - 3D (Tai Chi) vs balance and	470 (2 RCTs)	⊕◯◯◯ Very low[a,g]	Rate ratio 0.50 (0.26 to 0.94)	-	-	MID: 0.8 to 1.25 (precision: CI crosses 1 MID) **Benefit of 3D (Tai Chi) exercise**

Outcomes	№ of participants (studies) Follow-up	Certainty of the evidence (GRADE)	Relative effect (95% CI)	Anticipated absolute effects		Comments
				Risk with exercise	Risk difference with Exercise	
functional exercises						
Rate of falls, different types of exercise compared - 3D (Tai Chi) vs 3D (Tai Chi)	86 (1 RCT)	⊕◯◯◯ Very low[a,c]	Rate ratio 0.73 (0.24 to 2.19)	-	-	MID: 0.8 to 1.25 (precision: CI crosses 2 MIDs) **Benefit of 3D (Tai Chi) exercise**
Rate of falls, different types of exercise compared - Multiple categories of exercise vs balance and functional exercises	71 (1 RCT)	⊕◯◯◯ Very low[a,c]	Rate ratio 1.03 (0.54 to 1.97)	-	-	MID: 0.8 to 1.25 (precision: CI crosses 2 MIDs) **No difference**
Rate of falls, different types of exercise compared - Multiple categories of exercise vs resistance exercises	117 (2 RCTs)	⊕◯◯◯ Very low[a,c,h]	Rate ratio 0.96 (0.16 to 5.57)	-	-	MID: 0.8 to 1.25 (precision: CI crosses 2 MIDs) **No difference**
Rate of falls, different types of exercise compared - Multiple categories of exercise vs multiple categories of exercise	546 (4 RCTs)	⊕◯◯◯ Very low[a,c,h]	Rate ratio 0.91 (0.52 to 1.58)	-	-	MID: 0.8 to 1.25 (precision: CI crosses 2 MIDs) **No difference**
Rate of falls, different types of exercise compared - Tai chi vs multimodal exercises	447 (1 RCT)	⊕⊕⊕◯ Moderate[i]	Rate ratio 0.69 (0.56 to 0.85)	-	-	MID: 0.8 to 1.25 (precision: CI crosses 1 MIDs) **No difference**
Rate of falls, different	377 (1 RCT)	⊕⊕◯◯ Low[g,i]	Rate ratio 0.78			MID: 0.8 to 1.25

Outcomes	№ of participants (studies) Follow-up	Certainty of the evidence (GRADE)	Relative effect (95% CI)	Anticipated absolute effects		Comments
				Risk with exercise	Risk difference with Exercise	
types of exercise compared - Perturbation exercise vs balance and functional exercise			(0.47 to 1.29)			(precision: CI crosses 2 MIDs) **No difference**
Number of fallers, different types of exercise compared - Balance and functional exercises vs balance and functional exercises	1038 (5 RCTs)	⊕◯◯◯ Very low[a,c,h]	RR 0.75 (0.35 to 1.60)	-	-	MID: 0.8 to 1.25 (precision: CI crosses 2 MIDs) **Benefit of balance and functional exercise**
Number of fallers, different types of exercise compared - Balance and functional exercises vs walking	126 (2 RCTs)	⊕◯◯◯ Very low[a,g]	RR 0.52 (0.25 to 1.05)	-	-	MID: 0.8 to 1.25 (precision: CI crosses 1 MID) **Benefit of balance and functional exercise**
Number of fallers, different types of exercise compared - Balance and functional exercises vs multiple categories of exercise	195 (1 RCT)	⊕⊕◯◯ Low[f,g]	RR 0.90 (0.72 to 1.11)	-	-	MID: 0.8 to 1.25 (precision: CI crosses 1 MID) **No difference**
Number of fallers, different types of exercise compared - 3D (Tai Chi) vs balance and functional exercises	334 (1 RCT)	⊕⊕◯◯ Low[f,g]	RR 0.73 (0.59 to 0.90)	-	-	MID: 0.8 to 1.25 (precision: CI crosses 1 MID) **Benefit of 3D (Tai Chi) exercise**

Outcomes	№ of participants (studies) Follow-up	Certainty of the evidence (GRADE)	Relative effect (95% CI)	Anticipated absolute effects		Comments
				Risk with exercise	Risk difference with Exercise	
Number of fallers, different types of exercise compared - 3D (Tai Chi) vs resistance exercises	117 (1 RCT)	⨁◯◯◯ Very low[a,g]	RR 0.63 (0.37 to 1.06)	-	-	MID: 0.8 to 1.25 (precision: CI crosses 1 MID) **Benefit of 3D (Tai Chi) exercise**
Number of fallers, different types of exercise compared - Multiple categories of exercise vs balance and functional exercises	43 (1 RCT)	⨁◯◯◯ Very low[a,c]	RR 1.73 (0.53 to 5.62)	-	-	MID: 0.8 to 1.25 (precision: CI crosses 2 MIDs) **Benefit of balance and functional exercise**
Number of fallers, different types of exercise compared - Multiple categories of exercise vs resistance exercises	44 (1 RCT)	⨁◯◯◯ Very low[a,c]	RR 0.52 (0.18 to 1.48)	-	-	MID: 0.8 to 1.25 (precision: CI crosses 2 MIDs) **Benefit of multiple categories of exercise**
Number of fallers, different types of exercise compared - Multiple categories of exercise vs resistance exercises (after hospital stays)	114 (1 RCT)	⨁◯◯◯ Very low[a,c]	RR 1.72 (0.72 to 4.06)	-	-	MID: 0.8 to 1.25 (precision: CI crosses 2 MIDs) **Benefit of resistance exercise**
Number of fallers, different types of exercise compared - Multiple categories of	546 (4 RCTs)	⨁◯◯◯ Very low[a,b,g]	RR 0.75 (0.48 to 1.19)	-	-	MID: 0.8 to 1.25 (precision: CI crosses 1 MID) **Benefit of multiple categories**

Outcomes	№ of participants (studies) Follow-up	Certainty of the evidence (GRADE)	Relative effect (95% CI)	Anticipated absolute effects		Comments
				Risk with exercise	Risk difference with Exercise	
exercise vs multiple categories of exercise						**of exercise**
Number of fallers, different types of exercise compared - Tai Ji Chuan vs Multimodal exercise	447 (1 RCT)	⊕⊕◯◯ Low[g,i]	RR 0.76 (0.61 to 0.93)	-	-	MID: 0.8 to 1.25 (precision: CI crosses 1 MID) **Benefit of Tai Chi exercise**
Number of fallers, different types of exercise compared – Perturbation exercise vs balance and functional exercise	505 (1 RCT)	⊕◯◯◯ Very low[c,h,i]	RR 0.92 (0.68 to 1.25)	-	-	MID: 0.8 to 1.25 (precision CI crosses 1 MID) **No difference**
Number of fallers, different types of exercise compared - Individual multimodal exercise vs group multimodal exercises	309 (1 RCT)	⊕⊕◯◯ Low[g,i]	RR 1.03 (0.79 to 1.34)	-	-	MID: 0.8 to 1.25 (precision CI crosses 1 MID) **No difference**
Falls - Balance vs strengthening exercise	55 (1 RCT)	⊕⊕◯◯ Low[j]	RD 0.00 (-0.07 to 0.07)	-	-	MID: 0.8 to 1.25 (precision CI crosses 1 MID) **No difference**
Falls - Balance vs aerobic exercise	54 (1 RCT)	⊕⊕◯◯ Low[j]	RD 0.00 (-0.07 to 0.07)			MID: 0.8 to 1.25 (precision CI crosses 1 MID) **No difference**

Outcomes	№ of participants (studies) Follow-up	Certainty of the evidence (GRADE)	Relative effect (95% CI)	Anticipated absolute effects		Comments
				Risk with exercise	Risk difference with Exercise	
Number of people who experienced one or more fall-related fractures, different types of exercise compared - Balance and functional exercise vs balance and functional exercise	375 (2 RCTs)	⊕◯◯◯ Very low[c,h,i]	RR 1.25 (0.04 to 37.26)	-	-	MID: 0.8 to 1.25 (precision: CI crosses 2 MIDs) **No difference**
Number of people who experienced one or more fall-related fractures, different types of exercise compared - Balance and functional exercises vs resistance exercises	72 (1 RCT)	⊕◯◯◯ Very low[a,c]	RR 0.21 (0.01 to 4.25)	-	-	MID: 0.8 to 1.25 (precision: CI crosses 2 MIDs) **Benefit of balance and functional exercise**
Number of people who experienced one or more fall-related fractures, different types of exercise compared - Multiple categories of exercise vs resistance exercises	73 (1 RCT)	⊕◯◯◯ Very low[a,c]	RR 0.19 (0.01 to 3.92)	-	-	MID: 0.8 to 1.25 (precision: CI crosses 2 MIDs) **Benefit of multiple categories of exercise**
Quality of life (general) - Balance and functional exercise vs balance and functional exercise	133 (1 RCT)	⊕⊕◯◯ Low[a]	-	-	SMD 0.01 lower (0.35 lower to 0.33 higher) [o]	MID: -0.5 to +0.5 (precision: CI crosses 0 MIDs) **No difference**

Outcomes	№ of participants (studies) Follow-up	Certainty of the evidence (GRADE)	Relative effect (95% CI)	Anticipated absolute effects		Comments
				Risk with exercise	Risk difference with Exercise	
Quality of life (general) - Balance and functional exercise vs resistance exercise	50 (1 RCT)	⊕◯◯◯ Very low[j,m]	-	-	SMD 0.42 higher (0.14 lower to 0.98 higher) [o]	MID: -0.5 to +0.5 (precision: CI crosses 1 MID) **No difference**
Quality of life (general) - Resistance exercise vs aerobic exercise	50 (1 RCT)	⊕◯◯◯ Very low[j,n]	-	-	SMD 0.4 lower (0.96 lower to 0.16 higher) [o]	MID: -0.5 to +0.5 (precision: CI crosses 1 MID) **No difference**
Quality of life (general) - Balance and functional exercise vs aerobic	50 (1 RCT)	⊕◯◯◯ Very low[j,n]	-	-	SMD 0.01 lower (0.56 lower to 0.55 higher)[o]	MID: -0.5 to +0.5 (precision: CI crosses 2 MIDs) **No difference**
Adverse events	542 (5 RCTs)	⊕⊕◯◯ Low[a]	RD 0.00 (-0.04 to 0.04)	71 per 1,000	71 fewer per 1,000 (71 fewer to 71 fewer)	MID: 0.8 to 1.25 (precision: CI crosses 2 MIDs) **No difference**

a. Downgraded by 2 increments due to high risk of bias in studies (lack of blinding participants, lack of blinding of outcome assessments and selective reporting)

b. Downgraded by 1 increment for unexplained heterogeneity

c. Downgraded by 2 increments as confidence interval crosses 2 MIDs (0.8 and 1.25 for dichotomous outcomes)

d. Downgraded by 2 increments due to high risk of bias in studies (lack of blinding participants and selective reporting)

e. Downgraded by 2 increments due to high risk of bias in studies (lack of blinding participants, lack of blinding of outcome assessments)

f. Downgraded by 1 increment due to high risk of bias in study (lack of blinding of outcome assessments)

g. Downgraded by 1 increment as confidence interval crosses 1 MID (0.8 and 1.25 for dichotomous outcomes)

h. Downgraded by 2 increments for serious unexplained heterogeneity

i. Downgraded by 1 increment due to high risk of bias in studies (lack of blinding participants,)

j. Downgraded by 2 increments due to high risk of bias in studies (lack of blinding participants, lack of pre-specified plan)

k. Downgraded by 1 increment as confidence interval crosses 1 MID (0.5 lower and 0.5 higher for SMDs)

l. Downgraded by 2 increments as confidence interval crosses 2 MIDs (0.5 lower and 0.5 higher for SMDs)

m. Downgraded by 1 increment as 1 confidence interval crosses 1 MID (7.05)

n. Downgraded by 1 increment as 1 confidence interval crosses 1 MID (7.6)

o. Outcome reported as SMD in line with Cochrane

See Appendix F for full GRADEpro tables

1.1.7. Economic evidence

1.1.7.1. Included studies

Ten health economic studies with relevant comparisons were included in this review: 6 comparing exercise to usual care;[54, 62, 73, 76, 164, 219], 2 comparing group exercise to individual exercise [87], 1 comparing group exercise with usual care or multifactorial interventions and 1 comparing group exercise with usual care or multiple interventions [34] . The exercise interventions are summarised in the health economic evidence profiles below (Table 10, Table 11, Table 12 and Table 13) and the health economic evidence tables in Appendix H.

1.1.7.2. Excluded studies

Twelve economic studies relating to this review question were identified but were excluded or selectively excluded due to a combination of limited applicability and methodological limitations and in some instances the availability of more applicable evidence. [14, 25, 52, 58, 86 1, 35, 111, 167, 205, 232, 264]. These are listed in Appendix J, with reasons for exclusion given.

See also the health economic study selection flow chart in Appendix G

1 ## 1.1.8. Summary of included economic evidence

2 **Table 11: Health economic evidence profile: Exercise versus usual care**

Study	Applicability	Limitations	Other comments	Incremental cost	Incremental effects	Cost effectiveness	Uncertainty
Davis 2020 (Canada)[54]	Partially applicable[(a)]	Potentially serious limitations[(b)]	• Within-RCT analysis (Davis 2020) • Cost-utility analysis (QALYs) • Population: community dwelling adults aged 70 years and older with a history of falls. • Setting: Community • Comparators: 1. Usual care 2. Individualised Otago exercise home based programme delivered by a physical therapist. • Time horizon: 12 months	Saves £120 [(c)]	0.007 fewer QALYs	£17,479 per QALY lost based on imputed data set.[(d)]	Bootstrapping undertaken but probability cost effective at £20K/£30k not reported. Results are presented based on complete case analysis (CCA) and imputed data set. These do not differ significantly. QALYs estimated using SF-6D also presented. Incremental QALY was 0.003. In this scenario intervention Otego exercise programme dominates usual care (less costly and more effective.) Using both EQ-5D-3L and SF-6D to estimate QALYs resulted in very small incremental QALYs, below the MID of 0.03. Various additional one-way sensitivity analyses were undertaken, the results remained relatively robust to changes.

Study	Applicability	Limitations	Other comments	Incremental cost	Incremental effects	Cost effectiveness	Uncertainty
Deverall 2019 (New Zealand)[62]	Partially Applicable[(e)]	Potentially serious limitations [(f)]	• Markov model built on model derived by Pega et al. (2016) • Cost-utility analysis (QALYs) • Population: community dwelling adults aged 70 years and older with a history of falls. • Setting: Community • Comparators: 1.No intervention 2.Peer-led group exercise 3.Commercial group exercise 4.Home-based individual exercise • Time horizon: 12 months	Only available at cohort level, not reported at per patient level[(g)]	Only available at cohort level, not reported at per patient level.	2 versus 1: £6,700 per QALY gained 3 versus 1: £24,328 per QALY gained 4 versus 1: £3,279 per QALY gained	Sensitivity analysis including adjusting discount rates (0% and 6%) and targeted scenario analysis explored for Peer-led group exercise (for example targeting specific age groups). Results remain robust to sensitivity analyses.
Farag 2015 (Australia)[73]	Partially Applicable[(h)]	Potentially serious limitations[(i)]	• Within trial analysis (Sherrington 2009) • Cost-utility analysis (QALYs) • Population: community dwelling adults	£1,117[(j)]	2-1: 0.03 QALYs	£35,263 per QALY gained	Bootstrapping undertaken. Subgroup analysis of participants with higher cognitive status (MMSE>28). Intervention 2 becomes cost effective.

<table>
<tr><th>Study</th><th>Applicability</th><th>Limitations</th><th>Other comments</th><th>Incremental cost</th><th>Incremental effects</th><th>Cost effectiveness</th><th>Uncertainty</th></tr>
<tr><td></td><td></td><td></td><td>aged 60 years recently discharged from hospital
• Setting: Community
• Comparators:
1. Usual care
2. 12-month home exercise programme
• Follow up: 12 months</td><td></td><td></td><td></td><td>Sensitivity analyses varying total costs in base case analysis, as well as exclusion of participants who are hostel residents.</td></tr>
<tr><td>Franklin 2019 (United Kingdom)[76]</td><td>Directly Applicable</td><td>Minor limitations[k]</td><td>• Decision tree and Markov model
• Cost-utility analysis (QALYs)
• Population: The model includes 5 stratified age groups ranging from 65 to 89 years old.
• Setting: Community
• Comparators:
1. No assessment followed by no care pathway.
2. QTUG followed by Otago home-based exercise pathway.
3. QTUG followed by Falls Management group Exercise</td><td colspan="4">TUG-based pathways were included interventions but as these were dominated (more costly and less effective) by QTUG-based pathways in all cohorts these were not reported in the paper.
Both ‘Healthcare’ and ‘Health and Social care’ perspectives are both presented. Former excludes care home costs. Latter includes some self, local authority, and NHS funded care home costs.

Base case analysis – Healthcare costs (age group: 65-89 years)

<table>
<tr><th>Comparison</th><th>Incr. HC costs[l]</th><th>Incr. QALYs</th><th>ICERs HC costs</th><th>% CE at £20K:</th><th>% CE at £30K:</th></tr>
<tr><td>2 vs 1</td><td>£43,971</td><td>1.21</td><td>£36,396</td><td>37%</td><td>41%</td></tr>
<tr><td>3 vs 1</td><td>-£26,134</td><td>0.92</td><td>Dominates</td><td>66%</td><td>71%</td></tr>
<tr><td>4 vs 1</td><td>£56,662</td><td>1.13</td><td>£50,363</td><td>29%</td><td>34%</td></tr>
<tr><td>5 vs 1</td><td>£24,017</td><td>0.79</td><td>£30,287</td><td>38%</td><td>43%</td></tr>
</table></td></tr>
</table>

<table>
<tr><th>Study</th><th>Applicability</th><th>Limitations</th><th>Other comments</th><th>Incremental cost</th><th>Incremental effects</th><th>Cost effectiveness</th><th>Uncertainty</th></tr>
<tr><td></td><td></td><td></td><td>programme (FaME) pathway.
4. QTUG followed by Tai Chi pathway.
5. QTUG followed by home safety assessment and modification (HAM) pathway.
Time horizon: 2 years</td><td colspan="4">Dominates (less costly and more effective)
Incremental costs and QALYs are presented at per cohort level not patient level.

Base case analysis – Healthcare and social costs (age group: 65-89 years)
<table>
<tr><th>Comparison</th><th>Incr. HSC costs(l)</th><th>Incr. QALYs</th><th>ICERs HSC costs</th><th>% CE at £20K:</th><th>% CE at £30K:</th></tr>
<tr><td>2 vs 1</td><td>£2,302</td><td>1.21</td><td>£1,906</td><td>53%</td><td>58%</td></tr>
<tr><td>3 vs 1</td><td>-£67,803</td><td>0.92</td><td>Dominates</td><td>88%</td><td>91%</td></tr>
<tr><td>4 vs 1</td><td>£14,994</td><td>1.13</td><td>£13,327</td><td>48%</td><td>54%</td></tr>
<tr><td>5 vs 1</td><td>-£17,651</td><td>0.79</td><td>Dominates</td><td>64%</td><td>69%</td></tr>
</table>
Dominates (less costly and more effective)
Incremental costs and QALYs are presented at per cohort level not patient level.

The cost-effectiveness of the QTUG-based care pathways relative to no care pathway is also dependent on the age of the cohort. Results found those aged 75-89 had a higher probability of cost-effectiveness in the fall prevention interventions.

Sensitivity analysis

Probabilistic sensitivity analysis conducted at both £20K and £30K thresholds. Sensitivity analyses included:
▪ Uptake on fall-prevention intervention screening varied from 100% to 75,50,25,10 and 1%.</td></tr>
</table>

Study	Applicability	Limitations	Other comments	Incremental cost	Incremental effects	Cost effectiveness	Uncertainty
							▪ -QTUG sensitivity and specificity were independently or jointly varied from 0.05 to 0.95 in 0.05 increments ▪ Increasing utility decrements
McLean 2015[164] (Australia)	Partially applicable[(m)]	Potentially serious limitations[(n)]	• Decision tree • Cost utility analysis (QALYs) • Population: Community dwelling people 70+ • Comparators: Routine exercise (1), Exercise program (2) • Time horizon: 18 months	£45.87 Women only: £43.31	0.0009 Women only: 0.0019	£51,483 Women only: £22,986	Probability the exercise program cost effective (£20/£30K threshold): <5%/8.8%. In the mixed gender cohort, adding advertising costs or increasing cost of ambulatory care had little impact on the cost effectiveness conclusion. The use of a fitness instructor (lower cost) as opposed to an Allied Health Assistant for the group instructor and no venue or equipment cost, reduced the ICER. In the mixed gender group however, it remained over the £20K threshold. In women, the ICERs fell below £20K, suggesting intervention 2 may be cost effective. Threshold analysis found that generate an ICER

Study	Applicability	Limitations	Other comments	Incremental cost	Incremental effects	Cost effectiveness	Uncertainty
							within the £20K to £30K threshold in the overall base case, the exercise program required a falls rate reduction of between 32% and 42%, assuming injury distribution remains constant.
Stanmore (2019) [219] (United Kingdom)	Directly Applicable	Potentially serious limitations[(o)]	• Complete case within trial analysis (Stanmore 2019). • Cost utility analysis (QALYs) • Population: adults aged 55 years and older (mean age=78) • Setting: Assisted living facilities • Comparators: (1) Standard care (physiotherapist visit to explain Otago exercise programme (OEP) and leaflet on falls prevention and OEP recommended exercise). Recommended exercise 3 times a week. (2) Tailored 12-week strength and balance Exergame, supported by physiotherapists[(p)] or trained assistants plus standard care Follow-up: 12 weeks	£101.84 [(q)]	0.007 QALYs	£15,209.80 per QALY gained	Probability Exergames cost effective (£20/£30K threshold): 61%/73% Results were robust to controlling for baseline characteristics using multiple (15) imputations for complete case analysis, with utility derived from EQ-5D-5L measure. Incidence rate ratio of fall self-reported by the intervention and control groups found an IRR of 0.31 (95% CI 0.16 to 0.62, p = 0.001) in favour of Exergames. However, this was only followed up for 3-month and is at risk of recall bias.

Abbreviations: ICER= incremental cost-effectiveness ratio; QALY= quality-adjusted life years; RCT= randomised controlled trial, CUA = Cost-utility Analysis, CCA= Computed complete analysis, QoL = Quality of Life, EQ-5D = EuroQol 5 dimension, NZ = New Zealand, OEP = Otago exercise programme, QTUG = Quantitative timed up and go, TUG = Timed up and go, DT = Decision tree, FaME = Falls Management group Exercise programme; HAM = Home safety assessment and modification, BBS = Berg balance scale.
(a) Canadian healthcare perspective. Older adult cohort (82 years) may not be applicable for all older people to whom this guideline applies to.
(b) Study is based on a single RCT and may not reflect full body of clinical evidence for this intervention. Source of resource use is not from the best estimated source. Canadian unit costs (2019) may not reflect current UK NHS. Short time horizon may not fully capture differences between interventions and impact of falls.
(c) 2019Canadian dollars converted to 2019 UK pounds[185]. Cost components incorporated: OEP delivery, and other healthcare costs .
(d) When the ICER is over £20,000 per QALY lost, intervention 2 is considered the cost-effective option.
(e) New Zealand healthcare perspective may not be reflective of current UK context. QoL assessed using disease weights rather than EQ-5D. Discounting at 3% rather than 3.5% as required by NICE reference case.
(f) NZ baseline data and resource use may not be applicable to the current NHS context. Assumption in results that the impact of reducing falls was the same as its impact on reducing injurious falls. Relative treatment affect based on older Cochrane (Gillespie, 2012) and may not represent full body of evidence
(g) 2011 New Zealand dollars presented here as 2011 UK pounds [185]. Cost components incorporated: intervention costs, health system costs: primary healthcare and hospitalisation after fall, however residential/care after hospitalisation not captured.
(h) Australian healthcare perspective may not be reflective of current UK context. Older adult cohort (82 years) may not be applicable for all older people to whom this guideline applies to.
(i) Short time horizon, based on single study and may not reflect the full body of evidence. Based on Australian 2012-unit costs which may not reflect current NHS context.
(j) 2012 Australian costs (presented here as 2012 UK pounds [185]. Cost components incorporated: Health system costs included in study includes Health service (including social support) and programme costs.
(k) 2-year time horizon may not sufficiently long assess the full costs and benefits. One potential conflict of interest, Kinesis Health Technologies Ltd who developed the QTUG technology was a part of the Perfect Patient Pathway Test Bed, for which the model was developed, and representatives of Kinesis provided their thoughts on the initial design of the model however, they did not inform the overall development and analysis of the model and subsequent results in this manuscript.
(l) 2017 UK pounds. Health system costs included Intervention costs and falls related visits to primary care, community care and hospitalisations.
(m) Australian healthcare system may not be reflective of current UK context. Discounting at 3% rather than 3.5% as required by NICE reference case.
(n) Based on two study and may not reflect the full body of evidence. 18 month time horizon which may not fully capture downstream effects of intervention . Utility of a 70+ year old that has no fall is 1 which is unrealistic as they are likely to have other health conditions that would lower their utility, resource uses based on phone calls to the participants to ask but only managed to capture 93% of falls resource use
(o) Short time horizon, based on single study and may not reflect the full body of evidence. Based on 2015
(p) Physiotherapist support consists of setting up patient tailored Exergame programme and supervision of Exergames undertaken by patients three times a week.
(q) 2015-2016 UK costs. Cost components incorporated. Cost of intervention, cost of standard care, and health care utilisation over study period

Table 12: Health economic evidence profile: Group exercise versus individual exercise.

Study	Applicability	Limitations	Other comments	Incremental cost	Incremental effects	Cost effectiveness	Uncertainty
Gottschalk 2021[87] (Germany)	Partially applicable[(a)]	Potentially serious limitations[(b)]	• Within RCT analysis (Jansen 2018) • Cost utility analysis (QALYs)	Saves £340 [(c)]	0.007 fewer QALYs	£51,801 per QALY lost[(d)]	Probability Individual therapy cost effective (£20/£30K threshold): 78%/77%

Study	Applicability	Limitations	Other comments	Incremental cost	Incremental effects	Cost effectiveness	Uncertainty
			• Population: German speaking people aged 70 years or older at risk of falling • Comparators: Individual exercise therapy (1), Group exercise therapy (2) • Time horizon: 6 months				The cost effectiveness acceptability curves based on adjusted total costs and QALYs indicated that the cost effectiveness of the group program was uncertain over a large range of willingness to pay thresholds.
Jansen 2023 Germany	Partly applicable [(e)]	Potentially serious limitations[(f)]	• Analytic model based on a RCT • Cost-utility analysis (QALYs) • Population: Older people in the community • Comparators: LiFE (1), gLiFE (2) • Time horizon: 12 months	£470[(g)]	-0.02 QALYs	LiFE dominates	gLiFE is unlikely to ever be cost effective when compared to LiFE.

Abbreviations: ICER= incremental cost-effectiveness ratio; QALY= quality-adjusted life years; RCT= randomised controlled trial
(a) German Healthcare system
(b) Short time horizon may not capture all downstream effects of intervention. Based on single study and may not reflect the full body of evidence (Jansen 2018). Based on German 2018 unit costs which may not reflect current NHS context.
(c) 2018 Euros converted to UK pounds[185]. Cost components incorporated: Staff costs, outpatient and inpatient services (including stays in hospitals, rehabilitation clinics, psychiatric clinics). medication costs.
(d) When the ICER is over £20,000 per QALY lost, intervention 2 is considered the cost-effective option.
(e) German study for people aged 70+, used the EQ-5D-5L, study was 12 months
(f) Based on a single RCT so may not represent the full body of evidence
(g) 2018 EUR

1 **Table 13: Health economic evidence profile: Group exercise versus usual care versus multifactorial intervention.**

Study	Applicability	Limitations	Other comments	Incremental cost	Incremental effects	Cost effectiveness	Uncertainty
Bruce et al. 2021/Lamb 2020	Directly applicable	Minor limitations[(a)]	• Within-RCT analysis (Bruce 2021) • Cost-utility analysis (QALYs) • Population: People over 70 years • Setting: Community • Comparators: Usual care (1), Exercise (2) or multifactorial fall prevention (3) • Follow-up: 18 months	2-1: saves £27 3-2: £230[(b)]	2-1: 0.0057 QALYs 3-2: -0.013 QALYs	Exercise dominates (less costly and more effective) both usual care and multifactorial fall prevention	Probability exercise cost effective (£20/£30K threshold): 64.5%/68.5% The uncertainty around which intervention is cost effective is between exercise or usual care, when the willingness-to-pay threshold is £20,000 the likelihood that multifactorial fall prevention is cost effective is only 1%.

2 *(a) 18-month time horizon, it is based on a single RCT and so may not reflect full body of evidence identified in clinical review*
3 *(b) 2015/16 UK pounds. Cost components: Staff cost, Postage, exercise booklet, ankle weights, day centre, nursing home, equipment*

4 **Table 14: Health economic evidence profile: Group exercise versus multiple interventions including multifactorial interventions.**

Study	Applicability	Limitations	Other comments	Incremental cost	Incremental effects	Cost effectiveness	Uncertainty
Church et al. 2012	Partially applicable[(a)]	Potentially serious limitations[(b)]	• Decision tree and Markov model. • Cost-utility analysis (QALYs) • Population: Cohort starting age 65 • Setting: Community but can move into	Incremental versus 1: General population 2: £230 3: £240 4: £322 5: £387 6: £465	Incremental versus 1: General population 2: 0.007 3: 0.011 4: 0.009 5: 0.005 6: 0.010	General population[(f)]: 2: Ex. Dom 3 vs 1: £21,770 4: Dominated 5: Dominated 6: Dominated 7: Dominated	One way sensitivity analysis shows that removing "fear of falling" from the model, none of the interventions were cost effective. Intervention effectiveness, intervention cost and cohort start age are all drivers in the model.

Study	Applicability	Limitations	Other comments	Incremental cost	Incremental effects	Cost effectiveness	Uncertainty
			residential care in the model • Comparators: General population: No treatment (1), Group-based exercises (2), Tai Chi (3), Exercise and falls advice (4), Multifactorial interventions; Assessment and referral (5), Home-based exercise (6), Multifactorial interventions; Assessment and active intervention (7), High risk population: Group based exercise (8), Multifactorial (high risk) (9), Home hazard modification (10), Specific population: Psychotropic medication withdrawal (11), Cardiac pacing (12), Expedited cataract surgery (12) • Time horizon: Lifetime • Cycle length: 1 year	7: £550 High risk population 8: £208 9: £355 10: £417 Specific population 11: £162 12: £4,753 13: saves £30 (c)	7: 0.009 High risk population 8: 0.008 9: 0.008 10: 0.015 Specific population 11: 0.019 12: 0.172 13: 0.010	High risk population(d): 8 vs 1: £25,086 9: Dominated 10 vs 8: £32,997 Specific population (e): 11 vs 1: £8,474 12 vs 1: £27,634 13 vs 1: Dominates (less costly and more effective)	Using probabilistic sensitivity analysis for the general population interventions, at low willingness to pay thresholds 'no intervention' dominates however, above £29,549 threshold Tai Chi dominates.

(a) Australian health care system, discounting at 5% rather than 3.5% as required by NICE reference case.
(b) Outcomes, cost and interventions effectiveness came from 2009 which may not reflect full body of clinical evidence and may not reflect current UK NHS context.
(c) 2009 costs AUD converted to GDP 2009 using PPP

(d) Estimates are all ranked against the next best option in this group to determine cost-effectiveness. Full incremental analysis of available strategies: first strategies are ruled out that are dominated (another strategy is more effective and has lower costs) or subject to extended dominance (the strategy is more effective and more costly but the incremental cost effectiveness ratio is higher than the next most effective option and so it would never be the most cost effective option); incremental costs, incremental effects and incremental cost effectiveness ratios are calculated for the remaining strategies by comparing each to the next most effective option.
(e) Estimates are all compared to the 'no intervention' option as each intervention applies to a different population.

1.1.9. Economic model

Whilst this review question was prioritised for de novo health economic modelling, this intervention was not prioritised.

1.1.10. Evidence statements

1.1.10.1. Economic

Six cost-utility studies compared various community exercise interventions compared to usual care in people ages 55 and over.

- One cost–utility analysis found that home-based Otago exercise programme (OEP) was not cost effective compared to usual care for falls prevention (ICER: £17,479 per QALY lost). This analysis was assessed as partially applicable with potentially serious limitations. (Davis 2020)
- Another cost–utility analysis found that home-based exercise and peer-led group exercise were cost effective compared to no intervention for falls prevention (ICER: £3297 and £6,700 per QALY gained respectively). It also found commercial group exercise was not cost effective compared to no intervention (ICER: £24,328 per QALY gained). This analysis was assessed as partially applicable with potentially serious limitations. (Deverall 2019)
- Another cost–utility analysis found that home WEBB based exercise programme was not cost effective compared to usual care for falls prevention (ICER: £35,263 per QALY gained). This analysis was assessed as partially applicable with potentially serious limitations. (Farag 2015)
- Another cost-utility analysis found that “No Falls” exercise program for 15 weeks was not cost effective compared with usual care for falls prevention (ICER: £51,483 per QALY gained). This analysis was assessed as partially applicable with potentially serious limitations. (McLean 2015)
- Another cost–utility analysis found that Exergame programme was cost effective compared to standard care for falls prevention (ICER: £15,210 per QALY gained). This analysis was assessed as directly applicable with potentially serious limitations. (Stanmore 2019)
- The final analysis found that group therapy was not cost effective compared to individual therapy for falls prevention (ICER: £51,801 per QALY lost). This analysis was assessed as directly applicable with potentially serious limitations.

One cost-utility analysis found that for fall prevention:

- When solely healthcare costs are applied, falls management group exercise programme was dominant (less costly more effective) compared to No intervention. Otago exercise programme, Tai Chi exercise programme and home assessment modification was not cost-effective compared to no intervention (ICER: £36,396 per QALY gained, ICER: £50,363 per QALY gained, ICER: £30,297 per QALY gained.)
- When healthcare and social care costs are applied, falls management group exercise programme and home assessment modification dominates (less costly more effective) No intervention. Otago exercise programme and Tai Chi exercise programme was cost-effective compared to no intervention (ICER: £1906 per QALY gained, ICER: £13,329 per QALY gained).
- This analysis was assessed as directly applicable with minor limitations. (Franklin 2019)

Two cost-utility analyses compared exercise and multifactorial interventions.

- One cost-utility analysis found that exercise dominated both usual care and multifactorial interventions. The analysis was assessed as directly applicable with minor limitations (Bruce 2021, Lamb 2020).
- Another cost-utility analysis found that Tai Chi dominated all the other interventions. The analysis was assessed as partially applicable with potentially serious limitations (Church 2012).

One cost utility study compared individual exercise and group exercise

- One cost utility study found that LiFE dominates gLiFE. The analysis was assessed to be partly applicable with potentially serious limitations

1.1.11. The committee's discussion and interpretation of the evidence

1.1.11.1. The outcomes that matter most

The committee discussed that all outcomes are considered to be equally important for decision making and therefore agreed that all outcomes are rated as critical. The review on exercise interventions for falls prevention found evidence for all outcomes (rate of falls, number of people sustaining one or more falls, number of participants sustaining fall related fractures, adverse events, and health related quality of life).

1.1.11.2. The quality of the evidence

The quality of the evidence for quantitative outcomes was assessed with GRADE and was rated as very low to low. Findings were downgraded due to risk of bias (for example, lack of blinding, lack of blinding of outcome assessments, lack of information regarding adherence and poor reporting of randomisation procedures). Studies were also downgraded for imprecision when 95% confidence intervals crossed 1 or more decision-making thresholds. Some evidence was also downgraded due to inconsistency with unexplained heterogeneity. The evidence was not downgraded for indirectness. See appendix F for full GRADE tables with quality ratings of all outcomes.

1.1.11.3. Benefits and harms

Exercise vs control – Rate of falls

Evidence from 71 studies showed a clinical benefit of exercise compared to control for rate of falls with very low certainty about the effects. When sub-grouped by exercise type evidence from 38 studies suggested a clinical benefit of balance and functional exercises compared to control for rate of falls. Evidence from 1 study showed a clinical benefit for 3D exercises (ditangquan) compared to control for rate of falls. Evidence from 20 studies suggested a clinical benefit of multiple categories of exercises compared to control for rate of falls. While evidence from 1 study showed a clinical harm for 3d exercises (dance) compared to control for rate of falls. No further clinical differences were found for rate of falls.

Exercise vs control – Number of fallers

Clinical benefits for exercise compared to control for the number of fallers were only found when sub-grouped by type of exercise for Tai-Chi (evidence from 9 studies), whereby a clinical benefit for Tai Chi compared to control was found. A clinical harm again was found for dance compared to control was for the number of fallers (evidence from 1 study).

Exercise vs control – Fall related fractures and adverse events

Evidence from 14 studies showed a benefit of exercise compared to control for the number of people experiencing fall-related fractures with very low certainty of effect. Further clinical benefits were also found when exercises where sub-grouped by exercise type. Evidence from 7 studies suggested a clinical benefit of balance and functional exercises compared to control with very low certainty of effect, while evidence from 1 study also suggested a clinical benefit for a walking programme compared to control with very low certainty of effect. No further clinical differences were found for the outcome of fall-related fractures. Evidence from 1 study suggested a clinical harm of exercise (Balance and strength training plus stepping) compared to control for the number of people sustaining adverse events with very low certainty of effects.

Exercise vs control – health related quality of life

Some benefits of exercise compared to control for the outcome of health-related quality of life were also found. For example evidence from 1 study showed a clinical benefit for virtual reality compared to control, evidence from 5 studies suggested a clinical benefit for balance and functional exercises compared to control for the mental component of quality of life, evidence from 1 study showed a clinical benefit of resistance exercises compared to control for the mental component of quality of life, and evidence from 4 studies showed a clinical benefit of multiple categories of exercise compared to control for the physical component of quality of life. No further clinical differences were found for the outcome of health-related quality of life when comparing exercise to control.

Exercise vs exercise

When comparing exercises with each other some exercises showed clinical benefits over others. Evidence from 2 studies showed a clinical benefit of balance and functional exercises compared to walking for rate of falls, and number of fallers. While 1 study suggested a clinical benefit of balance and functional exercises compared to resistance exercises for the number of people who experienced one or more fall related fractures. In turn, evidence from 2 studies showed a clinical benefit of Tai Chi compared to balance and functional exercises for rate of falls and number of fallers. Tai Chi exercises also showed a clinical benefit for number of fallers when compared to resistance exercises or multimodal exercises. Evidence from 1 study also suggested a clinical benefit of multiple types of exercises compared to resistance exercises for number of fallers and number of people experiencing one or more fall related fractures. No further clinical differences were found when comparing different types of exercises with each other.

1.1.11.4. Committee discussion

The committee agreed that overall the large body of evidence supported exercise as an intervention to reduce the rate of falls compared with usual care, although no difference was seen in the number of fallers. The type of exercise included in the studies varied, but often included a balance and functional component.

The committee discussed the methods of delivering exercise interventions within the studies. They agreed the studies that delivered exercise programmes within groups rather than individual sessions reflected current practice. People often like the peer support from being in a group, as this motivated them to participate, although the committee noted this would not always be appropriate for some people, such as those with a cognitive impairment.

The frequency and duration of exercise programmes in the studies varied widely. The committee agreed health practitioners would discuss with the person the importance of continuing to exercise beyond the structured programme and explain exercise should be made part of everyday activity for life to maintain benefit. The types of exercise and duration of the programme would be based on a falls risk assessment because some types of exercises may increase the risk of falls in some people. The committee agreed exercise programmes need to be individualised based on the safety profile of individuals and tailored according to the level of risk of falling. People at lower risk will benefit from exercise to prevent future falls, whilst those who are frailer are less likely to benefit from an exercise programme.

The committee discussed the World falls guideline recommendation for exercise programmes 3 times per week for a minimum of 12 weeks, and the Chief medical officer recommendation for older people aged 65 or over to undertake physical activity that aims to improve muscle strength, balance and flexibility combined with aerobic activity at least 2 days per week for 150 minutes.

When focusing on the exercise prescription within the studies that showed a benefit for the rate of falls outcome the committee acknowledged they comprised of functional components related to the risk of falls such as balance, co-ordination and strength.

1.1.11.5. Cost effectiveness and resource use

Ten studies found that exercise was cost effective versus usual care or other treatments. These were Bruce 2021, Deverall 2019, Franklin 2019, Davis 2020, Farag 2015, McLean 2015, Gottschalk 2021, Jansen 2023, Church 2012 and Stanmore 2019. Bruce (a six-month program) found that exercise dominated usual care and multifactorial falls prevention, that is exercise was more effective and less costly than usual care. This study was assessed as directly applicable and with minor limitations. Deverall (based on Gillespie 2012 using a range of program lengths) found that peer-led group exercise and home-based exercise were cost effective compared to no intervention with ICERs of £6,700 and £3,279 respectively. This study was assessed as partially applicable with potentially serious limitations. Franklin (based on Gilespie 2012 using a range of program lengths) found that QTUG with a falls management group exercise programme was dominant compared to no intervention. This study was assessed to be directly applicable with minor limitations. Stanmore (12-week program) found that Exergame had an ICER of £15,210 per QALY gained compared to standard care. This study was found to be directly applicable with potentially serious limitations.

Four of the nine studies found that usual care was more cost effective versus exercise, Church 2012, Davis 2020, Farag 2015, McLean 2015. All these studies were assessed to be partially applicable with potentially serious limitations. Church found that Tai Chi had an ICER of £21,770 and all other interventions were dominated or extendedly dominated. Davis found that home-based exercise had an ICER of £17,479 per QALY lost (when an ICER is over £20,000 per QALY lost it is considered cost effective). Farag found that home-based exercise had an ICER of £35,263 per QALY gained compared to usual care. McLean found that “No Falls” program had an ICER of £51,483 per QALY gained compared to routine activity.

Gottschalk 2021 found that group exercise was more cost effective than individual exercise. It found that group exercise had an ICER of £51,801 per QALY lost. This study was assessed to be partially applicable with potentially serious limitations. However, Jansen 2023 found that individual exercise dominated group exercise. This study was assessed to be partly applicable with potentially serious limitations.

The committee acknowledged that exercise improves the outcomes in patients who are at risk of falling. The committee felt that the benefit of exercise was important but did not think that there was enough evidence to recommend a particular programme. The committee acknowledged that usually a therapist will start the exercise programme, but fitness instructors are likely to be able to run the programmes which may lower the impact on resources.

The committee also felt unable to put a minimum time on the duration of the exercise programme or frequency or duration of individual sessions, given how varied the evidence was, some programs were only 8 weeks and others were 6 months or longer. They were aware that practice around the country is very varied with some people being offered 30+ weeks and others finding it difficult to get three weeks of a programme. The committee acknowledged that there were elements on exercise that it was very important to include, these were balance, coordination, strength and power. The committee felt that it was very important for older people to continue exercising and that after the exercises have been learnt, individuals should be able to carry on without frequent professional input. The committee felt that access to exercise programmes was likely to be cost effective given all the directly applicable evidence (Bruce 2021, Franklin 2019) found exercise to be cost effective and those with minor limitations (Bruce 2021, Franklin 2019) also found exercise to be cost effective. Franklin 2019 along with Deverall 2019 and Church 2012 had a relative risk which was similar to the overall clinical relative risk calculated in the review. However, Bruce 2021, Davis 2020 and Stanmore had a relative risk that was very different to the clinical relative risk calculated in the review. The committee acknowledged that offering exercise programs may have a resource impact, the recommendation is likely to increase the number of people at risk of falling starting the exercise program.

The committee felt that the evidence around Tai Chi was too uncertain to make a recommendation. However, if a person was to start it privately, they should be encouraged to continue. Therefore, this should not have a resource impact.

1.1.12. Recommendations supported by this evidence review

This evidence review supports recommendations 1.3.1 to 1.3.12 in the NICE guideline.

Multicomponent/Multifactorial interventions for falls prevention in community care settings

1.1.13. Effectiveness evidence

1.1.13.1. Included studies

A total of 81 randomised controlled studies were included in this review, 53 multifactorial interventions and 28 multicomponent interventions. One Cochrane review (Hopewell 2018)[105] was identified in the search, which included 62 randomised trials (44 multifactorial interventions and 18 multicomponent interventions), while 18 additional RCTs found in our search were included to update the review (9 multifactorial and 9 multicomponent interventions). The Cochrane review describes that the difference between these interventions as: 1) multifactorial interventions where component interventions differ based on individual assessment of risk; or 2) multiple component interventions where the same component interventions are provided to all people.

Of the 53 studies that focused on multifactorial interventions 53 compared multifactorial interventions with control (Barker, 2019[10]; Beling, 2009[16]; Bhasin, 2020[19]; Bruce, 2021[24]; Carpenter, 1990[30]; Carter, 1997(unpublished); Ciaschini, 2009[36]; Close, 1999[42]; Coleman, 1999[44]; Daly, 2019[51]; Davison, 2005[56]; De Vries, 2010[60]; Elley, 2008[68]; Fabacher, 1994[69]; Fairhall, 2014[72]; Ferrer, 2014[74]; Gallagher, 1996[79]; Hendriks, 2008[101]; Hogan, 2001[104]; Huang, 2005[107]; Imhof, 2012[112]; Jitapunkul, 1998[116]; Kingston, 2001[124]; Ganz, 2022[80]; Lightbody, 2002[141]; Logan, 2010[149]; Lord, 2005[152]; Luck, 2013[154]; Markle-Reid, 2010[161]; Metzelthin, 2013[170]; Moller, 2014[173]; Newbury, 2001[179]; Palvanen, 2014[186]; Pardessus, 2002[187]; Rubenstein, 2007[199]; Russell, 2010[201]; Schrijnemaekers, 1995[206]; Sheffield, 2013[208]; Shyu, 2010[213]; Spice, 2009[218]; Stathi, 2022[221]; Taylor, 2021[230]; Tinetti, 1994[234]; Ueda, 2022[237]; Van Haastregt, 2000[240]; Van Rossum, 1993[241]; Vetter, 1992[244]; Vind, 2009[245]; Wagner, 1994[249]; Whitehead, 2003[256]; Williamson, 2022a[258]; Zijlstra, 2009[271]), 3 studies compared multifactorial interventions with exercise (Bruce, 2021[24]; Ciaschini, 2009[36]; Ueda, 2017.[238]

Of the 28 multicomponent studies, 7 compared exercise and psychological interventions to control (Faes, 2011[70]; Hagovska, 2016[93], Huang, 2011[108]; Lipardo, 2020[143]; Marrocco 2023[162]; Mendoza-Ruvalcaba, 2015[168]; Ng, 2015[180]), 4 compared exercise and education to control (Freiberger, 2012[77]; Huang, 2010[106]; Olsen, 2014; Sosnoff, 2015[217]), 6 compared exercise and home safety interventions to control (Campbell, 2005[29]; Clemson, 2004[38]; Day, 2002[57]; Waterman, 2016[253]; Wesson, 2013[255]; Wilder, 2001[257]), 1 compared nutrition and psychological interventions to control (Neelemaat, 2012)[178], 2 compared exercise and nutrition to control (Serra-Prat, 2017[207]; Uusi-Rasi, 2015[239]), 1 compared exercise and multiple component interventions (Arkkukangas, 2019a)[6], 1 compared exercise and exercise with vitamin D (Garcia-Gomariz, 2022)[81], 1 compared exercise and control (Hentschke, 2021)[102], 1 compared exercise and falls prevention programme to control (Oliveira, 2019)[183], 1 compared psychomotor interventions with exercise and psychomotor interventions (Rosado, 2021)[198], and 1 compared continence promotion interventions to control (Tannenbaum, 2019)[228].

Of the 53 multifactorial interventions 31 reported Rate of falls (Barker, 2019[10]; Beling, 2009[16]; Bruce, 2021[24]; Carpenter, 1990[30]; Close, 1999[42]; Davison, 2005[56]; Daly, 2019[51]; Elley, 2008[68]; Fairhall, 2014[72]; Ferrer, 2014[74]; Gallagher, 1996[79]; Ganz, 2022[80]; Hogan, 2001[104]; Lightbody, 2002[141]; Logan, 2010[149]; Lord, 2005[152]; Luck, 2013[154]; Markle-Reid, 2010[161]; Moller, 2014[173]; Palvanen, 2014[186]; Pardessus, 2002[187]; Rubenstein, 2007[199]; Russell, 2010[201]; Stathi, 2022[221]; Taylor, 2021[230]; Tinetti, 1994[234]; Ueda, 2017[238]; Ueda, 2022[237]; Vind, 2009[245]; Williamson, 2022a[258]; Zijlstra, 2009), 39 reported number of fallers (Barker, 2019[10]; Bruce, 2021[24]; Carter, 1997 (unpublished); Ciaschini, 2009[36]; Close, 1999[42]; Coleman, 1999[44]; Davison, 2005[56]; De Vries, 2010[60]; Elley, 2008[68]; Fabacher, 1994[69]; Fairhall, 2014; Ferrer, 2014[74]; Hendriks, 2008[101]; Hogan, 2001[104]; Huang, 2005[107]; Imhof, 2012[112]; Jitapunkul, 1998[116]; Kingston, 2001[124]; Lightbody, 2002[141]; Logan, 2010[149]; Lord, 2005[152]; Moller, 2014[173]; Newbury, 2001[179]; Palvanen, 2014[186]; Pardessus, 2002[187]; Russell, 2010[201]; Schrijnemaekers, 1995[206]; Shyu, 2010[213]; Spice, 2009[218]; Taylor, 2021[230]; Tinetti, 1994[234]; Ueda, 2017; Ueda, 2022[237]; Van Haastregt, 2000[240]; Vetter, 1992[244]; Vind, 2009[245]; Wagner, 1994[249]; Whitehead, 2003[256]; Zijlstra, 2009[271]), 13 reported the number of people sustaining a fall-related fracture (Barker, 2019[10]; Bhasin, 2020[19]; Bruce, 2021[24]; Ciaschini, 2009[36]; Davison, 2005[56]; De Vries, 2010[60]; Fairhall, 2014[72]; Hogan, 2001[104]; Logan, 2010[149]; Spice, 2009[218]; Taylor, 2021[230]; Vetter, 1992[244]; Williamson, 2022a[258]), 4 reported adverse events (Bhasin, 2020[19]; Fairhall, 2014[72]; Tinetti, 1994[234]; Zijlstra, 2009[271]), 23 reported quality of life outcomes (Close, 1999[42]; Coleman, 1999[44]; De Vries, 2010[60]; Elley, 2008[68]; Fairhall, 2014[72]; Gallagher, 1996[79]; Ganz, 2022[80]; Hendriks, 2008[101]; Huang, 2005[107]; Imhof, 2012[112]; Jitapunkul, 1998[116]; Kingston, 2001[124]; Lightbody, 2002[141]; Logan, 2010[149]; Markle-Reid, 2010[161]; Metzelthin, 2013[170]; Newbury, 2001[179]; Rubenstein, 2007[199]; Sheffield, 2013[208]; Shyu, 2010[213]; Spice, 2009[218]; Stathi, 2022[221]; Taylor, 2021[230]). Spice 2009[218] included two multifactorial arms, which were both included in the analyses. The control group was halved to avoid double counting of participants.

Of the 27 multicomponent interventions 13 reported rate of falls (Campbell, 2005[29]; Clemson, 2004[38]; Day, 2002[57]; Freiberger, 2012[77]; Hentschke, 2021[102]; Huang, 2011[108]; Lipardo, 2020[143]; Neelemaat, 2012[178]; Oliveira, 2019[183]; Rosado, 2021[198]; Tannenbaum, 2019[228]; Uusi-Rasi, 2015[239]; Waterman, 2016[253]), 15 reported number of fallers (Arkkukangas, 2019a; Campbell, 2005[29]; Clemson, 2004[38]; Day, 2002[57]; Faes, 2011[70]; Garcia-Gomariz, 2022[81]; Huang, 2010[106]; Huang, 2011[108]; Neelemaat, 2012[178]; Ng, 2015[180]; Olsen, 2014; Serra-Prat, 2017[207]; Sosnoff, 2015[217]; Waterman, 2016[253]; Wesson, 2013; Wilder, 2001), 3 reported number of people sustaining a fall related fracture (Garcia-Gomariz, 2022[81]; Neelemaat, 2012[178]; Wesson, 2013[255]), 5 reported adverse events (Campbell, 2005[29]; Freiberger, 2012[77]; Ng, 2015[180]; Uusi-Rasi, 2015[239]; Wesson, 2013[255]), 9 reported quality of life outcomes (Clemson, 2004[38]; Faes, 2011[70]; Hagovska, 2016[93]; Huang, 2011[108]; Mendoza-Ruvalcaba, 2015[168]; Oliveira, 2019[183]; Serra-Prat, 2017[207]; Tannenbaum, 2019[228]; Waterman, 2016[253]).

Campbell 2005[29] included two multicomponent arms (exercise, home safety plus nutrition and exercise plus nutrition, which were both included in the meta-analysis for multicomponent versus control. The control group was halved to avoid double counting of participants. Day 2002[57] included 4 multicomponent arms, which were compared to the control group which was quartered.

See also the study selection flow chart in Appendix C, study evidence tables in Appendix D, forest plots in Appendix E and GRADEpro tables in Appendix F.

1.1.13.2. Excluded studies

Two Cochrane reviews (Sherrington, 2019[210] and Gillespie 2012[85] were identified but were not included due to inappropriate interventions, Sherrington (2019)[210] included exercise interventions (Sherrington, 2019[210] and Gillespie 2012[85]) was superseded by the Hopewell Cochrane review[105] for multifactorial/multicomponent interventions.

See the excluded studies list in Appendix J.

1.1.14. Summary of studies included in the effectiveness evidence

Table 15: Summary of studies with multifactorial interventions included in the evidence review

The included studies focused on community-dwelling adults. Below are the studies which focused on multifactorial interventions.

Study	Intervention and comparison	Population	Outcomes	Comments
Barker, 2019[10] RCT (parallel) 2 Emergency departments	Multifactorial intervention: RESPOND program (n=217) Usual care (n=213) Follow-up: 12 months	Community-dwelling adults presenting at emergency department Mean age (SD): 73 years Sex (m/f): 55% female Setting: Australia	Rate of falls; number of fallers; number of people sustaining a fall-related fracture	
Beling, 2009[16] RCT (parallel) Single centre	Multifactorial intervention: Balance training to address risk factors, medication review, and home assessment for falls (n=12) Control (usual care) (n=11) Duration of study: follow-up: 3 months	Community-dwelling adults Mean age (SD): 80 (5.7) Sex: 42% women Setting: USA	Rate of falls	Study identified in Hopewell, 2018[105]
Bhasin, 2020[19] (STRIDE) Cluster RCT 86 primary care practices Ganz 2022[80, 101] Secondary paper	Multifactorial intervention: Standardised assessment of modifiable risk factors, recommendations for management of risk factors, care plan, and referral to community-based programs (43 practices; 2802 participants) Usual care (43 practices, 2649 participants) Duration of study: 24 months	Community-dwelling adults, 70 years or over Mean age: 80 years Sex: 62% women Setting: USA	People sustaining a fall-related fracture; serious adverse events	This study included fall-related injuries, which could be bone fractures or injuries leading to hospital. Only fall related fractures were extracted.

Study	Intervention and comparison	Population	Outcomes	Comments
Bruce, 2021[24];Lamb, 2020[132] (PreFIT) Cluster RCT	Multifactorial fall prevention programme: Falls history, balance and gait assessment, medication review Exercise Control Duration of study: follow-up: 18 months	Community-dwelling adults, 70 years and over Mean age (SD): 77.9 (5.7) years Sex (m/f): 4653/5150 Setting: 63 GP practices, UK	Rate of falls; number of fallers; number of people sustaining one or more fall related fractures; quality of life	Health Technology Assessment: three-arm cluster (general practice level) RCT.
Carpenter, 1990[30] RCT (parallel) Multiple centres	Multifactorial intervention: Referral to psychogeriatric day hospital or nursing services, and referral to aids for daily living (n=272) Control (no disability surveillance) (n=267) Duration of study: follow-up: 36 months	Community-dwelling adults Age: 75 years or over Sex (m/f): 65% women Setting: United Kingdom	Rate of falls	Study identified in Hopewell, 2018[105]
Carter, 1997 (unpublished data from the Hopewell 2018 Cochrane review) RCT (parallel) Study centre: unclear	Multifactorial intervention: Home assessment for falls risk with written summary of hazards and referral to local services to make changes, and medication review (n=220) Control (no intervention) (n=232) Duration of study: follow-up: 12 months	Community-dwelling adults identified from GP practice lists Age: 80 years + Sex (m/f): 66% women Setting: Australia	Number of people sustaining one or more falls	Study identified in Hopewell, 2018[105] This study included another arm: Action plan for home safety plus medication review.
Ciaschini, 2009[36] RCT (parallel)	Multifactorial intervention: Referral to physiotherapy (strengthening, gait	Community-dwelling adults at risk of a fall-related fracture	Number of people sustaining 1 or more falls; number of people sustaining 1 or	Study identified in Hopewell, 2018[105]

Study	Intervention and comparison	Population	Outcomes	Comments
Single study centre	and balance training, referral to activities such as Tai Chi), medication review, and referral to occupational therapy (cognitive assessment and home environmental assessment) (n=101) Control (usual care until 6 months then same as intervention) (n=100) Duration of study: follow-up 12 months	Mean age (SD): 72 (8.4) Sex (m/f): 94% women Setting: Canada	more fall-related fractures	12 months study but 6-month data used in analysis as control group offered the intervention after 6 months.
Close, 1999[42] RCT (parallel) Study centre: unclear	Multifactorial intervention: Medication review, cognition and depression assessment, and occupational therapy home visit assessing environmental hazards with home modifications (n=184) Control (usual care) (n=213) Duration of study: follow-up: 12 months	Community-dwelling individuals presenting at A&E after a fall. Admitted patients recruited after discharge. Mean age (SD): 78.2 (7.5) years Sex (m/f): 68% women Setting: United Kingdom	Rate of falls, number of people sustaining 1 or more falls; health-related quality of life	Study identified in Hopewell, 2018[105]
Coleman, 1999[44] Cluster-RCT (by Physician practice) Multiple centres	Multifactorial intervention: Problem solving on physical activity, session with pharmacist addressing polypharmacy and medications associated, problem solving on nutrition, and self-management skills	Community-dwelling adults Mean age: 77 years Sex (m/f): 49% women Setting: USA	Number of people sustaining 1 or more falls; health-related quality of life (SF-36 physical function)	Study identified in Hopewell, 2018[105]

Study	Intervention and comparison	Population	Outcomes	Comments
	and group problem solving (n=73) Control (usual care (n=96) Duration of study: follow-up: 12 months			
Daly, 2019[51] RCT (parallel)	Multifactorial intervention: Multicomponent exercise, osteoporosis education, and theory-based behavioural change programme(n=81) Usual care (n=81) Duration of study: 12-month intervention; 6 month follow-up	Community-dwelling adults with osteopenia or high risk of falls, 60 years or over Mean age (range): 67.4 (60 to 86 years) Sex (m/f): 73% female Setting: Melbourne, Australia	Rate of falls; number of fallers	
Davison, 2005[56] RCT (parallel) Study centres: unclear	Multifactorial intervention: Physiotherapist assessment of gait and balance, functional training programme, medication to achieve target blood pressure, medication review, neurological examination, and occupational therapy home visit assessing environmental hazards with home modifications and assistive devices (n=159) Control (usual care) (n=154) Duration of study: follow-up: 12 months	People presenting at A&E with a fall or fall-related injury Mean age (SD): 77 (7) Sex (m/f): 72% women Setting: United Kingdom	Rate of falls; number of people sustaining 1 or more falls; number of people sustaining 1 or more fall-related fractures	Study identified in Hopewell, 2018[105]
De Vries, 2010[60]	Multifactorial intervention: Balance and	People consulting emergency department or	Number of people sustaining 1 or more falls;	Study identified in Hopewell, 2018[105]

Study	Intervention and comparison	Population	Outcomes	Comments
RCT (parallel) Multiple centres	strength exercise, Vitamin D, medication review, and home hazard reduction (n=106) Control (usual care) (n=111) Duration of study: follow-up: 12 months	family physician after a fall Mean age (SD): 79.8 (7.35) Sex (m/f): 71% women Setting: The Netherlands	number of people sustaining 1 or more fall-related fractures; health-related quality of life (EQ-5D, SF-36 physical subscale)	
Elley, 2008[68] RCT (parallel) Multiple centres	Multifactorial intervention: Strength and balance exercise programme, vitamin D and calcium, medication review, and home hazard assessment with home modifications or referral to occupational therapist (n=155) Control (usual care and social visits) n=157 Duration of study: follow-up: 12 months	Patients from primary care practices Mean age (SD): 80.8 (5) Sex (m/f): 69% women Setting: New Zealand	Rate of falls, number of people sustaining 1 or more falls; health-related quality of life	Study identified in Hopewell, 2018[105]
Fabacher, 1994[69] RCT (parallel) Single centre	Multifactorial intervention: Gait and balance assessment, medication review, mental status examination, and home hazard assessment (n=131) Control (n=123) Duration of study: follow-up: 12 months	Men and women eligible for Veterans' medical care Mean age: 73 Sex (m/f): 2% women Setting: USA	Number of people sustaining 1 or more falls	Study identified in Hopewell, 2018[105]
Fairhall, 2014[72] RCT (parallel)	Multifactorial intervention: Physiotherapy visits, strength and balance training, referral to urinary	Participants discharged from aged care services	Rate of falls; number of people sustaining 1 or more falls; number of people sustaining 1 or	Study identified in Hopewell, 2018[105]

Study	Intervention and comparison	Population	Outcomes	Comments
Single centre	incontinence clinic, nutrition assessment and management, and home hazard assessment with home modifications, mobility aids and safety advice, and referral to an occupational therapist (n=120) Control (usual care) (n=121) Follow-up: 12 months	Mean age (SD): 83.3 (5.9) Sex (m/f): 67% women Setting: Australia	more fall-related fractures; health-related quality of life; adverse events of the intervention	
Ferrer, 2014[74] RCT (parallel) Single centre	Multifactorial intervention: Gait and balance assessment, referral for physical therapy, medication review, recommendations to discuss medication with physician, malnutrition screening, nutrition or vitamin supplementation, cognitive screening education, referral to physician for further cognitive testing, and home hazard assessment with home modifications and recommendations (n=164) Control (usual care) (n=164) Duration of study: follow-up: 12 months	Community-dwelling individuals Mean age: 81 years Sex (m/f): 61.6% women Setting: Barcelona, Spain	Rate of falls and number of people sustaining 1 or more falls	Study identified in Hopewell, 2018[105]
Gallagher, 1996[79] RCT (parallel)	Multifactorial intervention: Falls-reduction program with counselling interview, video and booklet and	Community-dwelling volunteers Mean age; 74.6 years	Rate of falls; health-related quality of life (SF-36)	Study identified in Hopewell, 2018[105]

Study	Intervention and comparison	Population	Outcomes	Comments
Study centres: unclear	results of risk assessment (n=100) Control (baseline interview and follow-up only: no intervention) (n=100) Duration of study: follow-up: 6 months	Sex (m/f): 80% women Setting: Canada		
Hendriks, 2008[101] RCT (parallel) Single centre	Multifactorial intervention: Assessment by rehabilitation physician and home hazard assessment with home modifications, mobility aids and safety advice, and referral to an occupational therapist (n=166) Control (usual care) (n=167) Duration of study: follow-up: 12 months	Community-dwelling adults Mean age (SD): 74.8 (6.4) Sex (m/f): 68% women Setting: the Netherlands	Number of people sustaining 1 or more falls and health-related quality of life (EQ-5D)	Study identified in Hopewell, 2018[105]
Hogan, 2001[104] RCT (parallel) Study centres: unclear	Multifactorial intervention: Balance and gait assessment, referral to exercise class, recommendations for home exercise, medication review, neurological screening, home hazard assessment with recommendations, and advice on assistive devices (n=79) Control (usual care) (n=84)	Community-dwelling men and women Mean age (SD): 77.6 (6.8) years Sex (m/f): 72% women Setting: Canada	Rate of falls; number of people sustaining 1 or more falls; number of people who experience 1 or more fall-related fractures	Study identified in Hopewell, 2018[105]

Study	Intervention and comparison	Population	Outcomes	Comments
	Duration of study: follow-up: 14 months			
Huang, 2005[107] RCT (parallel) Single centre	Multifactorial intervention: Assessment of rehabilitation facility needs, education on medication, and education on environmental safety, assistance devices (n=70) Control (usual discharge planning by nurses, no brochures, written discharge summaries, home visits or phone calls) (n=71) Duration of study: follow-up: 3 months	Community-dwelling adults Mean age (SD): 77 (7.6) Sex: 69% women Setting: Taiwan	Number of people sustaining 1 or more falls; health-related quality of life (SF-36)	Study identified in Hopewell, 2018[105]
Imhof, 2012[112] RCT (parallel) Single centre	Multifactorial intervention: Mobility assessment, pain assessment, nutrition and bladder control assessments, and cognitive screening (n=231) Control (standard care) (n=230) Duration of study: follow-up: 9 months	Community-dwelling adults Mean age: 85 years Sex: 73% women Setting: Switzerland	Number of people who experienced 1 or more falls; health-related quality of life	Study identified in Hopewell, 2018[105]
Jitapunkul, 1998[116] RCT (parallel) Study centres: unclear	Multifactorial intervention: Nurse-provided rehabilitation programme, medication prescription, and assistive aids (n=80) Control (No intervention) (n=80)	Community-dwelling adults Mean age (SD): 75.6 (5.8) Sex: 65% women Setting: Thailand	Number of people who experienced 1 or more falls; health-related quality of life (Barthel Index)	Study identified in Hopewell, 2018[105]

Study	Intervention and comparison	Population	Outcomes	Comments
	Duration of study: follow-up: 36 months			
Kingston, 2001[124] RCT (parallel) Single centre	Multifactorial intervention: Advice on exercise to strengthen muscles and joints, pain control advice, medication, advice on risk factors related to drugs, advice on diet and vitamin supplementation, and education on environmental risks in the home (n=60) Control (usual post-fall treatment) (n=49) Duration of study: follow-up: 3 months	Community-dwelling adults presenting at A&E with a fall Mean age: 71.9 years Sex: 100% women Setting: United Kingdom	Number of people who experienced 1 or more falls; health-related quality of life	Study identified in Hopewell, 2018[105]
Lightbody, 2002[141] RCT (parallel) Single centre	Multifactorial intervention: Balance and mobility assessment, referral to physiotherapy, advised on simple exercises, medication review, and home hazard assessment with home modifications and recommendations (n=171) Control (usual care) (n=177) Duration of study: 6 months	Community-dwelling patients attending A&E with a fall Median age (IQR): 75 (70 to 81) years Sex: 74% women Setting: United Kingdom	Rate of falls; number of people sustaining one or more falls; health-related quality of life (Barthel Index)	Study identified in Hopewell, 2018[105]
Logan, 2010[149] RCT (parallel) Study centres: unclear	Multifactorial intervention: Strength and balance training, medication review, and home hazard assessment with home modifications and	Community-dwelling adults Median age (IQR): 83 (77 to 86) Sex: 65% women Setting: United Kingdom	Rate of falls; number of people sustaining one or more falls; number of people sustaining a fall-related fracture; health-related quality of life (Barthel Index)	Study identified in Hopewell, 2018[105]

Study	Intervention and comparison	Population	Outcomes	Comments
	recommendations (n=102) Control (no intervention) n=102) Duration of study: follow-up: 12 months			
Lord, 2005[152] RCT (parallel) Single centre	Multifactorial intervention: extensive intervention: individualised strength and balance exercise programme, referral for cataract surgery, advice on environmental risks n=210 Control (no intervention) (n=204) Duration of study: follow-up: 12 months	Community-dwelling adults Mean age (SD): 80.4 (4.5) Sex: 66% women Setting: Australia	Rate of falls; number of people sustaining one or more falls	Study identified in Hopewell, 2018[105] The study included another arm: minimal intervention: where participants received a report outlining their fall risk, test results and specific recommendations on preventing falls based on tests (n=206)
Luck, 2013[154] RCT (parallel) Multiple centres	Multifactorial intervention: Consultation with a nutritionist (n=150) Control (no preventive home visits) (n=155) Duration of study: follow-up: 18 months	Community-dwelling adults Mean age (SD): 85.3 Sex: 68.5% women Setting: Germany	Rate of falls	Study identified in Hopewell, 2018[105]
Markle-Reid, 2010[161] RCT (parallel) Multiple centres	Multifactorial intervention: Home support exercise programme, advice to consider vitamin D and calcium supplementation, medication review and modification, incontinence assessment, referral to GP, education on pelvic floor exercises,	Adults referred to home support services Age range: 75 to 84 Sex: 72% women Setting: Canada	Rate of falls; health-related quality of life (SF-36)	Study identified in Hopewell, 2018[105]

Study	Intervention and comparison	Population	Outcomes	Comments
	nutrition assessment, referral to dietician, cognitive assessment, referral to physician or community mental health services, home hazard assessment with home modifications and recommendations (n=54) Control (usual care) (n=55) Duration of study: follow-up: 6 months			
Metzelthin, 2013[170] Cluster RCT Multiple centres	Multifactorial intervention: Assessment by physiotherapist, advice on daily physical activity, and assessment by occupational therapist, and recommendations on environmental adaptations (n=193) Control: usual care (n=153) Duration of study: follow-up: 24 months	Community-dwelling frail older adults Mean age (SD): 77.2 (5.1) Sex: 58% women Setting: The Netherlands	Health-related quality of life	Study identified in Hopewell, 2018[105]
Moller, 2014[173] RCT (parallel) Multiple centres	Multifactorial intervention: Tailored exercise programme, referral to physical therapist, and home hazard assessment with home modifications and recommendations, and referral to occupational therapist(n=80) Control: usual care (n=73)	Community-dwelling adults Mean age (SD): 81.5 (6.4) years Sex: 67% women Setting: Sweden	Rate of falls and number of people sustaining one or more falls	Study identified in Hopewell, 2018[105]

Study	Intervention and comparison	Population	Outcomes	Comments
	Duration of study: follow-up: 12 months			
Newbury, 2001[179] RCT (parallel) Multiple centres	Multifactorial intervention: Health assessment with report delivered to patient's GP (n=50) Control (no health assessment) (n=50) Duration of study: follow-up: 12 months	Community-dwelling adults Median age (range): IG: 78.5; CG: 80 (75-91) Sex: 63% women Setting: Australia	Number of people sustaining 1 or more falls; health-related quality of life	Study identified in Hopewell, 2018[105]
Palvanen, 2014[186] RCT (parallel) Multiple centres	Multifactorial intervention: Physical activity prescription, individually tailored or group exercise, medication review, referral for cataract surgery, nutritional advice, home hazard assessment with home modifications and recommendations, and referral to occupational therapist (n=661) Control (baseline assessment and brochure alone) (653) Duration of study: follow-up: 12 months	Home-dwelling adults Mean age (SD): 77 (5.7) Sex: 86% women Setting: Finland	Rate of falls; number of people sustaining 1 or more falls	Study identified in Hopewell, 2018[105]
Pardessus, 2002[187] RCT (parallel) Single centre	Multifactorial intervention: Physical therapy, medication review, cognitive assessment, home hazard assessment with home modifications and recommendations (n=30)	Community-dwelling adults Mean age (SD): 83.2 (7.7) Sex: 78.3% women Setting: France	Rate of falls and number of people sustaining 1 or more falls	Study identified in Hopewell, 2018[105]

Study	Intervention and comparison	Population	Outcomes	Comments
	Control (usual care) (n=30) Duration of study: follow-up: 12 months			
Rubenstein, 2007[199] RCT (parallel) Single centre	Multifactorial intervention: Physiotherapy assessment of falls and gait impairment, urinary incontinence assessment treatment overseen by expert geriatrician, cognitive assessment, referral for mental health support, and referral to geriatric psychiatrist (n=380) Control (usual care) (n=412) Duration of study: follow-up: 12 months	Community-dwelling adults Mean age (SD): 74.5 (6) years Sex: 3% women Setting: USA	Rate of falls; number of people sustaining 1 or more falls; health-related quality of life (SF-36)	Study identified in Hopewell, 2018[105]
Russell, 2010[201] RCT (parallel) Multiple centres	Multifactorial intervention: Referral to physiotherapy, medication review, referral to GP, referral to dietetics, and referral to occupational therapy, and advice on minor home improvements (n=351) Control (standard care) (n=361) Duration of study: follow-up: 12 months	Community-dwelling adults presenting at emergency department Age range: 13% 60 to 64; 17% 65 to 70; 19% 70 to 74; 19% 75 to 79; 32% 80 or over Sex70% women Setting: Australia	Rate of falls and number of people sustaining 1 or more falls	Study identified in Hopewell, 2018[105]
Schrijnemaekers, 1995[206] RCT (parallel) Single centre	Multifactorial intervention: Referral to physiotherapy, advice to stop/ start medication,	Community-dwelling adults and residential care adults	Number of people sustaining recurrent falls	Study identified in Hopewell, 2018[105]

Study	Intervention and comparison	Population	Outcomes	Comments
	medication review, advice on diet, and referral to a psychologist (n=110) Control (usual care) (n=112) Duration of study: follow-up: 36 months	Age range; 70% aged 77 to 84; 30% 85 or over Sex: 70% women Setting: the Netherlands		
Sheffield, 2013[208] RCT (parallel) Single centre	Multifactorial intervention: Training in medication management and home hazard assessment with home modifications and recommendations, and provision of assistive devices (n=46) Control (delayed intervention) (n=44) Duration of study: follow-up: 3 months	Community-dwelling adults Mean age (SD): 81.67 (9.46) Sex: 80% women Setting: USA	Health-related quality of life	Study identified in Hopewell, 2018[105]
Shyu, 2010[213] RCT (parallel) Single centre	Multifactorial intervention: Rehabilitation plan including exercise to increase physical fitness and home exercise sessions by nurses, suggestions on antibiotics, medication review, suggestions to surgeon regarding time of hip fracture surgery, suggestions on urinary tract management, nutrition assessment, suggestions on nutrition management, cognitive assessment, and suggestions on	Community-dwelling adults admitted to hospital for an accidental single side hip fracture Mean age (SD): 78.2 (7.8) Sex: 69% women Setting: Taiwan	Number of people sustaining 1 or more falls; health-related quality of life (SF-36)	Study identified in Hopewell, 2018[105]

Study	Intervention and comparison	Population	Outcomes	Comments
	delirium management and prevention (n=80) Control (usual care) (n=82) Duration of study: follow-up: 12 months			
Spice, 2009[218] Cluster RCT Multiple centres	Multifactorial intervention: Mobility assessment referral to occupational therapist or physiotherapist, medication changes, medication review, referral to GP, environmental hazard screening, referral to occupational therapist or council-run home hazard assessment with home modifications In a primary care setting (n=141) In a secondary care setting (n=213) Control (usual care) (n=162) Duration of study: follow-up: 12 months	Community-dwelling adults Mean age: 82 years Sex: NR Setting: United Kingdom	Number of people sustaining 1 or more falls; number of people sustaining 1 or more fall-related fractures; health-related quality of life	Study identified in Hopewell, 2018[105] 3-arm trial with 2 multifactorial arms (primary and secondary care setting).
Stathi, 2022[221]	Multifactorial intervention: Exercise and behavioural intervention (n= 410) Control (brief advice) (n= 367) Duration of study: 24 months	Community-dwelling adults with reduced lower limb functioning Mean age (SD): 77.6 (6.8) Sex (m/f): 263/514 Setting: UK	Rate of falls, health related quality of life	
Tan, 2018[227]	Multifactorial intervention:	Community-dwelling adults	Rate of falls	

Study	Intervention and comparison	Population	Outcomes	Comments
	Footwear modification, medication review and falls education (cardiovascular, visual, Otago exercises, and home hazards modifications, if required)(n=134) Control (conventional treatment) (n= 134) Duration of study: 12 months	Mean age (SD): 75.3 (7.2) Sex: 68% female Setting: Malaysia		
Taylor, 2021[230]	Multifactorial intervention: Exercise and home hazard reduction programme Control (usual care) Follow-up: Duration of study:	Community-dwelling adults with cognitive impairment Mean age (SD): 82 (82-83) Sex (m/f): 49% female Setting:Australia	Rate of falls, Number of fallers, Number of people sustaining a fall related fracture, health related quality of life	
Tinetti, 1994[234] Cluster RCT Multiple centres	Multifactorial intervention: Home visits for physical therapy, balance and strengthening exercises, recommendation to adjust medication, medication review, and environmental hazard screening, home modifications, and training in transfer skills (n=153) Control (visits by social work student) (n=148) Duration of study: follow-up: 12 months	Community-dwelling adults Mean age (SD): 77.9 (5.3) Sex : 69% women Setting: USA	Rate of falls; number of people sustaining 1 or more falls; adverse events	Study identified in Hopewell, 2018[105]
Ueda, 2022[237]	Multifactorial intervention: physical therapist-led education programme (n = 27)	Discharged orthopaedic patients	Rate of falls; number of fallers	

Study	Intervention and comparison	Population	Outcomes	Comments
	Control (usual care) (n= 26) Follow-up: 1 months post DC from hospital	Mean age (SD): 76.5 (6.8) Sex: 72% female Setting: Japan		
Ueda, 2017 RCT (parallel) Single centre	Multifactorial intervention: Exercise and home hazard assessment with recommendations (n=30) Exercise (n=30) Duration of study: follow-up: 1 month	Discharged orthopaedic patients Mean age: 75.9 Sex: 68.5% women Setting: Japan	Rate of falls; number of people sustaining 1 or more falls	Study identified in Hopewell, 2018[105]
Van Haastregt, 2000[240] RCT (parallel) Multiple centres	Multifactorial intervention: Mobility assessment, advice on improving mobility, medication review, referral to GP, nutrition assessment, advice on diet, cognitive assessment, advice on psychiatric symptoms, referral to mental health care, and home hazard assessment with recommendations (n=159) Control (usual care) (n=157) Duration of study: follow-up: 18 months	Community-dwelling adults Mean age (SD): 77.2 (5.1) Sex: 66% women Setting: The Netherlands	Number of people sustaining 1 or more falls	Study identified in Hopewell, 2018[105]
Van Rossum, 1993[241] RCT (but some clusters as people living together allocated to same group)	Multifactorial intervention: Medication review, and referral to GP (n=292) Control (no home visits) (n=288)	Community-dwelling adults Age range: 75 to 84 years Sex: 58% women Setting: The Netherlands	Number of people who experienced a fall that required hospitalisation	Study identified in Hopewell, 2018[105]

Study	Intervention and comparison	Population	Outcomes	Comments
Study centres: unclear	Follow-up: 36 months Duration of study:			
Vetter, 1992[244] RCT (parallel) Single centre	Multifactorial intervention: Fitness classes, medication review, dietary advice, and home hazard assessment with home modifications (n=350 Control (usual care) (n=324) Duration of study: follow-up: 48 months	Community-dwelling adults Mean age: >70 years Sex: NR Setting: United Kingdom	Number of people who experienced 1 or more falls; number of people who experienced 1 or more fall-related fractures	Study identified in Hopewell, 2018[105]
Vind, 2009[245] RCT (parallel) Single centre	Multifactorial intervention: Strength and balance training, drug modification correction of vitamin deficiency, medication review, neurological screening, and referral to neurologist (n=196) Control (usual care) (n=196) Duration of study: follow-up: 12 months	Community-dwelling adults treated at the emergency department or admitted to hospital because of a fall Mean age (SD): Sex: 74% women Setting: Denmark	Rate of falls; number of people sustaining 1 or more falls	Study identified in Hopewell, 2018[105]
Wagner, 1994[249] RCT (parallel) Multiple centres	Multifactorial intervention: Exercise orientation class, recommendation to adjust medication, medication review, and home hazard assessment with recommendations (n=635) Control (usual care) (n=607) Duration of study: follow-up: 24 months	Community-dwelling adults Mean age: 72 years Sex: 59% women Setting: USA	Number of people sustaining 1 or more falls	Study identified in Hopewell, 2018[105] One arm was not included (Chronic disease prevention nurse visit, as an ineligible comparator).

Study	Intervention and comparison	Population	Outcomes	Comments
Whitehead, 2003[256] RCT (parallel) Single centre	Multifactorial intervention: Exercise programme, medication review, referral to GP, and home hazard assessment with recommendations (n=70) Control (standard care) (n=70) Duration of study: follow-up: 6 months	Community-dwelling adults Mean age (SD): 77.8 (7.0) Sex: 71% women Setting: Australia	Number of people sustaining 1 or more falls	Study identified in Hopewell, 2018[105]
Williamson, 2022a[258] (BOOST) Parallel RCT Participants from 15 NHS Trusts in England	Multifactorial intervention: physical and psychological group programme (n=292) delivered by a Physiotherapist in 12 group sessions of 90 minutes, over 12 weeks. Control (best practice advice) (n=143) Follow-up: 12 months	Community-dwelling adults, 65 years and over with symptoms consistent with Neurogenic Claudication Mean age (SD): 74.9 (6.0) years Sex: 56.6% women Setting: England	Rate of falls; Number of people sustaining one or more fractures	
Zijlstra, 2009[271] RCT (parallel) Multiple centres	Multifactorial intervention: Low intensity physical exercise, cognitive behavioural group intervention, and home environment changes to reduce falls risk (n=280) Control (no intervention) (n=260) Duration of study: follow-up: 14 months	Community-dwelling adults Mean age (SD): IG 77.8 (4.6); CG 78 (5.0) years Sex : IG 71% women; CG 73% women Setting: The Netherlands	Rate of falls; number of people sustaining 1 or more falls; adverse events	Study identified in Hopewell, 2018[105]

The included studies focused on community-dwelling adults. Below are the studies which focused on multiple component interventions.

1 **Table 16: Summary of studies with multicomponent interventions included in the**
2 **evidence review**

Study	Intervention and comparison	Population	Outcomes	Comments
Arkkukangas, 2019a[6] and Arkkukangas, 2019b[8]	Exercise (Otago Exercise Programme) (n=61) Multiple component intervention (Otago Exercise Programme + motivational interviewing) (n=58) Usual care (n=56) Duration of study: follow-up: 12 months	Community-dwelling adults Mean age (SD): 83 (4.7) years Sex (m/f): 70% female Setting: Sweden	Number of fallers	
Campbell, 2005[29] RCT (2x2 factorial design) Multiple centres	Exercise, home safety and nutrition (n=97) Exercise and nutrition (n=98) Attention control (social visits) (n=96) Duration of study: follow-up: 12 months	Community-dwelling men and women with severe visual impairment identified in blind register Mean age (SD): 83.6 (4.8) Sex (m/f): 68% women Ethnicity: Setting: New Zealand	Rate of falls: number of people sustaining one or more falls; adverse events	Study identified in Hopewell, 2018[105] 3 arm trial, where 2 were multicomponent interventions.
Clemson, 2004[38] RCT (parallel) Multiple centres	Exercise, home safety, and vision (n=157) Attention control (n=153) Duration of study: follow-up: 14 months	Community-dwelling adults Mean age (SD): 78 (5) years Sex (m/f): 74% women Setting: Australia	Rate of falls; number of people sustaining 1 or more falls; health-related quality of life (SF-36, 0-100 mental and physical subscales)	Study identified in Hopewell, 2018[105]
Day, 2002[57] RCT (2x2 factorial design) Multiple centres	Exercise, home safety, and vision Exercise + Home hazard management (n=135)	Community-dwelling adults Mean age (SD): 76.1 (5.0) years Sex (m/f): 60% women Setting: Australia	Rate of falls; number of people sustaining 1 or more falls	Study identified in Hopewell, 2018[105] Exercise, home hazard management and vision improvement interventions were added compared to control.

Study	Intervention and comparison	Population	Outcomes	Comments
	Exercise + vision improvement (n=136) Vision improvement + home hazard management (n=137) Vision improvement + home hazard management (n=135) Control (no intervention) n=137 Duration of study: follow-up: 18 months			
Faes, 2011[70] RCT (parallel) Multiple centres	Exercise and psychological interventions Control (usual care) Duration of study: follow-up: trial terminated due to “extremely difficult recruitment”	Patients recruited from geriatric outpatient clinics Mean age (SD): 78.3 (7) years Sex (m/f): 70% women Setting: The Netherlands	Number of people sustaining 1 or more falls; health-related quality of life (EQ-5D)	Study identified in Hopewell, 2018[105]
Freiberger, 2012[77] RCT (parallel) Single centre	Exercise and education Strength and balance exercises (n=73) Strength and balance + endurance training (n=64) Strength and balance plus fall-risk education (n=83) Control (no intervention)(n=80) Duration of study: follow-up: 24 months	Community-dwelling adults Mean age (SD): 76.1 (4.1) Sex: 44% women Setting: Germany	Rate of falls; adverse events	Study identified in Hopewell, 2018[105] Data were not included in the Hopewell Cochrane for Rate of falls because they only reported during interval period (12 to 24 months).

Study	Intervention and comparison	Population	Outcomes	Comments
Garcia-Gomariz, 2022[81]	High impact training (n = 9) High impact training with vitamin D (n= 16) Walking with vitamin D (n= 14) Duration of study: 2 years	Postmenopausal women with osteopenia Mean age (SD): 61.8 (7.2) years Sex: 0/100 Setting: Spain	Number of fallers, number of people sustaining fall related fractures	
Guerra, 2021[91]	Home safety and psychological component (n= 58) Control group (no details) (n=60) Duration of study: follow-up: 3 months	Adults with arterial hypertension Mean age (range): 65-69 range: 61% 70-75 range: 39% Sex: 66.9% female Ethnicity: 81.4% were black, 18.5% white Setting: Brazil	Rate of falls	
Hagovska, 2016[93] RCT (parallel) Single centre	Exercise and psychological interventions (n=40) Control (usual care) (n=40) Duration of study: follow-up: 2½ months	Elderly patients with mild cognitive impairment Mean age: 67.07 years Sex: 48.5% women Setting: Slovak Republic	Health-related quality of life	Study identified in Hopewell, 2018[105]
Hentschke, 2021[102]	Exercise (n= 212) Control (n= 144) Duration of study: 24 months	Community-dwelling adults with high risk of falling Mean age (SD): 78.1 (5.9) Sex: 75.4% female Setting: Germany	Rate of falls	

Study	Intervention and comparison	Population	Outcomes	Comments
Huang, 2010[106] Cluster RCT (cluster 4 villages) Multiple centres	Exercise and education Tai Chi Chuan + education (n=95) Usual care and exercise) (n=50) Duration of study: follow-up: 18 months	Community-dwelling adults Mean age (SD): 71.5 (0.64) Sex: 48% women Setting: Taiwan	Number of people sustaining 1 or more falls	Study identified in Hopewell, 2018[105] There were 4 arms in trial but only one was multifactorial and included in the analysis versus usual care and exercise.
Huang, 2011[108] RCT (parallel) Study centres: unclear	Exercise and psychological Cognitive behavioural intervention + intense Tai Chi (n=62) Control (no intervention) (n=62) Duration of study: follow-up: 5 months	Community-dwelling adults Mean age (SD): NR Sex: 59% women Setting: Taiwan	Rate of falls; number of people sustaining 1 or more falls; health-related quality of life (WHOQOL-BREF 16)	Study identified in Hopewell, 2018[105] Another arm (Cognitive behavioural intervention) was not included in this review but is in the psychological interventions review.
Lipardo, 2020[143]	Physical and cognitive training (n=23) Control (n= 23) Duration of study: 12 weeks + 6 months follow up	Community-dwelling adults with mild cognitive impairment Mean age (SD): 69 (8.3) Sex: 79% female Setting: Philippines	Rate of falls	
Marrocco 2023[162] RCT (parallel) Multiple centres	Exercise, medication review and home safety n=603 Control n=622	Community-dwelling adults Mean age (SD): IG 59.3 (4.4) and CG 59.5 (4.4) years Sex % female: IG 23.2%, CG 24% Setting: Switzerland	Rate of falls, number of people sustaining 1 or more falls; number of people sustaining 1 or more fall-related fractures	

Study	Intervention and comparison	Population	Outcomes	Comments
Mendoza-Ruvalcaba, 2015[168] RCT (parallel) Multiple centres	Exercise, nutrition, and psychological intervention (n=36) Wait list (n=36) Duration of study: follow-up: 6 months	Community-dwelling adults Mean age: 70.6 years Sex (m/f): 89% women Setting: Mexico	Health-related quality of life (Spanish version of Quality of Life Index 0-30)	Study identified in Hopewell, 2018[105]
Neelemaat, 2012[178] RCT (parallel) Multiple centres	Nutrition and psychological intervention (n=105) Control (usual care) (n=105) Duration of study: follow-up: 3 months	Community-dwelling adults admitted to acute care hospital Mean age (SD): 74.5 (9.5) years Sex: NR Setting: The Netherlands	Rate of falls; number of people sustaining 1 or more falls; number of people sustaining 1 or more fall-related fractures	Study identified in Hopewell, 2018[105]
Ng, 2015[180] RCT (parallel) Single centre	Exercise, nutrition, and psychological intervention Combination: physical activity, nutritional supplements, cognitive training (n=49) Resistance and balance exercises (n=48) Usual care (placebo) (n=50) Duration of study: follow-up: 12 months	Community-dwelling adults Mean age (SD): 70 (4.7) years Sex: 61% women Setting: Singapore	Number of people sustaining 1 or more falls; adverse events	Study identified in Hopewell, 2018[105] 5 study arms (3 eligible
Oliveira, 2019[183]	Exercise and falls prevention programme (n= 56) Control (n= 58) Duration of study: 6 months	Community-dwelling adults Mean age (SD): 71.5 (6.5) years Sex: 80.0% female Setting: Australia	Rate of falls; health related quality of life	

Study	Intervention and comparison	Population	Outcomes	Comments
Olsen, 2014 RCT (parallel) Single centre	Exercise and education (n=47) Control (usual care)(n=42) Duration of study: follow-up: 12 months	Community-dwelling women recruited from osteoporosis outpatient clinic Mean age: 71 years Sex: 100% women Setting: Norway	Number of people sustaining 1 or more falls; adverse events	Study identified in Hopewell, 2018[105]
Rosado, 2021[198]	Psychomotor intervention (n=16) exercise and psychomotor intervention (n = 16) Usual care (n= 19) Duration of study: 24 weeks +12 week follow up	Community-dwelling adults Mean age (SD): 75.4 (5.6) Sex: 73% female Setting: Portugal	Rate of falls	
Serra-Prat, 2017[207] RCT (parallel) Multiple centres	Exercise and nutrition (n=80) Usual care (n=92) Duration of study: follow-up: 12 months	Non-institutionalised adults Mean age: 78.3 Sex: 57% women Setting: Spain	Number of people sustaining 1 or more falls; health-related quality of life (QoL VAS); adverse events	Study identified in Hopewell, 2018[105]
Sosnoff, 2015[217] RCT (2x2 factorial design) Single centre	Home-based exercise on balance and muscle strength (n=11) Exercise and education (n=8) Waiting list control (usual care) (n=(9) Duration of study: follow-up: 6 months	Community-dwelling adults with neurologist-confirmed multiple sclerosis Mean age (SD): 62.3 (8.7) Sex: 65% women Setting: Canada	Number of people sustaining 1 or more falls	Study identified in Hopewell, 2018[105]

Study	Intervention and comparison	Population	Outcomes	Comments
Tannenbaum, 2019[228]	Continence promotion intervention (n= 461) Control (n= 448) Duration of study: 1 year	Community-dwelling women with urinary incontinence Mean age (SD): 78.0 (NR) Sex: 100% female Setting: multi-site (Canada, UK, France)	Number of fallers, health related quality of life	
Uusi-Rasi, 2015[239] RCT (2x2 factorial design) Multiple centres	Exercise and nutrition (vitamin D) (n=102) Exercise with placebo (n=103) Duration of study: follow-up: 24 months	Community-dwelling adults Mean age: 74.2 Sex: 100% women Setting: Finland	Rate of falls; adverse events	Study identified in Hopewell, 2018[105]
Waterman, 2016[253] RCT (parallel) Study centres: unclear	Exercise and home safety (n= 17) Control (usual care plus social visits) (n= 16) Duration of study: follow-up: 6 months	Community-dwelling adults recruited from low-vision clinics Mean age (SD): 81.4 (7.6) Sex: 61% women Setting: United Kingdom	Rate of falls; number of people sustaining 1 or more falls; health-related quality of life (SF-12); adverse events	Study identified in Hopewell, 2018[105]
Wesson, 2013[255] RCT (pilot study) Single centre	Exercise and home safety (n=11) Control (usual care (n=11) Duration of study: Follow-up: 3 months	Community-dwelling adults with specialist diagnosis of dementia or an Addenbrooke’s Cognitive Examination (ACE-R) score ≤82 Mean age (SD): 75.9 Sex: 41% women Setting: Australia	Number of people sustaining 1 or more falls; number of people sustaining a fall-related fracture; adverse events	Study identified in Hopewell, 2018[105]
Wilder, 2001[257] RCT (parallel)	Exercise and home safety Control (usual care)	Community-dwelling adults	Number of people sustaining 1 or more falls	Study identified in Hopewell, 2018[105] Abstract only.

Study	Intervention and comparison	Population	Outcomes	Comments
Study centres: unclear	n=60 Duration of study: follow-up: 9 months	Mean age (SD): NR Sex: NR Setting: USA		

See Appendix D for full evidence tables.

1.1.15. Summary of the effectiveness evidence

Table 17: Clinical evidence summary: Multifactorial intervention vs. usual care or attention control

Outcomes	№ of participants (studies) Follow up	Certainty of the evidence (GRADE)	Relative effect (95% CI)	Anticipated absolute effects		Comments
				Risk with usual care	Risk difference with Multifactorial intervention	
Rate of falls	18460 (27 RCTs)	⊕◯◯◯ Very low[a,b,c]	**Rate ratio 0.81** (0.73 to 0.90)	-	**-**	MID: 0.8 to 1.25 (precision: CI crosses 1 MIDs) **No clinical benefit**
Number of people sustaining one or more falls	22775 (37 RCTs)	⊕◯◯◯ Very low[d]	**RR 0.96** (0.91 to 1.01)	-	**-**	MID: 0.8 to 1.25 (precision: CI crosses 0 MIDs) **No clinical difference**
Number of people sustaining a fall-related fracture	14465 (14 RCTs)	⊕⊕◯◯ Low[c,e]	**RR 0.81** (0.70 to 0.94)	-	**-**	MID: 0.8 to 1.25 (precision: CI crosses 1 MIDs) **No clinical benefit**
Health-related quality of life: endpoint score (SF-36, 0-100 with 0 being the worst and 100 being the best)	2373 (9 RCTs)	⊕⊕◯◯ Low[f,g]	-	-	SMD **0.19 higher** (0.03 higher to 0.35 higher)	MID: 0.5 x SMD= +/- 0.095 (precision: CI crosses 1 MIDs) **No clinical difference**
Health-related quality of life (mental): endpoint score(SF-36 and SF-12, 0-100 with 0	7528 (5 RCTs)	⊕⊕◯◯ Low[c,g,h]	-	-	SMD **0.11 higher** (0.05 lower to 0.27 higher)	MID: 0.5 x SMD= +/- 0.055 (precision: CI crosses 1 MIDs)

Outcomes	**№ of participants (studies) Follow up**	**Certainty of the evidence (GRADE)**	**Relative effect (95% CI)**	**Anticipated absolute effects**		**Comments**
				Risk with usual care	**Risk difference with Multifactorial intervention**	
being the worst and 100 being the best)						**No clinical difference**
Health-related quality of life (physical): endpoint score(SF-36 and SF-12, 0-100 with 0 being the worst and 100 being the best)	7528 (5 RCTs)	⨁◯◯◯ Very low[b,c,h]	-	-	SMD **0.16 higher** (0.08 lower to 0.40 higher)	MID: 0.5 x SMD= +/- 0.08 (precision: CI crosses 1 MID) **No clinical difference**
Health-related quality of life endpoint score (EQ-5D) (0-1, with 0 being the worst and 1 being the best)	5760 (2 RCTs)	⨁⨁◯◯ Low[c]	-	-	**SMD 0.02** higher (-0.03 lower to 0.07 higher)	MID: 0.5 x SMD= +/- 0.01 (precision: CI crosses 0 MIDs) **No clinical difference**
Adverse events (overall)	10902 (1 RCT)	⨁⨁⨁◯ Moderate[h]	**RR 1.01** (0.85 to 1.20)	-	**-**	MID: 0.8 to 1.25 (precision: CI crosses 1 MIDs) **No clinical difference**
Adverse events: Death	5451 (1 RCT)	⨁⨁⨁◯ Moderate[h]	**RR 1.01** (0.85 to 1.20)	-	**-**	MID: 0.8 to 1.25 (precision: CI crosses 1 MIDs) **No clinical difference**
Adverse events: Hospitalisation	5451 (1 RCT)	⨁⨁⨁◯ Moderate[h]	**RR 0.97** (0.91 to 1.04)	-	**-**	MID: 0.8 to 1.25 (precision: CI crosses 0 MIDs) **No clinical difference**

a. Downgraded by 2 increments for risk of bias due to incomplete outcome data, participants and people delivering the intervention were aware of the assigned intervention, blinding of outcome assessment, method of ascertaining falls, selective reporting, and unclear allocation concealment.

b. Downgraded by 2 increments due to very serious heterogeneity unexplained by subgroup analysis

c. Downgraded by 1 increment if the confidence interval crossed one MID or by 2 increments if the confidence interval crossed both MIDs. The MIDs were 0.8 to 1.25 for dichotomous outcomes or 0.5 x median baseline SD (or 0.5 x SMD where no baseline values given) for continuous outcomes.

d. Downgraded by 2 increments for risk of bias due to incomplete outcome data, outcome assessment was not blinded, incorrect analysis for cluster randomisation, participants and people delivering the intervention were aware of the assigned intervention, and unclear allocation concealment.

Outcomes	№ of participants (studies) Follow up	Certainty of the evidence (GRADE)	Relative effect (95% CI)	Anticipated absolute effects		Comments
				Risk with usual care	Risk difference with Multifactorial intervention	
e. Downgraded by 1 increment for risk of bias due to participants and people delivering the intervention were aware of the assigned intervention, blinding of outcome assessment, and incomplete outcome data. f. Downgraded by 1 increment for risk of bias due to participants being aware of their assigned intervention, method of ascertaining falls, blinding of outcome assessment, and incomplete outcome data. g. Downgraded by 1 increment due to serious heterogeneity unexplained by subgroup analysis h. Downgraded by 1 increment for risk of bias due to participants and people delivering the intervention were aware of the assigned intervention, selective reporting, and incomplete outcome data.						

Table 18: Clinical evidence summary: Multifactorial intervention vs. usual care: Subgroup analysis by intensity of intervention

Outcomes	№ of participants (studies) Follow up	Certainty of the evidence (GRADE)	Relative effect (95% CI)	Anticipated absolute effects		Comments
				Risk with Usual care	Risk difference with Multifactorial intervention	
Rate of falls-assessment and active intervention	9303 (16 RCTs)	⊕◯◯◯ Very low[a,b,c]	**Rate ratio 0.81** (0.68 to 0.97)	-	-	MID: 0.8 to 1.25 (precision: CI crosses 1 MIDs) **No clinical difference**
Rate of falls-assessment and referral or provision of information	9157(11 RCTs)	⊕◯◯◯ Very low[b,c,d]	**Rate ratio 0.80 (0.69 to 0.93)**	-	-	MID: 0.8 to 1.25 (precision: CI crosses 1 MIDs) Clinical benefit of multifactorial intervention
Number of people sustaining one or more falls-assessment and active intervention	8976(15 RCTs)	⊕⊕◯◯ Low[c,e]	**RR 0.95** (0.88 to 1.02)	-	-	MID: 0.8 to 1.25 (precision: CI crosses 1 MIDs) **No clinical difference**
Number of people sustaining	6443(18 RCTs)	⊕⊕◯◯ Low[c,f]	**RR 0.99 (0.89 to 1.11)**	-	-	MID: 0.8 to 1.25

Outcomes	№ of participants (studies) Follow up	Certainty of the evidence (GRADE)	Relative effect (95% CI)	Anticipated absolute effects		Comments
				Risk with Usual care	Risk difference with Multifactorial intervention	
one or more falls-assessment and referral or provision of information						(precision: CI crosses 1 MIDs) **No clinical difference**
Health-related quality of life (SF-36)-assessment and active intervention	891 (4 RCTs)	⊕◯◯◯ Very low[b,c,g]	**-**	-	**SMD 0.32 higher (0.19 higher to 0.45 higher)**	MID: 0.5 x SMD= +/- 0.08 (precision: CI crosses 1 MID) **No clinical difference**
Health-related quality of life (SF-36)-assessment and referral or provision of information	1482 (5 RCTs)	⊕◯◯◯ Very low[b,c,h]	**-**	-	**SMD 0.07 higher (0.03 lower to 0.18 higher)**	MID: 0.5 x SMD= +/- 0.035 (precision: CI crosses 1 MID) **No clinical difference**

a. Downgraded by 1 increment for risk of bias due to missing outcome data, participants and people delivering the intervention were aware of the assigned intervention, and outcome assessment was not blind

b. Downgraded by 1 increment for inconsistency due to a high I2 value.

c. Downgraded by 1 increment if the confidence interval crossed one MID or by 2 increments if the confidence interval crossed both MIDs. The MIDs were 0.8 to 1.25 for dichotomous outcomes or 0.5 x median baseline SD (or 0.5 x SMD where no baseline values given) for continuous outcomes.

d. Downgraded by 1 increment for risk of bias due to unclear outcome assessment, unclear allocation concealment, unclear selective reporting, method of ascertaining falls, and participants and people delivering the intervention were aware of the assigned intervention

e. Downgraded by 1 increment for risk of bias due to incomplete outcome data, selective reporting, and participants and people delivering the intervention were aware of the assigned intervention.

f. Downgraded by 1 increment for risk of bias due to outcome assessment was not blinded, incomplete outcome data, and method of ascertaining falls.

g. Downgraded by 1increment for risk of bias due to issues regarding blinding of the outcome assessment, missing outcome data, and unclear method of ascertaining falls

h. Downgraded by 1 increment for risk of bias due to missing outcome data, method of ascertaining falls, and unclear allocation concealment

Table 19: Clinical evidence summary: Multifactorial intervention vs. exercise

Outcomes	№ of participants (studies) Follow up	Certainty of the evidence (GRADE)	Relative effect (95% CI)	Anticipated absolute effects		Comments
				Risk with exercise	Risk difference with Multifactorial intervention	
Rate of falls	5048 (2 RCTs)	⊕◯◯◯ Very low[a,c]	**Rate ratio 0.63** (0.11 to 3.48)	-	**-**	MID: 0.8 to 1.25 (precision: CI crosses 2 MIDs) **Clinical benefit of multifactorial intervention**
Number of people sustaining one or more falls	5048 (2 RCTs)	⊕⊕⊕◯ Moderate[a]	**RR 1.04** (0.93 to 1.17)	-	**-**	MID: 0.8 to 1.25 (precision: CI crosses 0 MIDs) **No clinical difference**
Number of people sustaining a fall-related fracture	4997 (1 RCT)	⊕◯◯◯ Very low[b,c]	**RR 0.84** (0.50 to 1.41)	-	**-**	MID: 0.8 to 1.25 (precision: CI crosses 2 MIDs) **No clinical difference**
Health-related quality of life (mental): endpoint score (SF-12, 0-100 with 0 being the worst and 100 being the best)	6524 (1 RCT)	⊕⊕◯◯ Low[b,c]	**-**	-	**SMD 0.06 lower (0.11 lower to 0.01 lower)**	MID: 0.5 x SMD= +/- 0.03 (precision: CI crosses 1 MID) **No clinical difference**
Health-related quality of life (physical): endpoint score (SF-12, 0-100 with 0 being the worst and 100 being the best)	6524 (1 RCT)	⊕⊕◯◯ Low[b,c]	**-**	-	**SMD 0.04 lower (0.09 lower to 0.10 higher)**	MID: 0.5 x SMD= +/- 0.05 (precision: CI crosses 1 MID) **No clinical difference**

Outcomes	№ of participants (studies) Follow up	Certainty of the evidence (GRADE)	Relative effect (95% CI)	Anticipated absolute effects		Comments
				Risk with exercise	Risk difference with Multifactorial intervention	

a. Downgraded by 1 increment due to personnel not being blinded, unclear allocation concealment, unclear blinding of outcome assessment, and unclear blinding of participants.

b. Downgraded by 1 increment for risk of bias due to personnel not being blinded.

c. Downgraded by 1 increment if the confidence interval crossed one MID or by 2 increments if the confidence interval crossed both MIDs. The MIDs were 0.8 to 1.25 for dichotomous outcomes or 0.5 x median baseline SD (or 0.5 x SMD where no baseline values given) for continuous outcomes.

Table 20: Clinical evidence summary: Multicomponent intervention vs. usual care

Outcomes	№ of participants (studies) Follow up	Certainty of the evidence (GRADE)	Relative effect (95% CI)	Anticipated absolute effects		Comments
				Risk with usual care	Risk difference with Multicomponent intervention	
Rate of falls (overall)	3027 (13 RCTs)	⊕◯◯◯ Very low[a,b,ca]	**Rate ratio 0.74** (0.62 to 0.88)	-	-	MID: 0.8 to 1.25 (precision: CI crosses 2 MIDs) **No clinical difference**
Rate of falls- Exercise, home safety, and nutrition	145 (1 RCT)	⊕⊕◯◯ Low[c,d]	**Rate ratio 0.70** (0.53 to 0.95)	-	-	MID: 0.8 to 1.25 (precision: CI crosses 1 MID) **Clinical benefit of multicomponent intervention**
Rate of falls- Exercise and nutrition	335 (2 RCTs)	⊕⊕◯◯ Low[c,e]	**Rate ratio 0.87** (0.69 to 1.09)			MID: 0.8 to 1.25 (precision: CI crosses 1 MID) **No clinical difference**
Rate of falls- Exercise, home safety, and vision	310 (1 RCT)	⊕⊕◯◯ Low[c,e]	**Rate ratio 0.69** (0.50 to 0.96)	-	-	MID: 0.8 to 1.25 (precision: CI crosses 1 MID) **Clinical benefit of multicomponent intervention**

Outcomes	№ of participants (studies) Follow up	Certainty of the evidence (GRADE)	Relative effect (95% CI)	Anticipated absolute effects		Comments
				Risk with usual care	Risk difference with Multicomponent intervention	
Rate of falls- Exercise and psychological component	578 (4 RCTs)	⊕◯◯◯ Very low[c,f,g]	**Rate ratio 0.62** (0.44 to 0.87)	-	-	MID: 0.8 to 1.25 (precision: CI crosses 2 MIDs) **Clinical harm for multicomponent intervention**
Rate of falls- Nutrition and psychological component	151 (1 RCT)	⊕⊕⊕◯ Moderate[h]	**Rate ratio 0.39** (0.22 to 0.68)	-	-	MID: 0.8 to 1.25 (precision: CI crosses 0 MIDs) **Clinical benefit of multicomponent intervention**
Rate of falls- Exercise and home safety	159 (2 RCTs)	⊕◯◯◯ Very low[c,g,i]	**Rate ratio 1.25** (0.79 to 2.0)	-	-	MID: 0.8 to 1.25 (precision: CI crosses 2 MIDs) **No clinical benefit**
Rate of falls- Home safety and psychological component	124 (1 RCT)	⊕⊕◯◯ Low[c,j]	**Rate ratio 0.33** (0.11 to 1.02)	-	-	MID: 0.8 to 1.25 (precision: CI crosses 2 MIDs) **Clinical benefit of multicomponent intervention**
Rate of falls- Exercise, medication review and home safety	1225 (1 RCT)	⊕◯◯◯ Very low[c,t]	**Rate ratio 0.75** (0.05 to 11.13)	-	-	MID: 0.8 to 1.25 (precision: CI crosses 2 MIDs) **No clinical benefit**
Number of people sustaining one or more falls (overall)	4584 (15 RCTs)	⊕◯◯◯ Very low[c,g,k]	**RR 0.83** (0.73 to 0.94)	-	-	MID: 0.8 to 1.25 (precision: CI crosses 1 MID) **No difference**
Number of people sustaining one or more falls- Exercise, home safety, and nutrition	145 (1 RCT)	⊕⊕◯◯ Low[c,d]	**RR 0.77** (0.57 to 1.03)	-	-	MID: 0.8 to 1.25 (precision: CI crosses 1 MID) **Clinical benefit of multicomponent**

Outcomes	№ of participants (studies) Follow up	Certainty of the evidence (GRADE)	Relative effect (95% CI)	Anticipated absolute effects		Comments
				Risk with usual care	Risk difference with Multicomponent intervention	
Number of people sustaining one or more falls- Exercise and nutrition	146 (1 RCT)	⊕⊕◯◯ Low[c,d]	**RR 0.78** (0.58 to 1.04)	-	-	MID: 0.8 to 1.25 (precision: CI crosses 1 MID) **Clinical benefit of multicomponent**
Number of people sustaining one or more falls- Exercise, home safety, and vision	479 (2 RCTs)	⊕⊕◯◯ Low[c,e]	**RR 0.84** (0.71 to 1.00)	-	-	MID: 0.8 to 1.25 (precision: CI crosses 1 MID) **No clinical benefit**
Number of people sustaining one or more falls- Exercise and vision	170 (1 RCT)	⊕⊕◯◯ Low[c,d]	**RR 0.75** (0.56 to 1.00)	-	-	MID: 0.8 to 1.25 (precision: CI crosses 1 MID) **Clinical benefit of multicomponent**
Number of people sustaining one or more falls- Exercise and home safety	219 (1 RCT)	⊕⊕◯◯ Low[c,l]	**RR 0.84** (0.65 to 1.09)	-	-	MID: 0.8 to 1.25 (precision: CI crosses 1 MID) **No clinical benefit**
Number of people sustaining one or more falls- Home safety and vision	141 (1 RCT)	⊕⊕◯◯ Low[c,d]	**RR 0.88** (0.65 to 1.18)	-	-	MID: 0.8 to 1.25 (precision: CI crosses 1 MID) **No clinical benefit**
Number of people sustaining one or more falls- Exercise and psychological component	619 (4 RCTs)	⊕◯◯◯ Very low[b,c,m]	**RR 0.90** (0.44 to 1.83)	-	-	MID: 0.8 to 1.25 (precision: CI crosses 2 MIDs) **No clinical benefit**
Number of people sustaining one or more falls- Education and exercise	192 (2 RCTs)	⊕◯◯◯ Very low[c,q]	**RR 1.09** (0.57 to 2.11)	-	-	MID: 0.8 to 1.25 (precision: CI crosses 2 MIDs) **No clinical benefit**

Outcomes	№ of participants (studies) Follow up	Certainty of the evidence (GRADE)	Relative effect (95% CI)	Anticipated absolute effects		Comments
				Risk with usual care	Risk difference with Multicomponent intervention	
Number of people sustaining one or more falls- Nutrition and psychological component	210 (1 RCT)	⊕⊕◯◯ Low[c,h]	**RR 0.41** (0.21 to 0.82)	-	-	MID: 0.8 to 1.25 (precision: CI crosses 1 MID) **Clinical benefit of multicomponent intervention**
Number of people sustaining one or more falls- Exercise, nutrition, and psychological component	99 (1 RCT)	⊕◯◯◯ Very low[c,o]	**RR 0.41** (0.08 to 1.99)	-	-	MID: 0.8 to 1.25 (precision: CI crosses 2 MIDs) **Clinical benefit of multicomponent intervention**
Number of people sustaining one or more falls- Education and psychological component	909 (1 RCT)	⊕◯◯◯ Very low[c,p]	**RR 1.06** (0.89 to 1.27)	-	-	MID: 0.8 to 1.25 (precision: CI crosses 2 MIDs) **No clinical benefit**
Number of people sustaining one or more falls- Exercise, home safety and medication review	1225 (1 RCT)	⊕◯◯◯ Very low[c,t]	**RR 0.81** (0.67 to 0.97)	-	-	MID: 0.8 to 1.25 (precision: CI crosses 1 MID) **No difference**
Number of people sustaining a fall-related fracture (overall)	1457 (3 RCTs)	⊕◯◯◯ Very low[c,q,t]	**RR 2.02** (1.00 to 4.09)	-	-	MID: 0.8 to 1.25 (precision: CI crosses 2 MIDs) **Clinical benefit of control**
Number of people sustaining a fall-related fracture- Nutrition and psychological component	210 (1 RCT)	⊕◯◯◯ Very low[c,h]	**RR 0.50** (0.02 to 14.89)	-	-	MID: 0.8 to 1.25 (precision: CI crosses 2 MIDs) **Clinical benefit of multicomponent interventions**

Outcomes	№ of participants (studies) Follow up	Certainty of the evidence (GRADE)	Relative effect (95% CI)	Anticipated absolute effects		Comments
				Risk with usual care	Risk difference with Multicomponent intervention	
Number of people sustaining a fall-related fracture-Exercise and home safety	22 (1 RCT)	⊕◯◯◯ Very low[c,r]	**RR 0.50** (0.02 to 13.50)			MID: 0.8 to 1.25 (precision: CI crosses 2 MIDs) **Clinical benefit of multicomponent intervention**
Number of people sustaining a fall-related fracture-Exercise, home safety and medication review	1225 (1 RCT)	⊕◯◯◯ Very low[c,t]	**RR 2.32** (1.11 to 4.84)			MID: 0.8 to 1.25 (precision: CI crosses 2 MIDs) **Clinical benefit of control**
Health-related quality of life: endpoint score (SF-36 0-100, 0 is the worst and 100 is the best) (overall)	1398 (6 RCTs)	⊕◯◯◯ Very low[b,c,p]	**-**	-	**SMD 0.52 higher** (0.1016 higher to 0.94 higher)	MID: 0.5 x SMD= +/- 0.385 (precision: CI crosses 1 MID) **Clinical benefit of multiple component intervention**
Health-related quality of life (SF-36 0-100, 0 is the worst and 100 is the best): endpoint score-Exercise and nutrition	133 (1 RCT)	⊕⊕◯◯ Low[c,p]	**-**	-	**SMD 0.07 higher** (0.27 lower to 0.41 higher)	MID: 0.5 x SMD= +/- 0.035 (precision: CI crosses 1 MIDs) **No clinical difference**
Health-related quality of life: endpoint score (SF-36 0-100, 0 is the worst and 100 is the best)-Exercise and psychological component	194 (2 RCTs)	⊕⊕◯◯ Low[c,p]	**-**	-	**SMD 1.23 higher** (0.92 higher to 1.54 higher)	MID: 0.5 x SMD= 0.615 (precision: CI crosses 1 MID) **Clinical benefit of multicomponent intervention**

Outcomes	№ of participants (studies) Follow up	Certainty of the evidence (GRADE)	Relative effect (95% CI)	Anticipated absolute effects		Comments
				Risk with usual care	Risk difference with Multicomponent intervention	
Health-related quality of life: endpoint score (SF-36; 0-100, 0 is the worst and 100 is the best)- Exercise, nutrition, and psychological component	64 (1 RCT)	⊕⊕◯◯ Low[c,p]	-	-	**SMD 0.57 higher** (0.07 higher to 1.07 higher)	MID: 0.5 x SMD= +/- 0.285 (precision: CI crosses 1 MID) **Clinical benefit of multicomponent intervention**
Health-related quality of life: (EQ5D 0.2-1) endpoint score - Exercise and home safety	98 (1RCT)	⊕⊕⊕◯ Moderate[p]	-	-	**SMD 0 higher** (0.04 lower to 0.04 higher)	MID: 0.5 x SMD= 0.615 **No clinical difference**
Health-related quality of life: (I-QOL 0-100) endpoint score - Education and psychological component	909 (1 RCT)	⊕⊕⊕◯ Moderate[p]	-	-	**SMD 0.11 higher** (0.02 lower to 0.24 higher)	MID: 0.5 x SMD= 0.615 **No clinical difference**
Health-related quality of life (mental): endpoint score (SF-36, 0-100, 0 is the worst and 100 is the best) (overall)	92 (2 RCTs)	⊕⊕◯◯ Low[c,p]	-	-	**SMD 0.69 higher** (0.26 higher to 1.11 higher)	MID: 0.5 x SMD= +/- 0.345 (precision: CI crosses 1 MID) **Clinical benefit of multicomponent intervention**
Health-related quality of life (mental): endpoint score (SF-36; 0-100, 0 is the worst and 100 is the best)-	28 (1 RCT)	⊕⊕◯◯ Low[c,d]	-	-	**SMD 0.8 higher** (0.02 higher to 1.57 higher)	MID: 0.5 x SMD= +/- 0.4 (precision: CI crosses 1 MID) **Clinical benefit of multicomponent intervention**

Outcomes	№ of participants (studies) Follow up	Certainty of the evidence (GRADE)	Relative effect (95% CI)	Anticipated absolute effects		Comments
				Risk with usual care	Risk difference with Multicomponent intervention	
Exercise and home safety						
Health-related quality of life (mental): endpoint score (SF-36; 0-100, 0 is the worst and 100 is the best)- Exercise, nutrition, and psychological component	64 (1 RCT)	⨁⨁◯◯ Low[c,p]	**-**	-	**SMD 0.64 higher** (0.14 higher to 1.14 higher)	MID: 0.5 x SMD= +/- 0.32 (precision: CI crosses 1 MID) **Clinical benefit of multicomponent intervention**
Health-related quality of life (physical): endpoint score (SF-36; 0-100, 0 is the worst and 100 is the best) (overall)	92 (2 RCTs)	⨁⨁◯◯ Low[c,p]	**-**	-	**SMD 0.12 higher** (0.53 higher to 0.77 higher)	MID: 0.5 x SMD= +/- 0.06 (precision: CI crosses 1 MID) **No clinical difference**
Health-related quality of life (physical): endpoint score (SF-36; 0-100, 0 is the worst and 100 is the best)- Exercise and home safety	28 (1 RCT)	⨁⨁◯◯ Low[c,d]	**-**	-	**SMD 0.27 lower** (1.02 lower to 1.57 higher)	MID: 0.5 x SMD= +/- 0.135 (precision: CI crosses 1 MID) **No clinical difference**
Health-related quality of life (physical): endpoint score (SF-36, 0-100, 0 is the worst and 100 is the best)- Exercise, nutrition, and psychological component	64 (1 RCT)	⨁⨁◯◯ Low[c,p]	**-**	-	**SMD 0.40 higher** (0.1 lower to 0.9 higher)	MID: 0.5 x SMD= +/- 0.02 (precision: CI crosses 1 MID) **No clinical difference**

Outcomes	№ of participants (studies) Follow up	Certainty of the evidence (GRADE)	Relative effect (95% CI)	Anticipated absolute effects		Comments
				Risk with usual care	Risk difference with Multicomponent intervention	
a. Downgraded by 2 increments for risk of bias due to participants and people delivering the intervention being aware of the assigned intervention, unclear randomisation process, unclear allocation concealment, limited information regarding outcome assessment, and incomplete outcome data. b. Downgraded by 2 increment for very serious inconsistency unexplained by subgroup analysis. c. Downgraded by 1 increment if the confidence interval crossed one MID or by 2 increments if the confidence interval crossed both MIDs. The MIDs were 0.8 to 1.25 for dichotomous outcomes or 0.5 x median baseline SD (or 0.5 x SMD where no baseline values given) for continuous outcomes. d. Downgraded by 1 increment for risk of bias due to participants and people delivering the intervention being aware of the assigned intervention. e. Downgraded by 1 increment for risk of bias due to participants and people delivering the intervention were aware of the assigned intervention, unclear randomisation process, and unclear allocation concealment. f. Downgraded by 1 increment for risk of bias due to participants and people delivering the intervention being aware of the assigned intervention and limited information regarding outcome assessment. g. Downgraded by 1 increment due to serious inconsistency unexplained by subgroup analysis. h. Downgraded by 1 increment for high risk of bias due to incomplete outcome data. i. Downgraded by 1 increment for risk of bias due to participants and people delivering the intervention being aware of the assigned intervention, issues with adherence, and missing outcome data. j. Downgraded by 1 increment for risk of bias due to participants and people delivering the intervention being aware of the assigned intervention, no pre-specified protocol, and the self-reported nature of the outcome k. Downgraded by 2 increments for risk of bias due to participants and people delivering the intervention being aware of the assigned intervention, unclear method of ascertaining falls, incomplete outcome data, issues regarding analysis related to clustering, and issues regarding blinding of the outcome assessment. l. Downgraded by 1 increment for risk of bias due to participants and people delivering the intervention being aware of the assigned intervention, and unclear method of ascertaining falls. m. Downgraded by 1 increment for risk of bias due to participants and people delivering the intervention, issues regarding outcome assessment, incomplete outcome data, and selective reporting. n. Downgraded by 2 increments for risk of bias due to unclear method of ascertaining falls, self-reported nature of the outcome, participants and people delivering the intervention were aware of the assigned intervention, incomplete outcome data, and incorrect analysis related to clustering. o. Downgraded by 1 increment for risk of bias due to lack of blinding regarding the outcome assessment. p. Downgraded by 1 increment for risk of bias due to participants and people delivering the intervention were aware of the assigned intervention and unclear impact of missing outcome data. q. Downgraded by 2 increments for risk of bias due to participants and people delivering the intervention being aware of the assigned intervention, unclear method how fractures were reported, unclear method of ascertaining falls, and incomplete outcome data. r. Downgraded by 1 increment for risk of bias due to participants and people delivering the intervention being aware of the assigned intervention, unclear method of how fractures were reported, and unclear method of ascertaining falls s. Downgraded by 1 increment for risk of bias due to participants and people delivering the intervention being aware of the assigned intervention and outcome assessors not being blinded. t. Downgraded by 1 increment for risk of bias due high attrition						

1 **Table 21: Clinical evidence summary: Multicomponent intervention vs. exercise**

Outcomes	№ of participants (studies) Follow up	Certainty of the evidence (GRADE)	Relative effect (95% CI)	Anticipated absolute effects		Comments
				Risk with exercise	Risk difference with Multicomponent intervention	
Rate of falls- Exercise and nutrition	191 (1 RCT)	⊕⊕◯◯ Low[a,b]	**Rate ratio 0.92** (0.77 to 1.10)	-	**-**	MID: 0.8 to 1.25 (precision: CI crosses 1 MID) **No clinical benefit**
Number of people sustaining one or more falls (overall)	1029 (5 RCTs)	⊕◯◯◯ Very low[b,c]	**RR 1.0** (0.85 to 1.17)	-	**-**	MID: 0.8 to 1.25 (precision: CI crosses 1 MID) **No clinical benefit**
Number of people sustaining one or more falls- Education and exercise	87 (1 RCT)	⊕◯◯◯ Very low[b,d]	**RR 2.23** (0.11 to 46.43)	-	**-**	MID: 0.8 to 1.25 (precision: CI crosses 2 MIDs) **Clinical benefit of exercise**
Number of people sustaining one or more falls- Education, nutrition, and psychological component	97 (1 RCT)	⊕◯◯◯ Very low[b,e]	**RR 0.65** (0.11 to 3.72)	-	**-**	MID: 0.8 to 1.25 (precision: CI crosses 2 MIDs) **Clinical benefit of multicomponent intervention**
Number of people sustaining one or more falls- Exercise and vision	170 (1 RCT)	⊕⊕◯◯ Low[b,f]	**RR 0.87** (0.61 to 1.24)	-	**-**	MID: 0.8 to 1.25 (precision: CI crosses 1 MID) **No clinical benefit**
Number of people sustaining one or more falls- Exercise and home safety	169 (1 RCT)	⊕⊕◯◯ Low[c,n]	**RR 0.95** (0.68 to 1.33)	-	**-**	MID: 0.8 to 1.25 (precision: CI crosses 2 MIDs) **No clinical benefit**
Number of people sustaining one or more falls- Home safety and vision	171 (1 RCT)	⊕◯◯◯ Very low[b,f]	**RR 1.02** (0.73 to 1.42)	-	**-**	MID: 0.8 to 1.25 (precision: CI crosses 2 MIDs) **No clinical benefit**

Outcomes	№ of participants (studies) Follow up	Certainty of the evidence (GRADE)	Relative effect (95% CI)	Anticipated absolute effects		Comments
				Risk with exercise	Risk difference with Multicomponent intervention	
Number of people sustaining one or more falls- Exercise, home safety, and vision	169 (1 RCT)	⊕⊕◯◯ Low[b,f]	**RR 0.86** (0.60 to 1.22)	-	**-**	MID: 0.8 to 1.25 (precision: CI crosses 1 MID) **No clinical benefit**
Number of people sustaining one or more falls- Exercise and psychological component	118 (1 RCT)	⊕◯◯◯ Very low[b,g]	**RR 1.44** (0.97 to 2.14)	-	**-**	MID: 0.8 to 1.25 (precision: CI crosses 2 MIDs) **Clinical benefit of exercise**
Number of people sustaining one or more falls- Exercise and Vitamin D and calcium	48 (1 RCT)	⊕◯◯◯ Very low[b,h]	**RR 2.99** (0.37 to 24.42)	-	**-**	MID: 0.8 to 1.25 (precision: CI crosses 2 MIDs) **Clinical benefit of exercise**
Number of people sustaining a fall-related fracture- Exercise and Vitamin D and calcium	39 (1 RCT)	⊕◯◯◯ Very low[b,h]	**RR 1.97** (0.41 to 9.42)	-	**-**	MID: 0.8 to 1.25 (precision: CI crosses 2 MIDs) **Clinical benefit of exercise**

a. Downgraded by 1 increment for risk of bias due to participants and people delivering the intervention were aware of the assigned intervention, unclear randomisation process, and unclear allocation concealment.

b. Downgraded by 1 increment if the confidence interval crossed one MID or by 2 increments if the confidence interval crossed both MIDs. The MIDs were 0.8 to 1.25 for dichotomous outcomes or 0.5 x median baseline SD (or 0.5 x SMD where no baseline values given) for continuous outcomes.

c. Downgraded by 2 increments for risk of bias due to participants and people delivering the intervention being aware of the assigned intervention, incorrect analysis, incomplete outcome data, unclear randomisation process, unclear allocation concealment., and no pre-specified protocol.

d. Downgraded by 2 increments for risk of bias due to participants and people delivering the intervention being aware of the assigned intervention, incorrect analysis, incomplete outcome data, unclear randomisation process, and unclear allocation concealment.

e. Downgraded by 1 increment for risk of bias due to self-reported outcome.

f. Downgraded by 1 increment for risk of bias due to participants and people delivering the intervention being aware of the assigned intervention.

g. Downgraded by 1 increment for risk of bias due to intervention did not adhere to protocol and no information provided regarding missing data.

h. Downgraded by 1 increment for risk of bias due to participants and people delivering the intervention being aware of the assigned intervention and no pre-specified protocol

1.1.16. Economic evidence

1.1.16.1. Included studies

Six health economic studies with the relevant comparison were included in this review. [24, 34, 125, 130, 132, 189, 202] These are summarised in the health economic evidence profile below (Table 15, Table 16, Table 17, Table 18) and the health economic evidence tables in Appendix H.

1.1.16.2. Excluded studies

Four economic studies relating to this review question were identified but were excluded due to limited applicability.[22, 35, 177] and methodological issues [63]. These are listed in Appendix J, with reasons for exclusion given.

See also the health economic study selection flow chart in Appendix G.

1.1.17. Summary of included economic evidence

Table 22: Health economic evidence profile: Multifactorial interventions versus usual care

Study	Applicability	Limitations	Other comments	Incremental cost	Incremental effects	Cost effectiveness	Uncertainty
Konnopka 2022 Turkey	Partly applicable (a)	Potentially serious limitations(b)	• Analytic decision model based on a RCT • Cost-effectiveness analysis (fall prevented) • Population: People aged 70 -85 with a fragility fracture in the past 5 years • Comparators: 1. Usual care, 2. Osteoporotic fracture prevention program • Time horizon: 1 year	£136(c)	-	£60,566 per fracture free year of survival	The probability that the intervention is cost effective was 50% at a willingness to pay threshold of £82,472 and 85% at a willingness to pay threshold of £439,852
Peeters 2011[189] (Netherlands)	Partially applicable(d)	Potentially serious limitations(e)	• Within trial analysis (Peeters 2007) • Cost utility analysis • Population: Persons of 65 or older who consulted their GP or A&E • Setting: Community • Comparators: 1. Usual care, 2. Multifactorial intervention • Follow-up: 12 months	2-1: £937(f)	2-1: -0.004	Usual care dominated multifactorial intervention (less costly and more effective)	Sensitivity analyses were performed on the societal perspective, but none were performed on the healthcare related costs alone. When bootstrapping was undertaken from a societal perspective the probability of multifactorial intervention being cost effective compared to usual care was zero at any threshold. Of note: multifactorial intervention did not reduce

Study	Applicability	Limitations	Other comments	Incremental cost	Incremental effects	Cost effectiveness	Uncertainty
							fall risk compared to usual care.
Sach 2012[202] (UK)	Directly applicable[(g)]	Potentially serious limitations[(h)]	• Within trial analysis (Logan 2010) • Cost utility analysis (QALYs) • Population: People of 60 years or older who contacted the ambulance due to a fall but did not attend hospital. • Setting: Community and Residential care • Comparators: 1. Usual care, 2. Multifactorial intervention • Follow-up: 12 months	2-1: saves £1,551.28[(i)]	2-1: 0.070	Multifactorial intervention dominated usual care (less costly and more effective)	Probability exercise cost effective (£20/£30K threshold): 89%/92.3% Increasing the cost of the intervention, taking a wider perspective, only considering the costs of the intervention all resulted in multifactorial interventions still being cost effective compared to usual care.

Abbreviations: A&E=Accident and Emergency; Dom=Dominated, one option is less costly and more effective than another option; Ex.Dom= Extendedly dominated, a combination of two interventions is less costly and more effective than the extendedly dominated option; GP=General Practitioner; ICER= incremental cost-effectiveness ratio; PSA=Probabilistic sensitivity analysis; QALY= quality-adjusted life years; RCT= randomised controlled trial

(c) German study, doesn't use QALYs, per fracture free year instead
(d) Based on a single RCT so may not represent the full body of evidence, time horizon is 1 year.
(e) 2017 EUR
(f) The Netherlands healthcare system, 12 month time horizon, societal perspective but healthcare costs can be extracted
(g) Dutch tariff used for EQ-5D-3L used. Dutch healthcare system with 2007 costs which may not reflect current UK NHS context. Study conducted from a societal perspective but healthcare costs could be extracted however no sensitivity analysis was done on healthcare costs alone. Based on a single RCT and so may not reflect full body of evidence identified in clinical review. Short follow-up (1 year) may not capture all downstream effects of intervention, although given age of participants may be less of a concern. Authors report poor adherence to the recommended multifactorial interventions recommended and note that increased adherence may have resulted in fewer falls but also greater costs and therefore impact on ICER of adherence uncertain.
(h) Euros 2007 converted to GDP 2007 using PPP
(i) UK, 12 month time horizon it is based on a single RCT and so may not reflect full body of evidence identified in clinical
(j) Based on a single RCT and so may not reflect full body of evidence identified in clinical review. Short follow-up (1 year) may not capture all downstream effects of intervention. 2008/9 unit costs may not reflect current NHS context
(k) 2008/9 UK pounds

Table 23: Health economic evidence profile: Multifactorial interventions versus exercise versus usual care

Study	Applicability	Limitations	Other comments	Incremental cost	Incremental effects	Cost effectiveness	Uncertainty
Bruce et al. 2021/Lamb 2020[24], [132] (UK)	Directly applicable	Potentially serious limitations[(a)]	• Within-RCT analysis (Bruce 2021) • Cost-utility analysis (QALYs) • Population: People over 70 years • Setting: Community • Comparators: 1.Usual care, 2. Exercise 3. Multifactorial fall prevention • Follow-up: 18 months	2-1: saves £27 3-2: £230[(b)]	2-1: 0.0057 QALYs 3-2: -0.013 QALYs	Exercise dominates (less costly and more effective) both usual care and multifactorial fall prevention	Probability exercise cost effective (£20/£30K threshold): 64.5%/68.5% The uncertainty around which intervention is cost effective is between exercise or usual care, when the willingness-to-pay threshold is £20,000 the likelihood that multifactorial fall prevention is cost effective is only 1%.

Abbreviations: A&E=Accident and Emergency; Dom=Dominated, one option is less costly and more effective than another option; Ex.Dom= Extendedly dominated, a combination of two interventions is less costly and more effective than the extendedly dominated option; GP=General Practitioner; ICER= incremental cost-effectiveness ratio; PSA=Probabilistic sensitivity analysis; QALY= quality-adjusted life years; RCT= randomised controlled trial

(a) 18-month time horizon, it is based on a single RCT and so may not reflect full body of evidence identified in clinical review, Clinical review gives a relative risk in a different direction to the one used in Bruce 2021

(b) 2015/16 UK pounds. Cost components: Staff cost, Postage, exercise booklet, ankle weights, day centre, nursing home, equipment

Table 24: Health economic evidence profile: Multifactorial interventions versus usual care versus multiple interventions

Study	Applicability	Limitations	Other comments	Incremental cost	Incremental effects	Cost effectiveness	Uncertainty
Church et al. 2012[34] (Australia)	Partially applicable[(a)]	Potentially serious limitations[(b)]	• Decision tree and Markov model. • Cost-utility analysis (QALYs) • Population: Cohort starting age 65	Incremental versus 1: General population 2: £230 3: £240	Incremental versus 1: General population 2: 0.007 3: 0.011	General population[(d)]: 2: Ex. Dom 3 vs 1: £21,770 4: Dominated	One way sensitivity analysis shows that removing “fear of falling” from the model, none of the interventions were cost effective. Intervention effectiveness, intervention

Study	Applicability	Limitations	Other comments	Incremental cost	Incremental effects	Cost effectiveness	Uncertainty
			• Setting: Community but can move into residential care in the model • Comparators: General population: 1.No treatment, 2.Group-based exercises, 3.Tai Chi, 4.Exercise and falls advice, 5.Multifactorial interventions; Assessment and referral, 6.Home-based exercise, 7.Multifactorial interventions; Assessment and active intervention, High risk population: 8.Group based exercise, 9.Multifactorial (high risk), 10. Home hazard modification, Specific population: 11. Psychotropic medication withdrawal, 12. Cardiac pacing, 13. Expedited cataract surgery • Time horizon: Lifetime	4: £322 5: £387 6: £465 7: £550 High risk population 8: £208 9: £355 10: £417 Specific population 11: £162 12: £4,753 13: saves £30 [(c)]	4: 0.009 5: 0.005 6: 0.010 7: 0.009 High risk population 8: 0.008 9: 0.008 10: 0.015 Specific population 11: 0.019 12: 0.172 13: 0.010	5: Dominated 6: Dominated 7: Dominated High risk population[(d)]: 8 vs 1: £25,086 9: Dominated 10 vs 8: £32,997 Specific population [(e)]: 11 vs 1: £8,474 12 vs 1: £27,634 13 vs 1: Dominates (less costly and more effective)	cost and cohort start age are all drivers in the model. Using probabilistic sensitivity analysis for the general population interventions, at low willingness to pay thresholds 'no intervention' dominates however, above £29,549 threshold Tai Chi dominates.

Study	Applicability	Limitations	Other comments	Incremental cost	Incremental effects	Cost effectiveness	Uncertainty
			• Cycle length: 1 year				

Abbreviations: A&E=Accident and Emergency; Dom=Dominated, one option is less costly and more effective than another option; Ex.Dom= Extendedly dominated, a combination of two interventions is less costly and more effective than the extendedly dominated option; GP=General Practitioner; ICER= incremental cost-effectiveness ratio; PSA=Probabilistic sensitivity analysis; QALY= quality-adjusted life years; RCT= randomised controlled trial

(a) Australian health care system, discounting at 5% rather than 3.5% as required by NICE reference case.
(b) Outcomes, cost and interventions effectiveness came from 2009 which may not reflect full body of clinical evidence and may not reflect current UK NHS context.
(c) 2009 costs AUD converted to GDP 2009 using PPP
(d) Estimates are all ranked against the next best option in this group to determine cost-effectiveness. Full incremental analysis of available strategies: first strategies are ruled out that are dominated (another strategy is more effective and has lower costs) or subject to extended dominance (the strategy is more effective and more costly but the incremental cost effectiveness ratio is higher than the next most effective option and so it would never be the most cost effective option); incremental costs, incremental effects and incremental cost effectiveness ratios are calculated for the remaining strategies by comparing each to the next most effective option.
(e) Estimates are all compared to the 'no intervention' option as each intervention applies to a different population.

Table 25: Health economic evidence profile: Usual care versus recommended multifactorial falls prevention

Study	Applicability	Limitations	Other comments	Incremental cost	Incremental effects	Cost effectiveness	Uncertainty
Kwon 2023	Partially applicable[(a)]	Potentially serious limitations[(b)]	• Patient level simulation • Cost-utility analysis (QALYs) • Population: People over 60 years • Setting: Community • Comparators: 1.Usual care, 2. Recommended multifactorial fall prevention • Time horizon: 40 years	Saves £320.60	0.05	Multifactorial fall prevention dominated usual care (less costly and more effective)	Sensitivity analyses were done from a societal perspective not a healthcare perspective.

Abbreviations: Dom=Dominated, one option is less costly and more effective than another option; Ex.Dom= Extendedly dominated, a combination of two interventions is less costly and more effective than the extendedly dominated option; GP=General Practitioner; ICER= incremental cost-effectiveness ratio; PSA=Probabilistic sensitivity analysis; QALY= quality-adjusted life years; RCT= randomised controlled trial
(a) People in the community over 60 years of age, assessed a societal perspective but did report healthcare perspective however no sensitivity analyses done from a healthcare perspective.
(b) Costs were inflated from 2013/14 to 2022/23, assessed uncertainty from a societal perspective not a healthcare perspective

1.1.18. Economic model

Whilst this review question was prioritised for de novo health economic modelling, this intervention was not prioritised.

1.1.19. Evidence statements

1.1.19.1. Economic

Four cost-utility analyses compared multifactorial interventions and usual care

- One cost-utility analysis found that usual care dominated multifactorial intervention. The analysis was assessed as partially applicable with potentially serious limitations (Peeters 2011)
- Another cost-utility analysis found that multifactorial intervention dominated usual care. The analysis was assessed as directly applicable with potentially serious limitations (Sach 2012)
- The final cost utility analysis found that multifactorial interventions dominated usual care. The analysis was assessed as partially applicable with potentially serious limitations
- A cost-effectiveness study found that an osteoporotic fracture prevention program had an ICER of £60,566 per fracture free year. This analysis was assessed as partly applicable with potentially serious limitations (Konnopka 2022)

Two cost-utility analyses compared exercise and multifactorial interventions

- One cost-utility analysis found that exercise dominated both usual care and multifactorial interventions. The analysis was assessed as directly applicable with potentially serious limitations (Bruce 2021, Lamb 2020).
- Another cost-utility analysis found that Tai Chi dominated all the other interventions. The analysis was assessed as partially applicable with potentially serious limitations (Church 2012)

1.1.20. The committee's discussion and interpretation of the evidence

1.1.20.1. The outcomes that matter most

The committee discussed that all outcomes are considered to be equally important for decision making and therefore agreed that all outcomes are rated as critical. The review on multifactorial and multicomponent interventions for falls prevention found evidence for all outcomes (rate of falls, number of fallers, number of people sustaining fall related fractures, adverse events, and health related quality of life).

1.1.20.2. The quality of the evidence

The quality of the evidence for quantitative outcomes was assessed with GRADE and was rated as very low to low. Findings were downgraded due to risk of bias (for example, lack of blinding, lack of blinding of outcome assessments, lack of information regarding adherence and poor reporting of randomisation procedures). Studies were also downgraded for imprecision when 95% confidence intervals crossed 1 or more decision-making thresholds. Some evidence was also downgraded due to inconsistency with unexplained heterogeneity. The evidence was not downgraded for indirectness. See appendix F for full GRADE tables with quality ratings of all outcomes.

1.1.21. Benefits and harms

1.1.21.1. Multifactorial intervention vs control

The evidence showed no clinical differences for multifactorial interventions compared to control for rate of falls, number of people sustaining fall-related fractures, health-related quality of life, and adverse events with very low to moderate confidence in the effects. Clinical benefit were only shown when sub-grouped by intensity of the interventions. Evidence from 11 studies showed a clinical benefit of assessment and referral or provision of information compared to control for rate of falls with very low confidence of effects. No further clinical differences for multifactorial interventions compared to control were found.

1.1.21.2. Multifactorial intervention vs exercise

Evidence from 2 studies suggested a clinical benefit of multifactorial intervention compared to exercise for rate of falls with very low confidence in the effects. No clinical differences of multifactorial interventions compared to exercise were found.

The committee agreed it was usual to offer individualised interventions based on an assessment and these studies were more representative of usual practice. The interventions offered after assessment were commonly exercise, environmental or assistive technologies.

Multifactorial versus usual care showed no clinical difference for all outcomes. Although the MID was borderline (0.81) for the rate of falls and fall related fracture, the committee concluded the evidence was mainly graded as low or very low, and there was a lot of heterogeneity which could be explained because the interventions were tailored to the individual. Overall, the committee concluded the evidence was not supportive in making recommendations, however they discussed offering tailored multifactorial intervention was widespread in current practice and would be targeted at people assessed as being at higher risk of falling. The committee noted this was in line with other guidance such as the World Falls guideline recommendations. The committee agreed any intervention offered to reduce a person's risk of falling would be based on a comprehensive falls assessment to identify their level of risk, the extent of any impairment and whether an intervention is likely to manage or improve their risk of falling.

1.1.21.3. Multicomponent intervention compared to control

Overall evidence from 11 studies showed no clinical differences for multicomponent interventions compared to control for rate of falls with very low confidence in the effects. Clinical benefits were only shown when sub-grouped by intervention type. For example, a clinical benefit was shown for exercise, home safety, nutrition interventions, home safety and vision, exercise and psychological component interventions, nutrition and psychological component interventions, and home safety and psychological component interventions compared to control for rate of falls with low confidence in its effects. When sub-grouped by type of intervention the following interventions showed a clinical benefit compared to control for number of people sustaining one or more falls: exercise, home safety, and nutrition interventions, exercise and nutrition interventions, exercise and vision interventions, nutrition and psychological component interventions, and exercise, nutrition, and psychological component interventions. However, these were all of very low to low confidence levels and derived from only 1 study. Evidence from 3 studies also showed a clinical benefit of control compared when compared to multicomponent exercise for fall-related fractures with very low confidence in the effects. When sub-grouped by intervention type both nutrition and psychological component interventions and exercise and home safety intervention showed a clinical benefit of multicomponent exercise for the number of fall related fractures with very low confidence in the effects. Lastly, evidence from 4 studies showed clinical benefit of multicomponent interventions compared to control for health-related quality of life with very low confidence in the effects.

Multicomponent interventions vs exercise

Clinical differences for multicomponent interventions compared to exercise were only found when analysed for sub-groups. Evidence from 1 study suggested a clinical benefit for exercise when compared to education and exercise interventions, when compared to exercise and psychological component interventions, and when compared to exercise and vitamin D and calcium interventions for the number of people sustaining one or more falls with very low confidence in the effects. A clinical benefit was found for education, nutrition, and psychological component interventions compared to exercise for number of people sustaining one or more falls with very low confidence in the effects.

The committee noted the results for multicomponent interventions were very mixed. Compared to control there was some benefit shown in the rate of falls outcome for exercise, home safety and nutrition and exercise, home safety and vision but these comprised of one or two underpowered studies. When compared to exercise multicomponent intervention also had mixed results with exercise showing a benefit in number of fallers outcome over multicomponent interventions, but the committee noted they were all single studies comprising of different combinations of intervention and it was not possible to draw any conclusion from them. The committee commented that giving everyone the same combination of interventions does not reflect current practice and based on the evidence found they could not support this approach.

1.1.22. Cost effectiveness and resource use

Multicomponent

No health economic studies were found for multicomponent interventions. There was also limited clinical evidence and therefore the committee did not recommend any multicomponent interventions.

Multifactorial

Six health economic studies were identified for multifactorial interventions. These were Bruce 2021, Konnopka 2022, Kwon 2023, Peeters 2011 and Sach 2012. Konnopka 2022, Peeters 2011 and Sach 2012 assessed multifactorial interventions versus usual care. Konnopka 2022 was partly applicable with potentially serious limitations and found that the multifactorial intervention had an ICER of £60,566 per fracture free year. Peeters 2011 was partially applicable and had potentially serious limitations and found that usual care dominated multifactorial interventions, that is usual care was more effective and less costly than multifactorial interventions. Sach 2012 was directly applicable with potentially serious limitations and found that multifactorial interventions dominated usual care. Bruce 2021 assessed multifactorial interventions versus exercise versus usual care. It was directly applicable with potentially serious limitations and found that exercise dominated both multifactorial interventions and usual care. Church 2012 assessed multifactorial interventions versus usual care versus multiple interventions. It was partially applicable with potentially serious limitations which found that exercise with falls advice had an ICER of £21,770 compared with no treatment, every other treatment was found to be dominated. Kwon 2023 assessed usual care versus recommended multifactorial falls prevention. It was partially applicable with potentially serious imitations and found that the recommended multifactorial falls prevention dominated usual care.

The committee acknowledged that the health economics evidence was very uncertain with some studies showing that multifactorial falls prevention was dominated and others showing it dominates. As the clinical evidence was similarly uncertain the committee felt that they were unable to make recommendations with regard to multifactorial interventions. As no recommendations were made is it unlikely to change practice and therefore there will not be a resource impact.

1.1.23. Recommendations supported by this evidence review

This evidence review supports recommendations 1.3.1 to 1.3.12 in the NICE guideline.

Environmental interventions for falls prevention in community care settings

1.1.24. Effectiveness evidence

1.1.24.1. Included studies

One Cochrane review (Clemson 2023[41]) was identified in the search. No further studies were identified through searching. Twenty-two studies were identified from the Clemson 2023[41] review.

See also the study selection flow chart in Appendix C.

The studies identified included the following comparisons:

- Bilateral custom-made ankle-foot orthoses to fitted walking shoes alone [159].
- Home hazard removal program to usual care [220]
- Home hazard program or Otago exercise program plus Vitamin D supplementation to control group. [29]
- Vision tests and eye examinations to usual care.[48]
- One home visit by experienced occupational therapist assessing environmental hazards to usual care.[49]
- Home hazard management to no intervention. [57]
- Optometrist examination to control. [98]
- Best practice occupational therapy home visit to control [133]
- Home based exercise training, home safety assessment and modification vs control. [142]
- Yaktrax walker (netting applied over usual footwear with wire coils to increase grip in winter outdoor conditions) to control. [163]
- Home visits from an interdisciplinary home intervention team to identify home hazards and prescribe technical aids if necessary to no home visit until final assessment. [15]
- 2-hour home visit with visit from physical medicine and rehabilitation doctor and occupational therapist in which environmental hazards were identified and modified where possible to usual care. [187]
- Balance-enhancing insoles to normal insole. [191]
- Environmental assessment provided by occupational therapist to usual care from a GP. [192].
- Home hazard assessment installation of free safety devices and educational strategy to control. [223]
- Occupational home therapy fall reduction home visit to control. [33]
- Home visit by an occupational therapist to identify personal fall-related hazards and risk-taking behaviours when walking through the home with provision or follow-up to control. [43]
- Home hazard modification programme of home hazard awareness education using combination of lecture with residential mock set-up and equipment with participants providing a self-report to control. [117]
- Builders assessed the house using a standard checklist of hazards in the home that were in the scope of the home modification intervention to control. [120]
- Occupational therapy home visit with home assessment and assessment of mobility to control. [148]
- Automatic night light near the bed coupled with tele-assistance service to control. [231]
- Daily delivery of hot/chilled meals from Meals on Wheels to waitlist. [233]

The included studies focused on community-dwelling adults.

1.1.24.2. Excluded studies

Cochrane reviews were identified but not could not be included due to inappropriate interventions (Sherrington, 2019[210]; Hopewell, 2018[105]). The Gillespie 2012[85] Cochrane review was also identified; however the information was superseded by the Clemson 2023[41] review.

See the excluded studies list in Appendix J.

1.1.25. Summary of studies included in the effectiveness evidence

Table 26: Summary of identified studies included in the evidence review

Study	Intervention and comparison	Population	Outcomes	Comments
Campbell, 2005[29] RCT (factorial)	Home safety programme or Otago exercise programme plus vitamin D supplements (or both) Control group (2 x 1-hour social visits during the first 6 months of the trial) Total n=196 Duration of study: 12-month follow-up	Adults with severe visual impairment Mean age (SD):83.6 (4.7) years Sex: 68% women Setting: New Zealand	Rate of falls; number of people falling	Study identified in Clemson, 2023[41]
Chu, 2017[33]	Occupational therapy fall reduction home visit Control Total n=204 Duration of study: 12-month follow-up	Adults who had already experienced a fall Mean age (SD): 78.4 (6.1) years Sex: 71.1% female Setting: Hong Kong	Rate of falls; number of fallers	Study identified in Clemson, 2023[41]
Cockayne, 2021a[43]	Home visit by occupational therapist Usual care Total n=1331 Duration of study: 12-month follow-up	Community-dwelling older adults Mean age (SD): 80.01 (6.3) years Sex: 65.5% female Setting: NR	Rate of falls; number of fallers; number of people sustaining a fracture	Study identified in Clemson, 2023[41]
Cumming, 2007[48]	Vision tests and eye examinations	Men and women from outpatient aged care services	Rate of falls; number of people falling; number of	Study identified in Clemson, 2023[41]

Study	Intervention and comparison	Population	Outcomes	Comments
	Usual care Total n=616 Duration of study: 12-month follow-up	Mean age (SD):80.6 (6) years Sex: 67% women Setting: Sydney, Australia	people sustaining a fracture	
Cumming, 1999[49]	One home visit by experienced occupational therapist assessing environmental hazards Usual care Total n=530 Duration of study: 12-month follow-up	Community-dwelling people aged 65 years or older Mean age (SD): 77 (7.2) years Sex: 57% women Setting: Sydney, Australia	Rate of falls; number of people falling	Study identified in Clemson, 2023[41]
Day, 2002[57] RCT (factorial)	Home hazard management (assessed by a trained assessor, with hazards removed or modified by participants or home maintenance programme) No intervention Total n=412 Duration of study: 18-month follow-up	Community-dwelling men and women identified from electoral roll Mean age (SD): 76.1 (5) years Sex: 60% women Setting: Melbourne, Australia	Rate of falls; number of people falling	Study identified in Clemson, 2023[41]
Haran, 2010[98]	Optometrist examination Control Total n=606 Duration of study: 13-month follow-up	Community-dwelling adults at a relatively high risk for falls Mean age (SD): 80 (6.6) years Sex: 65% women Setting: Australia	Rate of falls; number of people falling; number sustaining fall-related fractures	Study identified in Clemson, 2023[41]
Kamei, 2015[117]	Home hazard modification program No home hazard modification program	Community-dwelling adults Mean age (SD): NR (65 or over) Sex: 85% female	Fall risk reduction	Study identified in Clemson, 2023[41]

Study	Intervention and comparison	Population	Outcomes	Comments
	Total n=130 Duration of study: 12-month follow-up	Setting: Japan		
Keall, 2015[120] Cluster RCT	Builders assessed the house using a standard checklist of hazards in the home that were within the scope of the home modification intervention Control Total n=477 Duration of study: 36 month follow-up	Occupants of community-owned housing Mean age (SD): 70 years and over Sex: NR Setting: New Zealand	Injurious falls	Study identified in Clemson, 2023[41]
Lannin, 2007[133]	Best practice occupational therapy home visit Control (standard practice in-hospital assessment and education) Total n=10 Duration of study: 3 month follow-up	Community-dwelling adults Mean age (SD): 81 (7) years Sex: 80% female Setting: Sydney, Australia	Number of fallers	
Lin, 2007[142]	Home based exercise training, home safety assessment and modification Control (education and 1 social visit 30 to 40 minutes every 2 weeks for 4 months with fall prevention pamphlets) Total n=100 Duration of study: 6 month follow-up	Residents of rural agricultural area Mean age:76.8 years Sex: 51% female Setting: Taiwan	Rate of falls	Study identified in Clemson, 2023[41]
Lockwood, 2019[148]	Occupational home therapy visit with	Community-dwelling adults	Rate of falls; number of fallers,	Study identified in Clemson, 2023[41]

Study	Intervention and comparison	Population	Outcomes	Comments
	home assessment and assessment of mobility Hospital-based discharge planning only Total n=77 Duration of study: 6 month follow-up	about to be discharged from hospital Mean age (SD): 82.2 (7.2) years Sex: 71.4% female Setting: Melbourne, Australia	number of unplanned hospital readmissions, and health-related quality of life	
McKiernan, 2005[163]	Yaktrax walker (netting applied over usual footwear with wire coils to increase grip in winter outdoor conditions) Control (usual winter footwear) Total n=113 Duration of study: 12 month follow-up	Community-dwelling adults with one or more falls in the previous year Mean age (range): 74.2 (65 to 96) years Sex: 60% women Setting: USA	Rate of falls	Study identified in Clemson, 2023[41]
Nikolaus, 2003[181]	At least 2 home visits from the interdisciplinary home intervention team (HIT) to identify home hazards and prescribe technical aids if necessary and to inform about possible fall risk in home No home visit until final assessment at 1 year Total n=360 Duration of study: 12 month follow-up	Normally community-dwelling adults (recruited while admitted to a geriatric clinic) Mean age (SD):81.5 (6.4) years Sex: 73% women Setting: Germany	Rate of falls; number sustaining a fracture	Study identified in Clemson, 2023[41]
Pardessus, 2002[187]	2-hour home visit with visit from physical medicine and rehabilitation doctor and occupational therapist in which	Adults who had been hospitalised and able to return home	Number of people falling; mean number of falls per person reported, but unable to	Study identified in Clemson, 2023[41]

Study	Intervention and comparison	Population	Outcomes	Comments
	environmental hazards were identified and modified where possible Usual care Total n=60 Duration of study: 12 month follow-up	Mean age (SD):83.2 (7.7) years Sex: 78% female Setting: France	calculate rate of falls	
Perry, 2008[191]	Balance-enhancing insole Normal insole Total n=46 Duration of study: 3 month follow-up	Community-dwelling adults Mean age (SD): 69 (3.4) years Sex: 48% women Setting: Canada	Number of people falling	Study identified in Clemson, 2023[41]
Pighills, 2011[192]	Environmental assessment provided by occupational therapist Usual care from GP Total n=238 Duration of study: 12 month follow-up	Community-dwelling adults aged 70 years or older Mean age (SD): 79 (6) years Sex: 67% women Setting: UK	Rate of falls;number of people falling	Study identified in Clemson, 2023[41]
Stark, 2021[220]	Home hazard removal program Usual care Total n=310 Duration of study: 12 month follow-up	Community-dwelling adults Mean age (SD): 75 (7.4) years Sex: 74% female Setting: NR	Rate of falls; number of people falling	Study identified in Clemson, 2023[41]
Stevens, 2001[223]	Home hazard assessment, installation of free safety devices, and an educational strategy to empower seniors to remove and modify home hazards Control	Adults living independently Mean age:76 years Sex: 53% female Setting: Perth, Australia	Rate of falls; number of people falling	Study identified in Clemson, 2023[41]

Study	Intervention and comparison	Population	Outcomes	Comments
	Total n=1879 Duration of study: 12 month follow-up			
Tchalla, 2013[231]	Automatic night light and tele-assistance service Control Total n=96 Duration of study: 12 month follow-up	Frail older adults Mean age (SD): 86.6 (6.5) years Sex: 77% women Setting: France	Number of people falling; fall incidence.	Study identified in Clemson, 2023[41]
Thomas, 2018[233]	Daily delivery of hot/chilled meals Waitlist Total n=626 Duration of study: 15 weeks follow-up	Homebound older adults Mean age (SD): 76.3 (9.7) years Sex: NR Setting: USA	Number of people who experienced one or more fall	Study identified in Clemson, 2023[41]
Wang, 2019a[250]	Bilateral custom-made ankle-foot orthoses Fitted walking shoes alone Total n=44 Duration of study: 12 month follow-up	Community-dwelling adults attending outpatient clinics and educational centres Mean age (SD): 74.7 (6.4) years Sex: 70.5% women Setting: USA	Rate of falls; number of fallers	Study identified in Clemson, 2023[41]

1.1.26. Summary of the effectiveness evidence

See Clemson 2023[41] Cochrane review for the summary of the effectiveness evidence.

1.1.27. Economic evidence

1.1.27.1. Included studies

Two health economic studies with relevant comparisons were included in this review.[43], [190] These are summarised in the health economic evidence profiles below (**Table 31**) and the health economic evidence tables in Appendix H.

1.1.27.2. Excluded studies

Two economic studies relating to this review question were identified but excluded or selectively excluded due to a combination of limited applicability and methodological limitations and the availability of more applicable evidence.[259],[128] This is listed in Appendix J, with reasons for exclusion given.

See also the health economic study selection flow chart in Appendix G

1.1.28. Summary of included economic evidence

Table 27: Health economic evidence profile: Home hazard assessment and environmental modification versus usual care

Study	Applicability	Limitations	Other comments	Incremental cost	Incremental effects	Cost effectiveness	Uncertainty
Cockayne 2021[43] (UK)	Directly applicable	Potentially serious limitations[(a)]	• Within-RCT analysis based on OTIS trial (same paper) • Cost-utility analysis (QALYs) • Population: Community-dwelling people aged ≥ 65 years who are at risk of falling in England (NHS) • Setting: Community • Comparators: 1. Usual care 2. Home hazard assessment and environmental modification delivered by occupational therapists Follow-up: 1 year	£18.78[(b)]	0.0042 fewer QALYs	Usual care dominates home hazard assessment (less costly and more effective)	Probability intervention 2 (home hazard assessment) cost effective (£20K/£30K threshold): 29%/27% Bootstrapping undertaken. Sensitivity analyses included: 1. Complete-case analysis - ICER (2 versus 1): Home hazard assessment dominates usual care (less costly and more effective). 2. Inclusion of non-falls-related health-care resource use in addition to the falls-related resource use - ICER (2 versus 1): £53,900 per QALY lost 3. Inpatient stay data from falls data sheets, rather than from participant-completed questionnaires

Study	Applicability	Limitations	Other comments	Incremental cost	Incremental effects	Cost effectiveness	Uncertainty
							- ICER (2 versus 1): Usual care dominates home hazard assessment (less costly and more effective) 4. Exploration of the assumption that all equipment provided as part of the intervention is funded by the NHS and PSS - ICER (2 versus 1): Usual care dominates home hazard assessment (less costly and more effective) 5. Paid care worker visits being paid for by the NHS and PSS - ICER (2 versus 1): £14,859 per QALY lost.[(c)]
Pega 2016[190] (New Zealand)	Partially applicable [(d)]	Potentially serious limitations [(e)]	• Deterministic Markov model based on meta-analysis of RCTs (Gillespie 2012)[85] • Cost-utility analysis (QALYs) • Population: Community dwelling adults 65 years and older in New Zealand	NR[(f)]	NR	£4,276 per QALY gained	No probabilistic sensitivity analysis. Scenario analyses included targeting the intervention only to: - Older people with previous injurious falls (ICER £950 per QALY gained) - Older people aged 75 years and above (ICER £4,276 per QALY gained)

Study	Applicability	Limitations	Other comments	Incremental cost	Incremental effects	Cost effectiveness	Uncertainty
			• Setting: Community • Comparators: 1. Usual care 2. Home safety assessment and modification (targeted) • Time horizon: lifetime				- ‘At risk’ older people (≥65 years and one or more previous injurious falls) with declining intervention effectiveness over 10 years (linear decrease to nil) (ICER £9,503 per QALY gained). - ‘At risk’ older people (≥65 years and one or more previous injurious falls) and intervention costs reduced by a third (ICER £2,851per QALY gained). Setting discount rate to 0% and 6% resulted in ICERs of £3,801 per QALY and £5,227 per QALY gained respectively. ICER comparable for both genders and all ethnic groups.

Abbreviations: ICER= incremental cost-effectiveness ratio; QALY= quality-adjusted life years; RCT= randomised controlled trial
(a) Based on a single trial which is not representative of full body of clinical evidence, fall rate ratio 1.17 versus 0.74 in meta analysis and health related QoL mean difference (intervention versus usual care) -0.04 versus 0.09. High level of missing data (~55% complete case), so complete case analysis came to different conclusion to multiple imputation (dominant versus dominated). Short time horizon (1 year) may not capture all downstream effects of intervention.
(b) 2017/2018 UK pounds. Cost components incorporated: Intervention costs and visits to primary care, community care and hospitalisations.
(c) When the ICER is over £20,000 per QALY lost, intervention 2 is considered the cost-effective option.
(d) New Zealand healthcare perspective, with 2011 costs, may not be reflective of current UK context. QoL assessed using disease weights rather than EQ-5D. Discounting at 3% rather than 3.5% as required by NICE reference case.

(e) New Zealand baseline data and resource use may not be applicable to current NHS context. No probabilistic sensitivity analysis conducted. Potential concern with double counting: New Zealand Health Tracker and the Accident Compensation Corporation injury claims registry were not individually linked, in combining counts for injurious falls from these registries, they may have slightly overestimated the number of injured fallers each year. Relative treatment effect based on old Cochrane, which is less favourable than that reported in clinical review (0.81 vs 0.74).

(f) 2011 New Zealand Dollars converted to UK pounds[185]. Cost components incorporated: Intervention costs and falls related costs: hospitalisation and non-hospital healthcare.

1.1.29. Economic model

Table 28: Health economic evidence profile: Home hazard assessment and environmental modification versus usual care

Study	Applicability	Limitations	Other comments	Incremental cost	Incremental effects	Cost effectiveness	Uncertainty
De novo modelling	Directly applicable	Minor limitations	• Deterministic Markov model based on meta-analysis of RCTs • Cost-utility analysis (QALYs) • Population: Community-dwelling people aged ≥ 65 years who are at risk of falling in England (NHS) • Setting: Community • Comparators: 1. Home hazard assessment given by a combination of Occupational therapists and other personnel 2. Home hazard assessment and environmental modification delivered by occupational therapists	Males: -£227 Females: -£510	Males:0.017 Females: 0.028	Home hazard delivered by occupational therapist dominates home hazard assessment delivered by a combination of occupational therapists and other personnel. (less costly and more effective)	Probability intervention 2 (home hazard assessment, males) cost effective (£20K/£30K threshold): 60%/60% Probability intervention 2 (home hazard assessment, females) cost effective (£20K/£30K threshold): 60%/60% Home hazard given by occupational therapist dominates home hazard given by a combination of occupational therapists and other personnel in all sensitivity analyses except the most pessimistic view (where each input is at the most extreme end of its confidence interval that is likely to reduce its cost effectiveness. For example the effectiveness to the top end of its confidence interval).

Study	Applicability	Limitations	Other comments	Incremental cost	Incremental effects	Cost effectiveness	Uncertainty
			Follow-up: lifetime				

1.1.30. Evidence statements

Economic evidence statements

Cockayne 2021

One cost utility analysis found that home hazard assessment and environmental modification delivered by an occupational therapist was dominated by usual care (more costly and less effective) in community dwelling older adults at risk of falling. This analysis was assessed as directly applicable with potentially serious limitations.

Pega 2016

One cost utility analysis found that home safety assessment and targeted modification was cost effective compared to usual care in community dwelling older adults (ICER: £4,276 per QALY gained). This analysis was assessed as partially applicable with potentially serious limitations.

De novo modelling

One cost utility analysis found that home hazard assessment by an Occupational Therapist was dominant compared to usual care. This analysis was assessed as directly applicable with minor limitations.

1.1.31. The committee's discussion and interpretation of the evidence

1.1.31.1. The outcomes that matter most

The committee discussed that all outcomes are considered to be equally important for decision making and therefore agreed that all outcomes are rated as critical. The review on environmental interventions for falls prevention found evidence for all outcomes (rate of falls, number of fallers, number of people sustaining fall-related fractures, number of people sustaining one or more falls, health-related quality of life, and adverse events).

1.1.31.2. The quality of the evidence

The quality of the evidence for quantitative outcomes was assessed with GRADE and was rated as very low to high. See Clemson 2023[41] Cochrane review for full GRADE tables with quality ratings and details of downgrading where appropriate for all outcomes.

1.1.31.3. Benefits and harms

Home fall hazard reduction versus control

Evidence from 12 studies suggested a clinical benefit in the overall analysis of home fall hazard reduction compared to control for rate of falls with very low confidence in the effects. Further clinical benefit of home fall hazard reduction compared to control was also found when analysed for the following sub-groups: evidence from 9 studies found a clinical benefit when participants were selected for high risk of falling at baseline with low confidence in the effects; 7 studies found a clinical benefit when participants were sub-grouped for high tailoring of the interventions to falls with very low confidence in the effects; and another 9 studies found a clinical benefit when interventions were delivered by occupational therapists with very low confidence in the effects. No clinical benefits or harms were found for home fall hazard reduction compared to control for people not selected as high risk of falling, where there was limited tailoring of interventions and when the intervention was delivered by other personnel.

The overall analysis of 12 studies found no clinical differences of home fall hazard reduction compared to control for the number of fallers with very low confidence in the effects. Clinical differences were only when analysed further by the following sub-groups: evidence from 9 studies found a clinical benefit for number of fallers in the home fall hazard reduction group when selected for high of falls with very low confidence in the effects; evidence from 10 studies suggested a clinical benefit for number of fallers in the home fall hazard reduction group when the intervention was delivered by an occupational therapist. No clinical differences were found for other outcomes (number of fallers not selected for high risk of falls, with high tailoring for interventions, or for interventions delivered by personnel other than an OT, number of people sustaining a fracture or medical intervention and health related quality of life).

Assistive technology versus control – vision improvement

The overall analysis of 3 studies found no clinical differences for vision improvement compared to control for rate of falls with very low confidence in the effects. The only clinical benefit for vision improvement interventions compared to control was found for rate of falls requiring medical attention with very low confidence in the effects and only 1 study contributing to the evidence. No further clinical differences were found for vision improvement interventions for other outcomes (rate of falls for those selected for high risk of falls, those not selected for high risk of falls, number of fallers overall, number experiencing 1 or more fracture related falls, rate of falls requiring medical attention, health related quality of life or number of people experiencing 1 or more adverse events i.e. fall after switch glasses).

Assistive technology versus control – footwear, self-care and assistive devices

Evidence suggested a clinical benefit for assistive technologies (footwear, self-care and assistive devices) for rate of falls (3 studies) and number of fallers (4 studies) compared to control with very low confidence in the effects. Evidence from 2 studies also found a clinical benefit for footwear and foot devices compared to control for the rate of falls and number of fallers with very low confidence in the effects. Evidence also found a clinical benefit of self-care and assistive devices compared to control for rate of falls (1 study) and number of fallers (2 studies) with very low confidence in the effects. No further clinical differences were found for other outcomes (number of people requiring medical attention and number of people experiencing one or more fall-related fractures).

Overall discussion

Home hazard reduction

The intervention in the majority of studies identified comprised of a hazard assessment and modifications carried out in the home. The evidence overall demonstrated a benefit for rate of falls in the home hazard reduction arm, for rate of falls in the high risk of falling group and in the group where interventions were tailored to the risk profile of participants. The outcomes were graded as low or very low, although this was often due to participants or personnel within the studies not being blinded. However, the committee agreed blinding for these interventions would be difficult to achieve and some flexibility in interpretation of the grading of studies was required.

The committee discussed the subgroup analysis in people selected as being at higher risk of falls. They noted that in the majority of studies this was in people who had fallen at least one or more times within the previous year, and a number of studies reported previous falls requiring hospitalisation or medical attention.

The committee observed greater benefit was shown when interventions were delivered by an occupational therapist. The committee agreed that usual practice would be for an occupational therapist or physiotherapist to carry out the assessment themselves in a person’s home or would supervise a home intervention team. The committee discussed whether the recommendation should specify the intervention be carried out by specific personnel, and if health economic analysis could use the risk thresholds from within the included studies to test the cost effectiveness of this.

Education

There was only one small study included on a home hazard awareness education intervention, and although a benefit was seen in the rate of falls outcome this was graded as very low certainty in the evidence. The committee agreed no conclusion could be reached based on one study. The committee agreed further research was needed to determine whether people should be given advice or take additional precautions when changing eye prescriptions, and if education interventions have an impact on reducing falls.

Assistive technology

The evidence included vision tests and eye examinations all of which showed vision improvement interventions may make little or no difference to the rate of falls or people experiencing one or more falls.

Results for other assistive technology included footwear and foot devices, self-care and assistive devices. These were not pooled because of the diversity of interventions. The studies reported mixed results and confidence in the outcome was rated as low or very low. The committee agreed they could not make recommendations based on single studies assessing very different interventions. However, they noted it was good practice to advise people on wearing appropriate footwear to reduce hazards at home and when out walking.

1.1.31.4. Cost effectiveness and resource use

Two health economic studies were identified for environmental interventions for falls prevention in a community setting. The first study assessed home hazard assessment and environmental modification delivered by an occupational therapist versus usual care (Cockayne, 2021). This study was assessed as directly applicable with potentially serious limitations. The study found that home hazard assessment was dominated by usual care (more costly and less effective) in the base-case results. A sensitivity analysis, using complete cases, found that home hazard assessment dominates usual care. This analysis was based on evidence from a single trial which was not representative of the full body of clinical evidence identified in the clinical review. The fall rate ratio in this study was greater than 1, suggesting a harm associated with the intervention, whereas the clinical review meta-analysis reported a benefit. The quality of life mean difference was also less favourable than that reported in the meta-analysis. Overall this suggests the cost effectiveness of home hazard assessment and modifications were underestimated in this analysis.

The second study assessed targeted home assessment modification versus usual care (Pega, 2016). This study was assessed as partially applicable with potentially serious limitations. The ICER was £4,276 per QALY gained in the base-case results, additionally sensitivity and scenario analysis found home hazard ratio to be cost effective, with ICERs below the NICE threshold of £20,000 per QALY gained. This analysis may underestimate the true cost effectiveness of the intervention as the fall rate ratio used was based on an older Cochrane review (Gillespie 2012) which was higher than that reported in the updated clinical meta-analysis in this review.

The committee acknowledged the clinical evidence demonstrated a greater benefit for those at high risk of falling, and observed greater benefit was shown when interventions were delivered by an occupational therapist. The committee agreed that usual practice would be for an occupational therapist or physiotherapist to carry out the assessment themselves in a person’s home or would supervise a home intervention team. The committee acknowledged cost effectiveness based on results from Pega 2016. The committee also requested that de novo health economic modelling to be completed comparing home hazard assessment and modification done by an occupational therapist and home hazard assessment and modification done by a combination of occupational therapist and other personnel. This modelling found that home hazard assessment and medication was the dominant treatment (less costly and more effective. Therefore, the committee felt like they had strong evidence to make a recommendation requiring home hazard assessment and modification to be completed by occupational therapists. This recommendation is very likely to be cost saving.

For the other interventions, including assistive technologies (such as footwear, night lights, delivery of meals) and home hazard education support, there was no health economic evidence. The committee did not feel that there was sufficient clinical evidence to make any recommendations on these as standalone interventions but noted that they may be included in the multifactorial recommendations. A research recommendation was recommended for night lights and other assistive technologies such as sensors in the community as the committee felt there was a clinical plausibility and need with such interventions and a lack of clinical and economic evidence.

A consensus recommendation was made to raise awareness that poor footwear could increase the risk of falls. The provision of this advice requires minimal time and is considered current practice, therefore unlikely to have a resource impact.

1.1.32. Recommendations supported by this evidence review

This evidence review supports recommendations 1.3.1 to 1.3.12 in the NICE guideline.

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Appendices

Appendix A Review protocols

A.1 Review protocol for preventing falls in community care settings

ID	Field	Content
1.	Review title	What are the most clinically effective and cost-effective interventions for preventing falls in older people in community settings?
2.	Review question	What are the most clinically and cost-effective methods for falls prevention in older people in community settings?
3.	Objective	To update the existing guideline with new evidence of falls prevention and increase uptake in a range of other settings where NHS health and social care services are delivered, in addition to hospitals.
4.	Searches	The following databases will be searched from the date of the last search of the relevant Cochrane reviews: • Cochrane Central Register of Controlled Trials (CENTRAL) • Cochrane Database of Systematic Reviews (CDSR) • Embase • MEDLINE • Epistemonikos [Searches will be restricted by: • English language studies • Human studies

		The searches may be re-run 6 weeks before the final committee meeting and further studies retrieved for inclusion if relevant. The full search strategies will be published in the final review. Medline search strategy to be quality assured using the PRESS evidence-based checklist (see methods chapter for full details).
5.	Condition or domain being studied	Falls in people over 65 years old.
6.	Population	Inclusion: People in the community who are: • aged 65 and over • aged 50 to 64 who have a condition or conditions that may put them at higher risk of falling. Exclusion: any age group that does not fit the inclusion criteria; families and carers. If the study includes settings, other than community settings, a 10% cut-off point would be used before the evidence was downgraded.
7.	Intervention	Single interventions Exercise: group and individual Medication: vitamin D; calcium; HRT Medication withdrawal Surgery: cardiac pacemaker insertion; cataract surgery. Fluid or nutrition therapy Psychological interventions: CBT Environment/assistive technology: home safety interventions; aids for personal mobility. Environmental aids for communication, information and signalling e.g. vision improvement. Body worn aids for personal care and protection: footwear modification.

		Knowledge/education interventions Multiple component interventions: combination of single categories of intervention (receive a fixed combination of 2 or more fall prevention interventions from the different categories above) Multifactorial interventions: more than one main category of intervention (assessment of an individual to determine the presence of 2 or more modifiable risk factors for falling, followed by specific interventions targeting those risk factors).
8.	Comparator	Single interventions' comparators: Usual care/placebo Multicomponent or multifactorial interventions' comparators: Usual care/attention control Exercise as a single intervention. Exercise Usual care/control Exercise
9.	Types of study to be included	Randomised controlled trials (RCTs). There are enough RCTs identified within the area so we will not be including non-randomised studies. For a systematic review (SR) to be included it must be conducted in line with the methodological processes described in the NICE manual. If sufficient details are provided, reviewers will either include the SR fully or use it as the basis for further analyses where possible. If sufficient details are not provided to include a relevant SR, the review will only be used for citation searching. Published NMAs and IPDs will be considered for inclusion.
10.	Other exclusion criteria	Non-English language studies

		Conference abstracts will be excluded as it is expected there will be sufficient full text published studies available.
11.	Context	Community setting, other settings are included in other protocols.
12.	Primary outcomes (critical outcomes)	All outcomes are considered equally important for decision making and therefore have all been rated as critical: • Rate of falls • Number of people sustaining one or more falls • Number of participants sustaining fall-related fractures • Adverse effects of the interventions (composite of all) • Validated health-related quality of life scores e.g. EQ-5D or similar
13.	Data extraction (selection and coding)	EndNote will be used for reference management, sifting, citations and bibliographies. All references identified by the searches and from other sources will be uploaded into EPPI reviewer and de-duplicated. 10% of the abstracts will be reviewed by two reviewers, with any disagreements resolved by discussion or, if necessary, a third independent reviewer. The full text of potentially eligible studies will be retrieved and will be assessed in line with the criteria outlined above. A standardised form will be used to extract data from studies (see Developing NICE guidelines: the manual section 6.4). 10% of all evidence reviews are quality assured by a senior research fellow. This includes checking: • papers were included /excluded appropriately. • a sample of the data extractions

		• correct methods are used to synthesise data. • a sample of the risk of bias assessments Disagreements between the review authors over the risk of bias in particular studies will be resolved by discussion, with involvement of a third review author where necessary. Study investigators may be contacted for missing data where time and resources allow.
14.	Risk of bias (quality) assessment	Risk of bias will be assessed using the appropriate checklist as described in Developing NICE guidelines: the manual. For Intervention reviews • Systematic reviews: Risk of Bias in Systematic Reviews (ROBIS) • Randomised Controlled Trial: Cochrane RoB (2.0) • Non-randomised study, including cohort studies: Cochrane ROBINS-I
15.	Strategy for data synthesis	Where available, outcome data from new studies will be meta-analysed with corresponding data included in CG161 (which was based on Gillespie 2012 Cochrane review) for single interventions. A Cochrane review on multifactorial and multi-component interventions (Hopewell 2018) will be updated and a Cochrane review on exercise (Sherrington 2019) will be updated. • Pairwise meta-analyses will be performed using Cochrane Review Manager (RevMan5). Fixed-effects (Mantel-Haenszel) techniques will be used to calculate risk ratios for the binary outcomes where possible. Continuous outcomes will be analysed using an inverse variance method for pooling weighted mean differences. Heterogeneity between the studies in effect measures will be assessed using the I^2 statistic and visually inspected. An I^2 value greater than 50% will be considered indicative of substantial heterogeneity. Sensitivity analyses will be conducted based on pre-specified subgroups using stratified meta-analysis to explore the heterogeneity in effect estimates. If this does not explain the heterogeneity, the results will be presented pooled using random-effects.

		• GRADEpro will be used to assess the quality of evidence for each outcome, taking into account individual study quality and the meta-analysis results. The 4 main quality elements (risk of bias, indirectness, inconsistency and imprecision) will be appraised for each outcome. Publication bias will be considered with the guideline committee, and if suspected will be tested for when there are more than 5 studies for that outcome. • The risk of bias across all available evidence was evaluated for each outcome using an adaptation of the 'Grading of Recommendations Assessment, Development and Evaluation (GRADE) toolbox' developed by the international GRADE working group http://www.gradeworkinggroup.org/ • Where meta-analysis is not possible, data will be presented, and quality assessed individually per outcome. • WinBUGS will be used for network meta-analysis, if possible, given the data identified. Consider groups identified in the equality impact assessment. Equality issues raised: Disability -People with mental health problems have limited access to physiotherapy services within inpatient mental health. People with learning disabilities are at risk of falls. Tailored education and information may be required for people with learning disabilities to meet their needs. Sex differences in balance outcomes have been reported within the literature in some populations at risk of falls. Other definable characteristics (these are examples): - People in Gypsy, Roma and Traveller communities. - People not registered with a GP or in contact with health and social care services	
16.	Analysis of sub-groups	Subgroups that will be investigated if heterogeneity is present: specific type of intervention.	
17.	Type and method of review	x	Intervention
		☐	Diagnostic
		☐	Prognostic
		☐	Qualitative

		☐	Epidemiologic	
		☐	Service Delivery	
		☐	Other (please specify)	
18.	Language	English		
19.	Country	England		
20.	Anticipated or actual start date	[For the purposes of PROSPERO, the date of commencement for the systematic review can be defined as any point after completion of a protocol but before formal screening of the identified studies against the eligibility criteria begins. A protocol can be deemed complete after sign-off by the NICE team with responsibility for quality assurance.]		
21.	Anticipated completion date	21/8/2024		
22.	Stage of review at time of this submission	Review stage	Started	Completed
		Preliminary searches	☑	☑
		Piloting of the study selection process	☑	☑
		Formal screening of search results against eligibility criteria	☑	☑
		Data extraction	☑	☑
		Risk of bias (quality) assessment	☑	☑
		Data analysis	☑	☑
23.	Named contact	5a. Named contact Julie Neilson Centre for Guidelines, NICE		

		5b Named contact e-mail: Guidelines8@nice.org.uk 5e Organisational affiliation of the review National Institute for Health and Care Excellence (NICE)
24.	Review team members	From NICE: Gill Ritchie [Guideline lead] Julie Neilson [Senior systematic reviewer] Annette Chalker [Systematic reviewer] Sophia Kemmis-Betty [Senior Health economist] Steph Armstrong [Health economist] Joseph Runicles [Information specialist] Tamara Diaz [Project Manager]
25.	Funding sources/sponsor	Development of this systematic review is being funded by NICE.
26.	Conflicts of interest	All guideline committee members and anyone who has direct input into NICE guidelines (including the evidence review team and expert witnesses) must declare any potential conflicts of interest in line with NICE's code of practice for declaring and dealing with conflicts of interest. Any relevant interests, or changes to interests, will also be declared publicly at the start of each guideline committee meeting. Before each meeting, any potential conflicts of interest will be considered by the guideline committee Chair and a senior member of the development team. Any decisions to exclude a person from all or part of a meeting will be documented. Any changes to a member's declaration of interests will be recorded in the minutes of the meeting. Declarations of interests will be published with the final guideline.
27.	Collaborators	Development of this systematic review will be overseen by an advisory committee who will use the review to inform the development of evidence-based recommendations in line with section 3 of Developing NICE guidelines: the manual. Members of the guideline committee are available on the NICE website: [NICE guideline webpage].

28.	Other registration details	N/A	
29.	Reference/URL for published protocol	[Give the citation and link for the published protocol, if there is one.]	
30.	Dissemination plans	NICE may use a range of different methods to raise awareness of the guideline. These include standard approaches such as: • notifying registered stakeholders of publication • publicising the guideline through NICE's newsletter and alerts • issuing a press release or briefing as appropriate, posting news articles on the NICE website, using social media channels, and publicising the guideline within NICE. [Add in any additional agree dissemination plans.]	
31.	Keywords	[Give words or phrases that best describe the review.]	
32.	Details of existing review of same topic by same authors	N/A	
33.	Current review status	☐	Ongoing
		x	Completed but not published
		☐	Completed and published
		☐	Completed, published and being updated
		☐	Discontinued
34.	Additional information	[Provide any other information the review team feel is relevant to the registration of the review.]	
35.	Details of final publication	www.nice.org.uk	

A.2 Health economic review protocol

Review question	All questions – health economic evidence
Objectives	To identify health economic studies relevant to any of the review questions.
Search criteria	• Populations, interventions and comparators must be as specified in the clinical review protocol above. • Studies must be of a relevant health economic study design (cost–utility analysis, cost-effectiveness analysis, cost–benefit analysis, cost–consequences analysis, comparative cost analysis). • Studies must not be a letter, editorial or commentary, or a review of health economic evaluations. (Recent reviews will be ordered although not reviewed. The bibliographies will be checked for relevant studies, which will then be ordered.) • Unpublished reports will not be considered unless submitted as part of a call for evidence. • Studies must be in English.
Search strategy	A health economic study search will be undertaken using population-specific terms and a health economic study filter – see appendix B below.
Review strategy	Studies not meeting any of the search criteria above will be excluded. Studies published before 2007, abstract-only studies and studies from non-OECD countries or the USA will also be excluded. Studies published after 2007 that were included in the previous guideline(s) will be reassessed for inclusion and may be included or selectively excluded based on their relevance to the questions covered in this update and whether more applicable evidence is also identified. Each remaining study will be assessed for applicability and methodological limitations using the NICE economic evaluation checklist which can be found in appendix H of Developing NICE guidelines: the manual (2014).[176]

	Inclusion and exclusion criteria • If a study is rated as both ‘Directly applicable’ and with ‘Minor limitations’, then it will be included in the guideline. A health economic evidence table will be completed, and it will be included in the health economic evidence profile. • If a study is rated as either ‘Not applicable’ or with ‘Very serious limitations’, then it will usually be excluded from the guideline. If it is excluded, then a health economic evidence table will not be completed, and it will not be included in the health economic evidence profile. • If a study is rated as ‘Partially applicable’, with ‘Potentially serious limitations’ or both then there is discretion over whether it should be included. Where there is discretion The health economist will make a decision based on the relative applicability and quality of the available evidence for that question, in discussion with the guideline committee if required. The ultimate aim is to include health economic studies that are helpful for decision-making in the context of the guideline and the current NHS setting. If several studies are considered of sufficiently high applicability and methodological quality that they could all be included, then the health economist, in discussion with the committee if required, may decide to include only the most applicable studies and to selectively exclude the remaining studies. All studies excluded on the basis of applicability or methodological limitations will be listed with explanation in the excluded health economic studies appendix below. The health economist will be guided by the following hierarchies. Setting: • UK NHS (most applicable). • OECD countries with predominantly public health insurance systems (for example, France, Germany, Sweden). • OECD countries with predominantly private health insurance systems (for example, Switzerland).

	• Studies set in non-OECD countries or in the USA will be excluded before being assessed for applicability and methodological limitations. Health economic study type: • Cost–utility analysis (most applicable). • Other type of full economic evaluation (cost–benefit analysis, cost-effectiveness analysis, cost–consequences analysis). • Comparative cost analysis. • Non-comparative cost analyses including cost-of-illness studies will be excluded before being assessed for applicability and methodological limitations. Year of analysis: • The more recent the study, the more applicable it will be. • Studies published in 2007 or later (including any such studies included in the previous guideline(s)) but that depend on unit costs and resource data entirely or predominantly from before 2007 will be rated as 'Not applicable'. • Studies published before 2007 (including any such studies included in the previous guideline(s)) will be excluded before being assessed for applicability and methodological limitations. Quality and relevance of effectiveness data used in the health economic analysis: • The more closely the clinical effectiveness data used in the health economic analysis match with the outcomes of the studies included in the clinical review the more useful the analysis will be for decision-making in the guideline.

Appendix B Literature search strategies

The literature searches for this review are detailed below and complied with the methodology outlined in Developing NICE guidelines: the manual (2014)

For more information, please see the Methodology review published as part of the accompanying documents for this guideline.

B.1 Clinical search literature search strategy

Searches were constructed using a PICO framework where population (P) terms were combined with Intervention (I) and in some cases Comparison (C) terms. Outcomes (O) are rarely used in search strategies as these concepts may not be indexed or described in the title or abstract and are therefore difficult to retrieve. Search filters were applied to the search where appropriate.

Table 29: Database parameters, filters and limits applied

Database	Dates searched	Search filter used
Medline ALL (OVID)	01-03-2012 - 07-05-2024	Systematic reviews Randomised controlled trials Exclusions (animal studies, letters, comments, editorials, news, historical articles, anecdotes, case studies/reports) English language
Embase (OVID)	01-03-2012 - 07-05-2024	Systematic reviews Randomised controlled trials Exclusions (animal studies, letters, comments, editorials, case studies/reports, conference abstracts) English language
The Cochrane Library (Wiley)	Cochrane CDSR to 2024 Issue 5 of 12	
Epistemonikos (The Epistemonikos Foundation)	No date limits applied (searched 07/05/2024)	

Medline (Ovid) search terms

1	Accidental Falls/
2	(falls or falling or fallen or faller*1).ti,ab.
3	or/1-2
4	letter/
5	editorial/
6	news/
7	exp historical article/
8	Anecdotes as Topic/
9	comment/
10	case reports/
11	(letter or comment*).ti.
12	or/4-11
13	randomized controlled trial/ or random*.ti,ab.
14	12 not 13
15	animals/ not humans/
16	exp Animals, Laboratory/
17	exp Animal Experimentation/
18	exp Models, Animal/
19	exp Rodentia/
20	(rat or rats or mouse or mice or rodent*).ti.
21	or/14-20
22	3 not 21
23	limit 22 to english language
24	exp Aged/
25	(senior*1 or elder* or old* or aged or ag?ing or geriatric or community dwelling*).ti,ab,kf.
26	24 or 25
27	23 and 26
28	randomized controlled trial.pt.
29	controlled clinical trial.pt.

30	randomi#ed.ti,ab.
31	placebo.ab.
32	randomly.ti,ab.
33	Clinical Trials as topic.sh.
34	trial.ti.
35	or/28-34
36	systematic review/
37	meta-analysis/
38	(meta analy* or metanaly* or metaanaly* or meta regression).ti,ab.
39	((systematic* or evidence*) adj3 (review* or overview*)).ti,ab.
40	(reference list* or bibliograph* or hand search* or manual search* or relevant journals).ab.
41	(search strategy or search criteria or systematic search or study selection or data extraction).ab.
42	(search* adj4 literature).ab.
43	(medline or pubmed or cochrane or embase or psychlit or psyclit or psychinfo or psycinfo or cinahl or science citation index or bids or cancerlit).ab.
44	cochrane.jw.
45	((multiple treatment* or indirect or mixed) adj2 comparison*).ti,ab.
46	or/36-45
47	27 and (35 or 46)
48	limit 47 to dt=20120301-20230331
49	limit 47 to ed=20120301-20230331
50	48 or 49

Embase (Ovid) search terms

1	falling/
2	(falls or falling or faller*1 or fallen).ti,ab.
3	or/1-2
4	letter.pt. or letter/
5	note.pt.

6	editorial.pt.
7	case report/ or case study/
8	(letter or comment*).ti.
9	(conference abstract or conference paper).pt.
10	or/4-9
11	randomized controlled trial/ or random*.ti,ab.
12	10 not 11
13	animal/ not human/
14	nonhuman/
15	exp Animal Experiment/
16	exp Experimental Animal/
17	animal model/
18	exp Rodent/
19	(rat or rats or mouse or mice or rodent*).ti.
20	or/12-19
21	3 not 20
22	limit 21 to english language
23	exp *aged/
24	(senior*1 or elder* or old* or aged or ag?ing or geriatric or community dwelling*).ti,ab,kf.
25	23 or 24
26	22 and 25
27	random*.ti,ab.
28	factorial*.ti,ab.
29	(crossover* or cross over*).ti,ab.
30	((doubl* or singl*) adj blind*).ti,ab.
31	(assign* or allocat* or volunteer* or placebo*).ti,ab.
32	crossover procedure/
33	single blind procedure/
34	randomized controlled trial/
35	double blind procedure/

36	or/27-35
37	systematic review/
38	meta-analysis/
39	(meta analy* or metanaly* or metaanaly* or meta regression).ti,ab.
40	((systematic* or evidence*) adj3 (review* or overview*)).ti,ab.
41	(reference list* or bibliograph* or hand search* or manual search* or relevant journals).ab.
42	(search strategy or search criteria or systematic search or study selection or data extraction).ab.
43	(search* adj4 literature).ab.
44	(medline or pubmed or cochrane or embase or psychlit or psyclit or psychinfo or psycinfo or cinahl or science citation index or bids or cancerlit).ab.
45	cochrane.jw.
46	((multiple treatment* or indirect or mixed) adj2 comparison*).ti,ab.
47	or/37-46
48	26 and (36 or 47)
49	limit 48 to dc=20120301-20230331

Cochrane CDSR search terms

#1	MeSH descriptor: [Accidental Falls] explode all trees
#2	(fall or falls or falling or faller* or fallen or slip* or trip* or collapse*):ti,ab
#3	#1 or #2
#4	MeSH descriptor: [Aged] explode all trees
#5	(senior*1 or elder* or old* or aged or ag?ing or geriatric or community dwelling*):ti,ab
#6	#4 or #5
#7	#3 and #6 with Cochrane Library publication date Between Mar 2012 and Mar 2023, in Cochrane Reviews

Epistemonikos search terms

(title:((title:((falls OR falling OR fallen OR faller*1)) OR abstract:((falls OR falling OR fallen OR faller*1)))) OR abstract:((title:((falls OR falling OR fallen OR faller*1)) OR abstract:((falls OR falling OR fallen OR faller*1))))) AND (title:((senior*1 OR elder* OR old* OR aged OR ag?ing OR geriatric OR community dwelling*)) OR abstract:((senior*1 OR elder* OR old* OR aged OR ag?ing OR geriatric OR community dwelling*)))

B.2 Health Economics literature search strategy

Health economic evidence was identified by applying economic evaluation and quality of life filters to the clinical literature search strategy in Medline and Embase. The following databases were also searched: NHS Economic Evaluation Database (NHS EED - this ceased to be updated after 31st March 2015), Health Technology Assessment database (HTA - this ceased to be updated from 31st March 2018) and The International Network of Agencies for Health Technology Assessment (INAHTA)

Table 30: Database parameters, filters and limits applied

Database	Dates searched	Search filters and limits applied
Medline (OVID)	Health Economics 1 January 2014 – 8 May 2024 Quality of Life 1 January 2004 to – 8 May 2024	Health economics studies Quality of Life studies Exclusions (animal studies) English language
Embase (OVID)	Health Economics 1 January 2014 – 8 May 2024 Quality of Life 1 January 2004 to – 8 May 2024	Health economics studies Quality of Life studies Exclusions (animal studies) English language
NHS Economic Evaluation Database (NHS EED) (Centre for Research and Dissemination - CRD)	Inception – 31 March 2015 (database no longer updated as of this date)	
Health Technology Assessment Database (HTA)	Inception – 31 March 2018 (database no longer updated as of this date)	

Database	Dates searched	Search filters and limits applied
(Centre for Research and Dissemination – CRD)		
The International Network of Agencies for Health Technology Assessment (INAHTA)	Inception - 8 May 2024	English language

Medline (Ovid) search terms

1	Accidental Falls/
2	(fall or falls or falling or faller* or fallen or slip* or trip or trips or tripped or tripping or tumbl*).ti,ab.
3	or/1-2
4	letter/
5	editorial/
6	news/
7	exp historical article/
8	Anecdotes as Topic/
9	comment/
10	case report/
11	(letter or comment*).ti.
12	or/4-11
13	randomized controlled trial/ or random*.ti,ab.
14	12 not 13
15	animals/ not humans/
16	exp Animals, Laboratory/
17	exp Animal Experimentation/
18	exp Models, Animal/
19	exp Rodentia/
20	(rat or rats or mouse or mice or rodent*).ti.
21	or/14-20
22	3 not 21
23	limit 22 to english language
24	limit 23 to yr="2004 -Current"

25	23 and 24
26	Economics/
27	Value of life/
28	exp "Costs and Cost Analysis"/
29	exp Economics, Hospital/
30	exp Economics, Medical/
31	Economics, Nursing/
32	Economics, Pharmaceutical/
33	exp "Fees and Charges"/
34	exp Budgets/
35	budget*.ti,ab.
36	cost*.ti.
37	(economic* or pharmaco?economic*).ti.
38	(price* or pricing*).ti,ab.
39	(cost* adj2 (effective* or utilit* or benefit* or minimi* or unit* or estimat* or variable*)).ab.
40	(financ* or fee or fees).ti,ab.
41	(value adj2 (money or monetary)).ti,ab.
42	or/26-41
43	quality-adjusted life years/
44	sickness impact profile/
45	(quality adj2 (wellbeing or well being)).ti,ab.
46	sickness impact profile.ti,ab.
47	disability adjusted life.ti,ab.
48	(qal* or qtime* or qwb* or daly*).ti,ab.
49	(euroqol* or eq5d* or eq 5*).ti,ab.
50	(qol* or hql* or hqol* or h qol* or hrqol* or hr qol*).ti,ab.
51	(health utility* or utility score* or disutilit* or utility value*).ti,ab.
52	(hui or hui1 or hui2 or hui3).ti,ab.
53	(health* year* equivalent* or hye or hyes).ti,ab.
54	discrete choice*.ti,ab.
55	rosser.ti,ab.
56	(willingness to pay or time tradeoff or time trade off or tto or standard gamble*).ti,ab.

57	(sf36* or sf 36* or short form 36* or shortform 36* or shortform36*).ti,ab.
58	(sf20 or sf 20 or short form 20 or shortform 20 or shortform20).ti,ab.
59	(sf12* or sf 12* or short form 12* or shortform 12* or shortform12*).ti,ab.
60	(sf8* or sf 8* or short form 8* or shortform 8* or shortform8*).ti,ab.
61	(sf6* or sf 6* or short form 6* or shortform 6* or shortform6*).ti,ab.
62	or/43-61
63	25 and 42
64	limit 63 to yr="2014 -Current"
65	25 and 62

Embase (Ovid) search terms

1	falling/
2	(fall or falls or falling or faller* or fallen or slip* or trip or trips or tripped or tripping or tumbl*).ti,ab.
3	or/1-2
4	letter.pt. or letter/
5	note.pt.
6	editorial.pt.
7	case report/ or case study/
8	(letter or comment*).ti.
9	(conference abstract or conference paper).pt.
10	or/4-9
11	randomized controlled trial/ or random*.ti,ab.
12	10 not 11
13	animal/ not human/
14	nonhuman/
15	exp Animal Experiment/
16	exp Experimental Animal/
17	animal model/
18	exp Rodent/
19	(rat or rats or mouse or mice or rodent*).ti.
20	or/12-19
21	3 not 20

22	limit 21 to english language
23	limit 22 to yr="2004 -Current"
24	health economics/
25	exp economic evaluation/
26	exp health care cost/
27	exp fee/
28	budget/
29	funding/
30	budget*.ti,ab.
31	cost*.ti.
32	(economic* or pharmaco?economic*).ti.
33	(price* or pricing*).ti,ab.
34	(cost* adj2 (effective* or utilit* or benefit* or minimi* or unit* or estimat* or variable*)).ab.
35	(financ* or fee or fees).ti,ab.
36	(value adj2 (money or monetary)).ti,ab.
37	or/24-36
38	quality adjusted life year/
39	"quality of life index"/
40	short form 12/ or short form 20/ or short form 36/ or short form 8/
41	sickness impact profile/
42	(quality adj2 (wellbeing or well being)).ti,ab.
43	sickness impact profile.ti,ab.
44	disability adjusted life.ti,ab.
45	(qal* or qtime* or qwb* or daly*).ti,ab.
46	(euroqol* or eq5d* or eq 5*).ti,ab.
47	(qol* or hql* or hqol* or h qol* or hrqol* or hr qol*).ti,ab.
48	(health utility* or utility score* or disutilit* or utility value*).ti,ab.
49	(hui or hui1 or hui2 or hui3).ti,ab.
50	(health* year* equivalent* or hye or hyes).ti,ab.
51	discrete choice*.ti,ab.
52	rosser.ti,ab.
53	(willingness to pay or time tradeoff or time trade off or tto or standard gamble*).ti,ab.
54	(sf36* or sf 36* or short form 36* or shortform 36* or shortform36*).ti,ab.

55	(sf20 or sf 20 or short form 20 or shortform 20 or shortform20).ti,ab.
56	(sf12* or sf 12* or short form 12* or shortform 12* or shortform12*).ti,ab.
57	(sf8* or sf 8* or short form 8* or shortform 8* or shortform8*).ti,ab.
58	(sf6* or sf 6* or short form 6* or shortform 6* or shortform6*).ti,ab.
59	or/38-58
60	23 and 37
61	limit 60 to yr="2014 -Current"
62	23 and 59

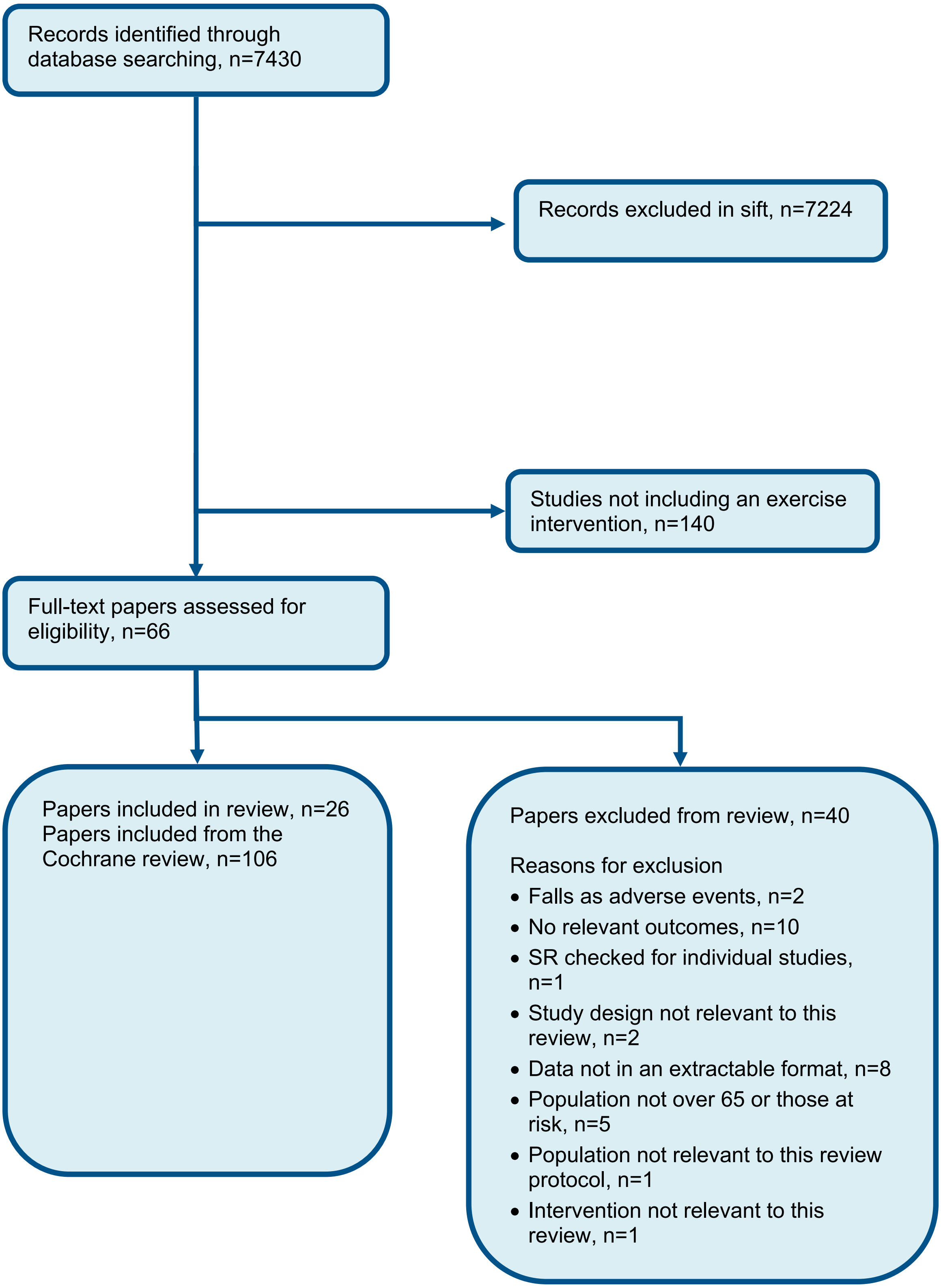
NHS EED and HTA (CRD) search terms

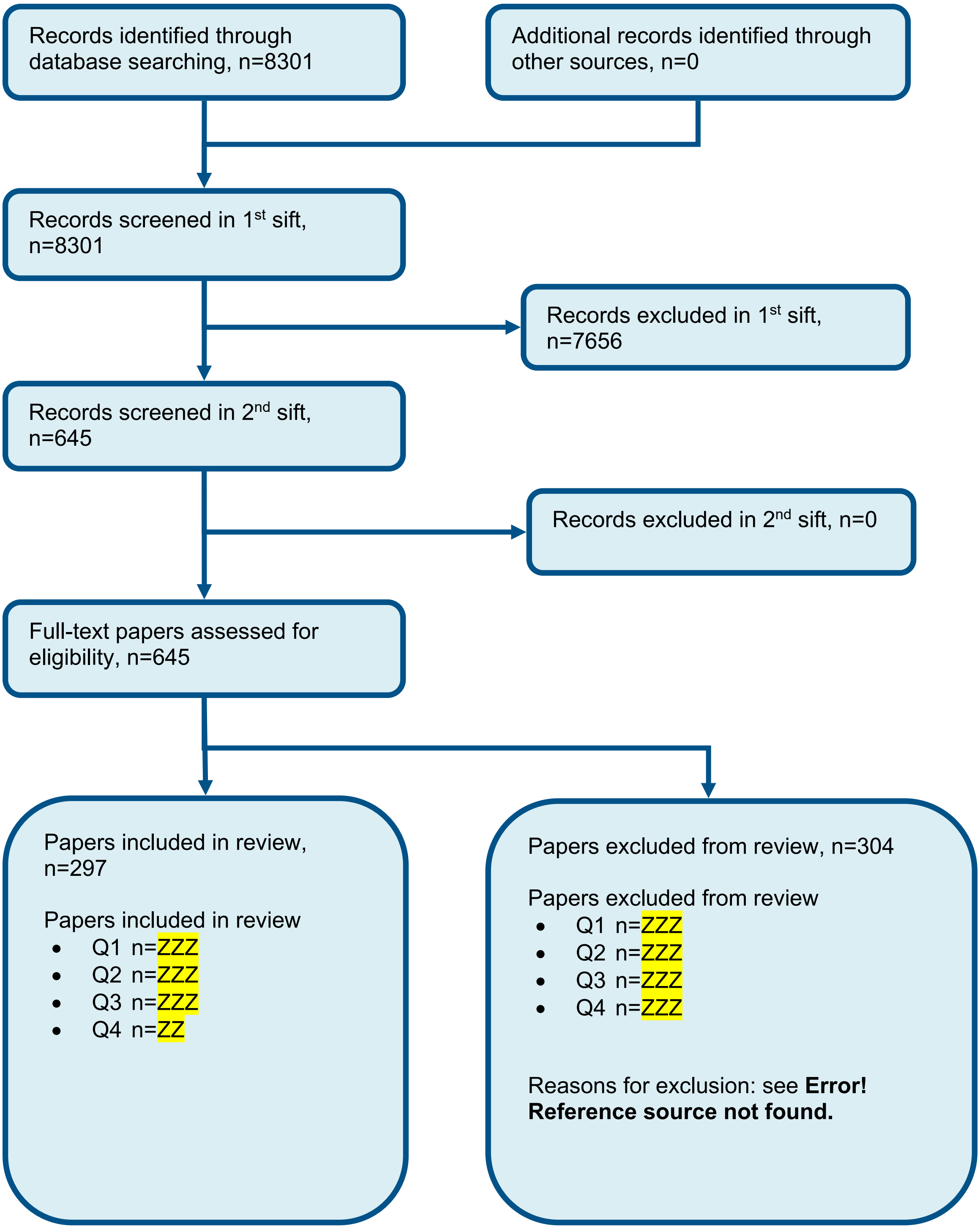
1	MeSH DESCRIPTOR Accidental Falls EXPLODE ALL TREES
2	((fall or falls or falling or faller* or fallen or slip* or trip or trips or tripped or tripping or tumbl*))
3	#1 OR #2
4	(#3) IN NHSEED
5	(#3) IN HTA

INAHTA search terms

1	("Accidental Falls"[mh]) OR (fall or falls or falling or faller* or fallen or slip* or trip or trips or tripped or tripping or tumbl*)
2	limit to english language
3	2004 - current

Appendix C Effectiveness evidence study selection




Records identified through database searching, n=8301
Additional records identified through other sources, n=0
Records screened in 1st sift, n=8301
Records excluded in 1st sift, n=7656
Records screened in 2nd sift, n=645
Records excluded in 2nd sift, n=0
Full-text papers assessed for eligibility, n=645
Papers included in review, n=297
Papers included in review
• Q1 n=ZZZ
• Q2 n=ZZZ
• Q3 n=ZZZ
• Q4 n=ZZ
Papers excluded from review, n=304
Papers excluded from review
• Q1 n=ZZZ
• Q2 n=ZZZ
• Q3 n=ZZZ
• Q4 n=ZZZ
Reasons for exclusion: see **Error! Reference source not found.**

Appendix D Effectiveness evidence

D.1 Exercise Interventions

Altamirano Guerrero, 2022

Bibliographic Reference	**Altamirano Guerrero, O.; Balarezo Garcia, M.G.; Herrera Lazo, Z.; EFFECTIVENESS OF A PREVENTIVE PROGRAM FOR THE REDUCTION OF FALLS IN OLDER ADULTS; NeuroQuantology; 2022; vol. 20 (no. 13); 287-292**

Study details

Secondary publication of another included study- see primary study for details	NR
Other publications associated with this study included in review	NR
Trial name / registration number	NR
Study type	Cluster randomised controlled trial (GP practices and patients).
Study location	Ecuador
Study setting	Community setting
Study dates	Intervention from June 2018 to June 2019

Sources of funding	Not reported
Inclusion criteria	65 years with an increased risk of physical falls
Exclusion criteria	Not living independently or physical or mental restrictions that interfered with assessing physical fall risk or participating in an exercise program
Recruitment / selection of participants	Participants were recruited from 40 general practices.
Intervention(s)	Supervised physical training programme with exercises for 1h per week including strength and power training, and balance and gait training with increasing levels of difficulty. Exercises were led by a physiotherapist and sports physician.
Population subgroups	NR
Comparator	Control
Number of participants	N=378 Intervention: n= 222 Control: n= 156
Duration of follow-up	12 months
Indirectness	None

Study arms

Intervention (N = 222)

Control (N = 156)

Characteristics

Arm-level characteristics

Characteristic	Intervention (N = 222)	Control (N = 156)
% Female Nominal	77.4	72.4
Mean age (SD) Mean (SD)	78 (6)	78 (6)

Outcomes

Study timepoints

12 month

Outcomes

Outcome	**Intervention, 12 month, N = 222**	**Control, 12 months, N = 156**
Number of fallers Nominal	73	70

Critical appraisal - Cochrane Risk of Bias tool (RoB 2.0) Cluster randomised trials

Outcomes-Number of fallers-Nominal-Intervention -Control-t12

Section	Question	Answer
Overall bias and Directness	Risk of bias judgement	High *(High risk of bias due to participants being aware of their assigned intervention)*
Overall bias and Directness	Overall Directness	Directly applicable *(Directly applicable)*

Bates, 2022

Bibliographic Reference	**Bates, Amanda; Furber, Susan; Sherrington, Cathie; van den Dolder, Paul; Ginn, Karen; Bauman, Adrian; Howard, Kirsten; Kershaw, Michelle; Franco, Lisa; Chittenden, Cathy; Tiedemann, Anne; Effectiveness of workshops to teach a home-based exercise program (BEST at Home) for preventing falls in community-dwelling people aged 65 years and over: a pragmatic randomised controlled trial.; BMC geriatrics; 2022; vol. 22 (no. 1); 366**

Study details

Secondary publication of another included study- see primary study for details	Not reported
Other publications associated with this study included in review	Not reported
Trial name / registration number	ACTRN12615000865516
Study type	Randomised controlled trial (RCT)

Study location	Australia
Study setting	Community setting
Study dates	September 2015 - May 2018
Sources of funding	Australian National Health and Medical Research Council Partnership Project Grant
Inclusion criteria	65 years and older residing in the Illawarra and Shoalhaven Local Health District
Exclusion criteria	Cognitive impairment (assessed by a Memory Impairment Screen score of less than 5) Inability to walk 10m despite assistance from a walking aid Insufficient English language skills to read and understand program materials Progressive neurological disease (e.g. Parkinson's disease, multiple sclerosis) Fracture or joint replacement within the last 6 months Medical condition precluding exercise (e.g. unstable cardiac disease, uncontrolled hypertension, uncontrolled metabolic diseases) Unable to obtain medical clearance (as determined by their General Practitioner) Currently participating in an exercise program two or more times per week that is similar to either the upper limb or lower limb exercise program
Recruitment / selection of participants	Recruitment occurred though paid advertisements in local newspapers, media releases, radio interviews, distribution of flyers and other printed material.
Intervention(s)	Based on the Otago Exercise programme including lower limb strength and balance exercises. Participants were asked to perform 10-20 repetitions of each exercise 3 times a week. Participants also received a fall prevention booklet. Experienced physiotherapists provided instructions in three group workshops which occurred at weeks 1, 4 and 12 for 1 hour.

Population subgroups	None
Comparator	Participants were asked to perform upper limb exercises at home in a seated position. Participants were asked to perform 10 repetitions 3 times week. Experienced physiotherapists provided instructions in three group workshops which occurred at weeks 1, 4 and 12 for 1 hour.
Number of participants	N=579 Intervention: n=290 Control: n=289
Duration of follow-up	12 months
Indirectness	None

Study arms

Intervention (N = 290)

Control (N = 289)

Characteristics

Study-level characteristics

Characteristic	**Study (N =)**
% Female Nominal	63.7
Mean age (SD)	73.1 (6)

Characteristic	Study (N =)
Mean (SD)	
arthritis Nominal	354
Osteoporosis Nominal	123
Diabetes Nominal	58
Depression Nominal	99

Outcomes

Study timepoints

12 month

Outcomes

Outcome	Intervention vs Control, 12 month, N2 = 289, N1 = 290
Number of falls (IRR) Relative risk/95% CI	0.91 (0.63 to 1.32)

Outcomes

Outcome	Intervention, 12 month, N = 290	Control, 12 month, N = 289
Number of fractures No of events	n = 12	n = 4
Quality of life (SF-12 Physical) Standardised Mean (SD)	48.5 (7.6)	47.2 (8.7)
Quality of life (SF-12 Mental) Mean (SD)	54.4 (5)	54.2 (4.8)

Critical appraisal - Cochrane Risk of Bias tool (RoB 2.0) Normal RCT

Outcomes-Number of falls (IRR)-RelativeRiskNineFivePercentCI-Intervention-Control-t12

Section	Question	Answer
Overall bias and Directness	Risk of bias judgement	High *(High risk of bias due to participants and people delivering the intervention being aware of the intervention, issues with adherence, and the self-reported nature of the outcome)*
Overall bias and Directness	Overall Directness	Directly applicable *(Directly applicable)*

Outcomes-Number of fractures -No of events -Intervention-Control-t12

Section	Question	Answer
Overall bias and Directness	Risk of bias judgement	High *(High risk of bias due to participants and people delivering the intervention being aware of the intervention, issues with adherence, and the self-reported nature of the outcome)*
Overall bias and Directness	Overall Directness	Directly applicable *(Directly applicable)*

Outcomes-Quality of life (SF-12Physical)-StandardisedMean SD -Intervention-Control-t12

Section	Question	Answer
Overall bias and Directness	Risk of bias judgement	High *(High risk of bias due to participants and people delivering the intervention being aware of the intervention, issues with adherence, and the self-reported nature of the outcome)*
Overall bias and Directness	Overall Directness	Directly applicable *(Directly applicable)*

Outcomes-Quality of life (SF-12Mental)-Mean SD -Intervention-Control-t12

Section	Question	Answer
Overall bias and Directness	Risk of bias judgement	High *(High risk of bias due to participants and people delivering the intervention being aware of the intervention, issues with adherence, and the self-reported nature of the outcome)*
Overall bias and Directness	Overall Directness	Directly applicable *(Directly applicable)*

Bernocchi, 2019

Bibliographic Reference	**Bernocchi, Palmira; Giordano, Alessandro; Pintavalle, Giuseppe; Galli, Tiziana; Ballini Spoglia, Eleonora; Baratti, Doriana; Scalvini, Simonetta; Feasibility and Clinical Efficacy of a Multidisciplinary Home-Telehealth Program to Prevent Falls in Older Adults: A Randomized Controlled Trial.; Journal of the American Medical Directors Association; 2019; vol. 20 (no. 3); 340-346**

Study details

Secondary publication of another included study- see primary study for details	NR
Other publications associated with this study included in review	NR
Trial name / registration number	NCT02487589
Study type	Randomised controlled trial (RCT)
Study location	Italy
Study setting	Community setting
Sources of funding	Ministero della Salute “Ricerca Finalizzata Giovani Ricercatori.”
Inclusion criteria	Aged 65 years or older Medium/high fall risk profile before discharge home At least 1 fall event during the hospital stay

	Mini-Mental State Examination (MMSE) score >1
Exclusion criteria	Low risk of recurrence of falling (BBS score > 45 and no fall during the previous 12 months and/or hospital stay) Inability to sign the informed consent Cognitive impairment Living in a nursing home Permanent bedridden state Full dependence on a wheelchair Terminal cancer or severe neurologic impairment, including perceptual neglect and language limitations (aphasia)
Recruitment / selection of participants	Patients admitted to the Rehabilitation Institute of Istituti Clinici Scientifici Maugeri Istituto di Ricovero e Cura a Carattere Scientifico were screened for eligibility.
Intervention(s)	Exercises were conducted by a physical trainer and based on the Otago Exercise programme. Participants were also asked to go for regular walks of 30 minutes at least twice a week. Participants were also called weekly to collect information on disease status, symptoms and events.
Population subgroups	None
Comparator	Usual care
Number of participants	N=245 Intervention: n=122 Control: n=123

Duration of follow-up	6 months
Indirectness	None
Additional comments	

Study arms

Intervention (N = 122)

Control (N = 123)

Characteristics

Arm-level characteristics

Characteristic	**Intervention (N = 122)**	**Control (N = 123)**
% Female Nominal	60	59
Mean age (SD) Mean (SD)	77.9 (6)	79.3 (7)
Respiratory Nominal	57	43
Cardiac Nominal	76	75

Characteristic	Intervention (N = 122)	Control (N = 123)
Neurological Nominal	63	68
Musculoskeletal Nominal	69	65
Diabetes Nominal	35	41
Hypertension Nominal	75	79
Atrial fibrillation Nominal	42	28

Outcomes

Study timepoints

6 month

Outcomes

Outcome	Intervention, 6 month, N = 122	Control, 6 month, N = 123
Number of fallers Nominal	29	56

Critical appraisal - Cochrane Risk of Bias tool (RoB 2.0) Normal RCT

Outcomes-Number of fallers -Nominal-Intervention-Control-t6

Section	Question	Answer
Overall bias and Directness	Risk of bias judgement	High *(High risk of bias due to participants and people delivering the intervention were aware of the assigned intervention and the self-reported nature of the outcome)*
Overall bias and Directness	Overall Directness	Directly applicable *(Directly applicable)*

Bjerk, 2020

Bibliographic Reference	Bjerk, Maria; Brovold, Therese; Davis, Jennifer C; Skelton, Dawn A; Bergland, Astrid; Health-related quality of life in home care recipients after a falls prevention intervention: a 6-month follow-up.; European journal of public health; 2020; vol. 30 (no. 1); 64-69

Study details

Secondary publication of another included study- see primary study for details	None
Other publications associated with	None

this study included in review	
Trial name / registration number	NCT02374307
Study type	Randomised controlled trial (RCT)
Study location	Norway
Study setting	Community setting
Study dates	February 2016 - September 2017
Sources of funding	Oslo Metropolitan University
Inclusion criteria	• 67+ years • Receiving home care • Having experienced at least one fall during the last 12 months • Able to walk with or without a walking aid. • Understand Norwegian
Exclusion criteria	• Medical contraindications to exercise • Life expectancy below 1 year (physician assessment) • Score below 23 on the Mini-Mental State Examination indicating cognitive impairment. • Currently participating in other falls prevention programmes or trials
Recruitment / selection of participants	Participants were recruited from list of people receiving home care

Intervention(s)	Falls prevention exercise programme based on the Otago exercise programme focussing on strengthening and balance exercises. Intervention lasted 12 weeks and included 5 home visits. Participants were instructed to perform the exercises 3 times a week and walk 2 times a week.
Population subgroups	None
Comparator	Control
Number of participants	N=155 Intervention: n=77 Control: n=78
Duration of follow-up	6 months
Indirectness	None

Study arms

Falls prevention exercise (N = 77)

Control (N = 78)

Characteristics

Study-level characteristics

Characteristic	Study (N = 155)
% Female Nominal	79.3
Mean age (SD) Mean (SD)	82.7 (6.7)

Outcomes

Study timepoints

- 6 month

Outcomes

Outcome	Falls prevention exercise, 6 month, N = 77	Control, 6 month, N = 75
Quality of Life (Physical) Mean (SD)	41.3 (1.1)	38.4 (1.3)
Quality of Life (Mental)	52 (1.1)	53.1 (1.3)

Outcome	Falls prevention exercise, 6 month, N = 77	Control, 6 month, N = 75
Mean (SD)		

Critical appraisal - Cochrane Risk of Bias tool (RoB 2.0) Normal RCT

Outcomes-Quality of Life(Physical)-Mean SD-Falls prevention exercise-Control-t6

Section	Question	Answer
Overall bias and Directness	Risk of bias judgement	High *(High risk of bias due to participants and people delivering the intervention were aware of the assigned intervention)*
Overall bias and Directness	Overall Directness	Directly applicable *(Directly applicable)*

Outcomes-Quality of Life (Mental)-Mean SD-Falls prevention exercise-Control-t6

Section	Question	Answer
Overall bias and Directness	Risk of bias judgement	High *(High risk of bias due to participants and people delivering the intervention were aware of the assigned intervention)*
Overall bias and Directness	Overall Directness	Directly applicable *(Directly applicable)*

Bruce, 2021

Bibliographic Reference	Bruce, Julie; Hossain, Anower; Lall, Ranjit; Withers, Emma J; Finnegan, Susanne; Underwood, Martin; Ji, Chen; Bojke, Chris; Longo, Roberta; Hulme, Claire; Hennings, Susie; Sheridan, Ray; Westacott, Katharine; Ralhan, Shvaita; Martin, Finbarr; Davison, John; Shaw, Fiona; Skelton, Dawn A; Treml, Jonathan; Willett, Keith; Lamb, Sarah E; Fall prevention interventions in

primary care to reduce fractures and falls in people aged 70 years and over: the PreFIT three-arm cluster RCT.; Health technology assessment (Winchester, England); 2021; vol. 25 (no. 34); 1-114

Study details

Secondary publication of another included study- see primary study for details	NA
Other publications associated with this study included in review	NA
Trial name / registration number	ISRCTN71002650
Study location	England
Study setting	Community
Study dates	September 2010 to March 2016
Sources of funding	This project was funded by the National Institute for Health Research (NIHR) Health Technology Assessment programme.
Inclusion criteria	Community-dwelling adults aged 70 years or older living as a resident in the community or in sheltered housing.
Exclusion criteria	Individuals housed in long-term residential nursing care homes and those with a terminal illness or expected shortened lifespan (defined as <6 months).
Recruitment / selection of participants	9803 participants were recruited from general practices
Intervention(s)	Exercise MFFP

Population subgroups	Age, sex, falls history, cognitive impairment, and frailty
Comparator	Advice leaflet
Number of participants	9803 participants
Duration of follow-up	18 months
Indirectness	None
Additional comments	

Study arms

Advice leaflet only (N = 3323)
Age UK Staying Steady booklet, with an emphasis on remaining steady and physically active.

Exercise (N = 2929)
Exercise intervention was entirely based on the Otago exercise program, with adaptations to the duration of the program to reflect the formulations of the NHS setting. The program consisted of strength training, balance retraining, and a walking plan. The program was home-based and individually-prescribed, adapted and progressed based on ability. A menu of five strength exercises and 12 balance exercises was available, with exercises prescribed according to ability.

Multifactorial Fall Prevention (MFFP) (N = 2862)
Developed using the Tinetti MFFP model, which included an assessment and treatment of different risk factors. The assessment includes a falls history interview, screen for 'red flags' (i.e. suspected cardiac abnormalities, history of syncope, etc.), assess balance

and gait, postural hypotension, polypharmacy, medication review, vision assessment, foot and footwear assessment, and assessment of environmental hazards.

Characteristics

Study-level characteristics

Characteristic	Study (N = 9803)
% Female Sample size	n = 5150; % = 52.5
Mean age (SD) Mean (SD)	77.9 (5.7)
Ethnicity Sample size	n = NA; % = NA
White Sample size	n = 9630; % = 98.2
Other Sample size	n = 94; % = 1
Missing Sample size	n = 79; % = 0.8
Comorbidities Sample size	n = NA; % = NA

Characteristic	Study (N = 9803)
None Sample size	n = 2311; % = 23.5
One or two Sample size	n = 5672; % = 57.9
Three or more Sample size	n = 1820; % = 18.6

Outcomes

Fall-related fractures

Outcome	Advice leaflet only, N = 2493	Exercise, N = 2500	Multifactorial Fall Prevention (MFFP), N = 2497
Fall-related fractures in the previous year No of events	n = 31; % = 1.2	n = 31; % = 1.2	n = 26; % = 1

At 18 months

Number of falls

Outcome	Advice leaflet only, N = 2493	Exercise, N = 2500	Multifactorial Fall Prevention (MFFP), N = 2497
One or more falls over 18 months	n = 1276; % = 39.6	n = 1277; % = 38.9	n = 1301; % = 39.4

Outcome	Advice leaflet only, N = 2493	Exercise, N = 2500	Multifactorial Fall Prevention (MFFP), N = 2497
No of events			
Two or more falls over 18 months No of events	n = 715; % = 22.2	n = 687; % = 21	n = 743; % = 22.5

Fall rate

Outcome	Advice leaflet only, N = 2493	Exercise, N = 2500	Multifactorial Fall Prevention (MFFP), N = 2497
Falls rate (95%CI) Rate ratio Custom value	NA	0.99 (0.86 to 1.14)	0.77 (067 to 0.87)

Number of fallers

Outcome	Advice leaflet only, N = 2493	Exercise, N = 2500	Multifactorial Fall Prevention (MFFP), N = 2497
Number of fallers Between 12-18 months Sample size	n = 455; % = 14.1	n = 450; % = 13.7	n = 470; % = 14.3

Quality of life (SF-12)

Outcome	Advice leaflet only, N = 3223	Exercise, N = 3279	Multifactorial Fall Prevention (MFFP), N = 3301
SF12-PCS Custom value	49.9 (10.0)	50.4 (10.0)	49.8 (10.3)
SF-12- MCS	50.0 (9.0)	50.3 (9.1)	49.9 (9.5)

Outcome	Advice leaflet only, N = 3223	Exercise, N = 3279	Multifactorial Fall Prevention (MFFP), N = 3301
Custom value			

Critical appraisal - Cochrane Risk of Bias tool (RoB 2.0) Cluster randomised trials

Fall-related fractures -Fall-related fractures inthepreviousyear-No of events -Advice leaflet only-Exercise-Multifactorial Fall Prevention (MFFP)

Section	Question	Answer
Overall bias and Directness	Risk of bias judgement	High *(High risk of bias due to clinicians involved in the multifactorial fall prevention program were aware of the allocation)*
Overall bias and Directness	Overall Directness	Directly applicable *(Directly applicable)*

Number of falls -Oneormorefallsover18months-No of events -Advice leaflet only-Exercise-Multifactorial Fall Prevention (MFFP)

Section	Question	Answer
Overall bias and Directness	Risk of bias judgement	High *(High risk of bias due to clinicians involved in the multifactorial fall prevention program were aware of the allocation)*
Overall bias and Directness	Overall Directness	Directly applicable *(Directly applicable)*

Number of falls -Twoormorefallsover18months-No of events -Advice leaflet only-Exercise-Multifactorial Fall Prevention (MFFP)

Section	Question	Answer
Overall bias and Directness	Risk of bias judgement	High *(High risk of bias due to clinicians involved in the multifactorial fall prevention program were aware of the allocation)*
Overall bias and Directness	Overall Directness	Directly applicable *(Directly applicable)*

Fallrate-Falls rate(95%CI)-Advice leaflet only-Exercise-Multifactorial Fall Prevention (MFFP)

Section	Question	Answer
Overall bias and Directness	Risk of bias judgement	High *(High risk of bias due to clinicians involved in the multifactorial fall prevention program were aware of the allocation)*
Overall bias and Directness	Overall Directness	Directly applicable *(Directly applicable)*

Quality of life (SF-12)-SF12-PCS-Advice leaflet only-Exercise-Multifactorial Fall Prevention (MFFP)

Section	Question	Answer
Overall bias and Directness	Risk of bias judgement	High *(High risk of bias due to clinicians involved in the multifactorial fall prevention program were aware of the allocation)*
Overall bias and Directness	Overall Directness	Directly applicable *(Directly applicable)*

Quality of life (SF-12)-SF-12-MCS-Advice leaflet only-Exercise-Multifactorial Fall Prevention (MFFP)

Section	Question	Answer
Overall bias and Directness	Risk of bias judgement	High *(High risk of bias due to clinicians involved in the multifactorial fall prevention program were aware of the allocation)*
Overall bias and Directness	Overall Directness	Directly applicable *(Directly applicable)*

Costa, 2022

Bibliographic Reference	Costa, Juliana N A; Ribeiro, Alexandre L A; Ribeiro, Daniele B G; Neri, Silvia G R; Barbosa, Daniel F; Avelar, Bruna P; Safons, Marisete P; Balance Exercise Circuit for fall prevention in older adults: a randomized controlled crossover trial.; Journal of frailty, sarcopenia and falls; 2022; vol. 7 (no. 2); 60-71

Study details

Secondary publication of another included study- see primary study for details	None
Other publications associated with this study included in review	None
Trial name / registration number	Not reported

Study type	Randomised controlled trial (RCT)
Study location	Brazil
Study setting	Community setting
Study dates	Not reported
Sources of funding	Not reported
Inclusion criteria	• 60 years or older • Living in the community • Able to walk independently without an assistive device • Able to hear and communicate verbally, and understand the trial procedures
Exclusion criteria	• Acute medical diseases in the previous 3 months • Pre-existing neurological diseases such as Parkinson's disease, dementia, or stroke • Arthritis, vision impairment, or a cardiovascular disease that impaired walking • Unable to walk without assistance whether due to an orthopaedic problem affecting walking • Dementia, or severe cognitive impairment
Recruitment / selection of participants	Participants were recruited through advertisements on television, newspapers and presentation in the local community.
Intervention(s)	Balance exercise circuit performed for 50 minutes twice a week for a total of 3 months. Each session contained 10 minute warm up and stretching, 30 minutes of balance exercises (circuit), and 10 minutes cool down. Participants exercised in pairs at each station. Exercises were progressing after 3 weeks.
Population subgroups	None

Comparator	Participants attended educational lectures for 60 minutes 2 times a month for a total of 3 months.
Number of participants	N=22 Exercise: n=10 Control: n=12
Duration of follow-up	Exercise: 3months Crossover occurred following the 3 months of initial exercise.
Indirectness	None
Additional comments	None

Study arms

Exercise (N = 10)

Control (N = 12)

Characteristics

Arm-level characteristics

Characteristic	Exercise (N = 10)	Control (N = 12)
Mean age (SE)	65.8 (1.2)	65.83 (1.19)
Diabetes	2	3

Characteristic	Exercise (N = 10)	Control (N = 12)
Nominal		
Hypertension Nominal	5	6
Depression Nominal	2	2
Labyrinthitis Nominal	5	3
Insomnia Nominal	2	0
Osteoporosis Nominal	1	3
Anxiety Nominal	5	5
Neuronal disease Nominal	0	0
Arthritis Nominal	2	3
Urinary incontinence Nominal	2	1

Outcomes

Study timepoints

- 3 month

Outcomes

Outcome	Exercise, 3 month, N = 10	Control, 3 month, N = 12
Quality of Life (Physical) Mean (SE)	60 (3.72)	64.39 (3.03)
Quality of Life Psychological Mean (SE)	63.75 (3.93)	68.06 (2.92)
Quality of Life (Social Relationships) Mean (SE)	65 (3.24)	73.61 (4.08)
Quality of Life (Environmental) Mean (SE)	65 (5.27)	72.92 (3.59)

Critical appraisal - Cochrane Risk of Bias tool (RoB 2.0) Cross-over trial

Outcomes-Quality of Life (Physical)-MeanSE-Exercise-Control-t3

Section	Question	Answer
Overall bias and Directness	Risk of bias judgement	High *(High risk of bias due to participants and personnel being aware of the allocated intervention, the self-reported nature of the outcome, and a limited number of participants with the outcome)*

Section	Question	Answer
Overall bias and Directness	Overall Directness	Directly applicable *(Directly applicable)*

Outcomes-Quality of life Psychological-MeanSE-Exercise-Control-t3

Section	Question	Answer
Overall bias and Directness	Risk of bias judgement	High *(High risk of bias due to participants and personnel being aware of the allocated intervention, the self-reported nature of the outcome, and a limited number of participants with the outcome)*
Overall bias and Directness	Overall Directness	Directly applicable *(Directly applicable)*

Outcomes-Quality of life (SocialRelationships)-MeanSE-Exercise-Control-t3

Section	Question	Answer
Overall bias and Directness	Risk of bias judgement	High *(High risk of bias due to participants and personnel being aware of the allocated intervention, the self-reported nature of the outcome, and a limited number of participants with the outcome)*
Overall bias and Directness	Overall Directness	Directly applicable *(Directly applicable)*

Outcomes-Quality of Life (Environmental)-MeanSE-Exercise-Control-t3

Section	Question	Answer
Overall bias and Directness	Risk of bias judgement	High *(High risk of bias due to participants and personnel being aware of the allocated intervention, the self-reported nature of the outcome, and a limited number of participants with the outcome)*

Section	Question	Answer
Overall bias and Directness	Overall Directness	Directly applicable *(Directly applicable)*

Coyle, 2020

Bibliographic Reference	Coyle, Peter C; Perera, Subashan; Albert, Steven M; Freburger, Janet K; VanSwearingen, Jessie M; Brach, Jennifer S; Potential long-term impact of "On The Move" group-exercise program on falls and healthcare utilization in older adults: an exploratory analysis of a randomized controlled trial.; BMC geriatrics; 2020; vol. 20 (no. 1); 105

Study details

Secondary publication of another included study- see primary study for details	Brach 2017
Other publications associated with this study included in review	None
Trial name / registration number	On the move: NCT01986647
Study type	Cluster randomised controlled trial
Study location	US

Study setting	Community setting
Study dates	April 2014 to January 2016
Sources of funding	Patient-Centred Outcomes Research Institute; the National Institute on Aging; Pittsburgh Older Americans Independence Centre
Inclusion criteria	• Aged ≥65 years and living in the greater Pittsburgh, Pennsylvania area • Attended participating senior community centres • Residing in participating independent living facilities or senior housing
Exclusion criteria	• Unable to ambulate independently with a gait speed ≥0.60 m/s • Non English-speaking • Cognitively impaired (i.e. could not follow two-step commands) • Medically unstable
Recruitment / selection of participants	Not reported
Intervention(s)	On the Move (OTM) exercise programme included exercises based on motor control principles focusing on stepping and walking patterns and progressing in difficulty. Exercises occurred twice weekly for 50 minutes each. Trained exercise professionals led each exercise class.
Population subgroups	Not reported
Comparator	Usual care consisted of a seated exercise programme focused on strength, endurance, and flexibility. Exercises occurred twice weekly for 50 minutes each. Trained exercise professionals led each exercise class.
Number of participants	N= 248 Intervention: n=123

	Control: n= 125
Duration of follow-up	12 months
Indirectness	None
Additional comments	

Study arms

On the Move exercise (N = 123)

Usual care (N = 125)

Characteristics

Arm-level characteristics

Characteristic	On the Move exercise (N = 123)	Usual care (N = 125)
% Female Nominal	87.8	81.6
Mean age (SD) Mean (SD)	79.4 (8.3)	81.3 (7.6)
Comorbidities	3 (1.4)	2.8 (1.5)

Characteristic	On the Move exercise (N = 123)	Usual care (N = 125)
Mean (SD)		

Outcomes

Study timepoints

- 12 month

Outcomes

Outcome	On the Move exercise vs Usual care, 12 month, N2 = 125, N1 = 123
Falls (IRR) Relative risk/95% CI	1.08 (0.72 to 1.62)

Critical appraisal - Cochrane Risk of Bias tool (RoB 2.0) Normal RCT

Outcomes-Falls (IRR)-Relative Risk Nine Five Percent CI-On the Move Exercise-Usual care-t12

Section	Question	Answer
Overall bias and Directness	Risk of bias judgement	High *(High risk of bias due to participants and people delivering the intervention aware of the assigned intervention, missing data, and the self-reported nature of the outcome)*
Overall bias and Directness	Overall Directness	Directly applicable *(Directly applicable)*

Delbaere, 2021

Bibliographic Reference	Delbaere, Kim; Valenzuela, Trinidad; Lord, Stephen R; Clemson, Lindy; Zijlstra, G A Rixt; Close, Jacqueline C T; Lung, Thomas; Woodbury, Ashley; Chow, Jessica; McInerney, Garth; Miles, Lillian; Toson, Barbara; Briggs, Nancy; van Schooten, Kimberley S; E-health StandingTall balance exercise for fall prevention in older people: results of a two year randomised controlled trial.; BMJ (Clinical research ed.); 2021; vol. 373; n740

Study details

Secondary publication of another included study- see primary study for details	Not reported
Other publications associated with this study included in review	Not reported
Trial name / registration number	ACTRN12615000138583
Study type	Randomised controlled trial (RCT)
Study location	Australia
Study setting	Community setting
Study dates	December 2014 - November 2019
Sources of funding	Australian National Health and Medical Research Council grant; Gandel Philanthropy, and NeuRA Foundation

Inclusion criteria	• Aged 70 years or older. • Living in the community • Independent in activities of daily living • Able to walk household distances without the use of a walking aid • Willing and able to give informed consent. • Comply with the study protocol
Exclusion criteria	• Unstable or acute medical condition that precluded exercise participation. • Suffering from a progressive neurological condition (such as Parkinson's disease or multiple sclerosis) • Cognitively impaired as defined by a Pfeiffer short portable mental status questionnaire score less than 8 • Currently participating in a fall prevention programme
Recruitment / selection of participants	Participants were recruited via flyers and advertisements in newspapers, community centres and by word of mouth.
Intervention(s)	Participants received a tablet with a health education programme including weekly fact sheets on healthy diet, drugs, fall risk factors, and exercise. The exercise programme was the Standing Tall programme which consisted of balance exercises with behavioural change techniques. Participants were asked to exercise 2h for each week during the duration of the programme. The programme was individually tailored, and exercises progressed in their difficulty. A qualified exercise physiologists performed 2 home visits.
Population subgroups	None
Comparator	Participants received a tablet with a health education programme including weekly fact sheets on healthy diet, drugs, and fall risk factors. Participants received 2 phone calls from a qualified exercise physiologist discussing any issues related with accessing the programme.
Number of participants	N=503 Intervention: n=254 Control: n=249

Indirectness	None

Study arms

Intervention (N = 254)

Control (N = 249)

Characteristics

Arm-level characteristics

Characteristic	Intervention (N = 254)	Control (N = 249)
% Female Nominal	69.7	65.1
Mean age (SD) Mean (SD)	77.1 (5.5)	77.7 (5.5)

Outcomes

Study timepoints.

- 24 months

Outcomes

Outcome	Intervention vs Control, 24 month, N2 = 249, N1 = 254
Rate of falls (IRR) Relative risk/95% CI	0.84 (0.72 to 0.98)

Dizdar, 2018

Bibliographic Reference	Dizdar, Meltem; Irdesel, Jale Fatma; Dizdar, Oguzhan Sitki; Topsac, Mine; Effects of Balance-Coordination, Strengthening, and Aerobic Exercises to Prevent Falls in Postmenopausal Patients With Osteoporosis: A 6-Month Randomized Parallel Prospective Study.; Journal of aging and physical activity; 2018; vol. 26 (no. 1); 41-51

Study details

Secondary publication of another included study- see primary study for details	NA
Other publications associated with this study included in review	NA
Trial name / registration number	NA

Study type	Randomised controlled trial (RCT)
Study location	Turkey
Study setting	Community setting
Study dates	Not reported
Sources of funding	Not reported
Inclusion criteria	• Postmenopausal female patients • Aged between 50–75 • Diagnosed with primary Osteoporosis (OP) according to World Health Organization (WHO) • No change in medical treatment for the last 6 months
Exclusion criteria	• Secondary OP • Severe systemic or cardiovascular disease • Mental disorders • Hearing-vision problems • Depressive disorders • Emotional problems
Recruitment / selection of participants	Participants were patients at the Department of Physical Medicine and Rehabilitation clinic of Uludag University Medical Faculty.
Intervention(s)	<u>Balance-coordination exercise group</u> • After warm-up participants performed 3 sets of 10-15 repetitions of balance and coordination exercises with 1-2min breaks in between. Exercises included single leg stance, tandem stance, toe walking, heel walking, tandem gait,

	reciprocal lower extremity movement, half squatting and more. Exercises were performed for 1h each day for 3 days a week. Strengthening exercises • After warm-up participants performed 3 sets of 10 repetitions of strengthening exercises on the upper extremity, abdominal muscles and back extensors. Aerobic exercises • Participants walked on a treadmill for 30 minutes.
Population subgroups	Not reported
Comparator	Exercises compared with each other
Number of participants	N=75 Balance exercises: n=25 Strengthening exercises: n=25 Aerobic exercises: n=25
Duration of follow-up	24 weeks
Indirectness	Participants are less than 65 years of age but have been diagnosed with Osteoporosis.
Additional comments	

Study arms

Balance and coordination (N = 25)

Strengthening exercises (N = 25)

Aerobic exercises (N = 25)

Characteristics

Arm-level characteristics

Characteristic	Balance and coordination (N = 25)	Strengthening exercises (N = 25)	Aerobic exercises (N = 25)
% Female Nominal	100	100	100
Mean age (SD) Mean (SD)	57.87 (4.5)	59.86 (5.5)	60.91 (6.5)
Comorbidities Nominal	100	100	100

Outcomes

Study timepoints

24 week

Outcomes

Outcome	Balance and coordination, 24 week, N = 25	Strengthening exercises, 24 week, N = 25	Aerobic exercises, 24 week, N = 25
Number of falls No of events	n = 0	n = 0	n = 0
Quality of life (total score) Mean (SD)	32.58 (13)	26.71 (14.1)	32.68 (15.2)

Critical appraisal - Cochrane Risk of Bias tool (RoB 2.0) Normal RCT

Outcomes-Number of falls – No Of Events-Balance and coordination-Strengthening exercises-Aerobic exercises-t24

Section	Question	Answer
Overall bias and Directness	Risk of bias judgement	High *(High risk of bias due to no pre-specified plan and participants and people delivering the intervention were aware of the assigned intervention)*
Overall bias and Directness	Overall Directness	Partially applicable *(different exercise groups are provided rather than a control group/ usual care group)*

Outcomes-Quality of life (total score) – Mean SD-Balance and coordination-Strengthening exercises-Aerobic exercises-t24

Section	Question	Answer
Overall bias and Directness	Risk of bias judgement	High *(High risk of bias due to no pre-specified plan and participants and people delivering the intervention were aware of the assigned intervention)*

Section	Question	Answer
Overall bias and Directness	Overall Directness	Partially applicable *(different exercise groups are provided rather than a control group/ usual care group)*

Fahlstrom, 2018

Bibliographic Reference	Fahlstrom, Gunilla; Kamwendo, Kitty; Forsberg, Jenny; Bodin, Lennart; Fall prevention by nursing assistants among community-living elderly people. A randomised controlled trial.; Scandinavian journal of caring sciences; 2018; vol. 32 (no. 2); 575-585

Study details

Secondary publication of another included study- see primary study for details	Not reported
Other publications associated with this study included in review	Not reported
Trial name / registration number	NCT01705912
Study location	Sweden
Study setting	Community setting
Sources of funding	Swedish Research Council; the National Board of Health and Welfare, Sweden; the County Council of Orebro

Inclusion criteria	Community living persons 65 years or older (i.e. persons living in flats or houses, but not in sheltered housing) Able to walk independently with or without walking aid. Experienced at least one fall during the last 12 months. Able to communicate and cooperate
Exclusion criteria	Ongoing physiotherapy treatment Ongoing participation in exercise or activity including balance and strength enhancing components (e.g. day rehabilitation) Diagnosis of dementia Mental disorder that affects the ability to communicate and/or cooperate. ?Other medical reason making
Recruitment / selection of participants	Participants were recruited through social services or primary healthcare staff, and advertisements in local newspapers and pamphlets sent by the county council.
Intervention(s)	Home based exercises focusing on improving balance, muscle strength and walking ability. Nursing Assistants or personal trainers visited participants home 8 times during the 5 months period. Participants were asked to perform exercises three times a week and to perform a minimum of 30minute walking per week.
Population subgroups	None
Comparator	Participants in the control group were telephoned once during the intervention to confirm participation.
Number of participants	N=169 Intervention: n=87 Control: n=82

Duration of follow-up	5 months
Indirectness	None

Study arms

Intervention (N = 87)

Control (N = 82)

Characteristics

Arm-level characteristics

Characteristic	Intervention (N = 87)	Control (N = 82)
% Female Nominal	71	72
Mean age (SD) Mean (SD)	82 (6.6)	81 (6.3)

Outcomes

Study timepoints

5 month

Outcomes

Outcome	Intervention vs Control, 5 month, N2 = 82, N1 = 87
Number of falls (IRR) Relative risk/95% CI	1.1 (0.58 to 2.07)

Outcomes

Outcome	Intervention, 5 month, N = 87	Control, 5 month, N = 82
Quality of life (SF-36 Physical) Mean (SD)	47.91 (NR)	47.73 (NR)
Quality of life (SF-36 Mental) Mean (SD)	73.25 (NR)	70.55 (NR)
Quality of life (SF-36 General Health) Mean (SD)	59.6 (NR)	53.38 (NR)

Critical appraisal - Cochrane Risk of Bias tool (RoB 2.0) Normal RCT

Outcomes-Number of falls (IRR)-RelativeRiskNineFivePercentCI-Intervention-Control-t5

Section	Question	Answer
Overall bias and Directness	Risk of bias judgement	High *(High risk of bias due to participants and people delivering the intervention being aware of the assigned intervention and missing outcome data)*
Overall bias and Directness	Overall Directness	Directly applicable *(Directly applicable)*

Outcomes-Quality of life (SF-36Physical)-Mean SD -Intervention-Control-t5

Section	Question	Answer
Overall bias and Directness	Risk of bias judgement	High *(High risk of bias due to participants and people delivering the intervention being aware of the assigned intervention and missing outcome data)*
Overall bias and Directness	Overall Directness	Directly applicable *(Directly applicable)*

Outcomes-Quality of life (SF-36Mental)-Mean SD -Intervention-Control-t5

Section	Question	Answer
Overall bias and Directness	Risk of bias judgement	High *(High risk of bias due to participants and people delivering the intervention being aware of the assigned intervention and missing outcome data)*
Overall bias and Directness	Overall Directness	Directly applicable *(Directly applicable)*

Outcomes-Quality of life (SF-36GeneralHealth)l)-Mean SD -Intervention-Control-t5

Section	Question	Answer
Overall bias and Directness	Risk of bias judgement	High *(High risk of bias due to participants and people delivering the intervention being aware of the assigned intervention and missing outcome data)*
Overall bias and Directness	Overall Directness	Directly applicable *(Directly applicable)*

Giangregorio, 2018

Bibliographic Reference	Giangregorio, L M; Gibbs, J C; Templeton, J A; Adachi, J D; Ashe, M C; Bleakney, R R; Cheung, A M; Hill, K D; Kendler, D L; Khan, A A; Kim, S; McArthur, C; Mittmann, N; Papaioannou, A; Prasad, S; Scherer, S C; Thabane, L; Wark, J D; Build better bones with exercise (B3E pilot trial): results of a feasibility study of a multicenter randomized controlled trial of 12 months of home exercise in older women with vertebral fracture.; Osteoporosis international : a journal established as result of cooperation between the European Foundation for Osteoporosis and the National Osteoporosis Foundation of the USA; 2018; vol. 29 (no. 11); 2545-2556

Study details

Secondary publication of another included study- see primary study for details	Not reported
Other publications associated with this study included in review	Not reported
Trial name / registration number	NCT01761084
Study type	Randomised controlled trial (RCT)
Study location	Canada
Study setting	Community setting

Study dates	Not reported
Sources of funding	CIHR Operating grant
Inclusion criteria	Female ≥65 years of age Radiographic evidence of non-traumatic fracture of ≥1 vertebrae between T4 and L4 (defined as radiographic presence of ≥25% reduction in anterior, middle, or posterior height of a vertebra, centrally-adjudicated by the study radiologist from lateral thoracic and lumbar spine X-rays using the Genant method)
Exclusion criteria	Index vertebral fracture due to trauma Medical disorder likely to prevent study completion or preventing exercise participation. Exercise participation ≥3 times per week that addresses ≥2 of 5 domains in the B3E exercise prescription. Impaired capacity to give informed consent (e.g., known, or suspected cognitive impairment) Inability to communicate in English. Unable to stand or walk 10m with or without a walking/mobility aid. Contraindication to exercise as determined by a physician
Intervention(s)	Home exercises included resistance, balance, and posture exercises. Participants received 6 homes visits by a physiotherapist during the 12-months. Participants received instructions on exercises. Physiotherapist called participants monthly to address safety, adherence, and exercise progression. Exercises prescribed consisted of a minimum of 5-8 exercises, minimum of 2 sets and 8-10 repetitions each and progressed in intensity over time.
Population subgroups	None

Comparator	Participants received 6 home visits by a Physiotherapists during the 12 months. whereby health related topics were discussed. Physiotherapists called participants monthly for social discussions.
Number of participants	N= 141 Intervention: n=71 Control: n=70
Duration of follow-up	12 months
Indirectness	None

Study arms

Intervention (N = 71)

Control (N = 70)

Characteristics

Study-level characteristics

Characteristic	Study (N = 141)
% Female Nominal	100

Arm-level characteristics

Characteristic	Intervention (N = 71)	Control (N = 70)
Mean age (SD)	76 (6.4)	77 (7.3)

Characteristic	Intervention (N = 71)	Control (N = 70)
Mean (SD)		

Outcomes

Study timepoints

12 month

Outcomes

Outcome	Intervention, 12 month, N = 71	Control, 12 month, N = 70
Number of people falling No of events	n = 48	n = 36
Number of fractures No of events	n = 12	n = 13
Number of people sustaining adverse events No of events	n = 18	n = 12

Critical appraisal - Cochrane Risk of Bias tool (RoB 2.0) Normal RCT

Outcomes-Numberofpeoplefalling-No of events -Intervention-Control-t12

Section	Question	Answer
Overall bias and Directness	Risk of bias judgement	High *(High risk of bias due to participants and people delivering the intervention being aware of the assigned intervention and no information regarding adherence)*
Overall bias and Directness	Overall Directness	Directly applicable *(Directly applicable)*

Outcomes-Number of fractures -No of events -Intervention-Control-t12

Section	Question	Answer
Overall bias and Directness	Risk of bias judgement	High *(High risk of bias due to participants and people delivering the intervention being aware of the assigned intervention and no information regarding adherence)*
Overall bias and Directness	Overall Directness	Directly applicable *(Directly applicable)*

Outcomes-Numberofpeoplesustainingadverseevents-No of events -Intervention-Control-t12

Section	Question	Answer
Overall bias and Directness	Risk of bias judgement	High *(High risk of bias due to participants and people delivering the intervention being aware of the assigned intervention and no information regarding adherence)*
Overall bias and Directness	Overall Directness	Directly applicable *(Directly applicable)*

Jansen, 2023

Bibliographic Reference	Jansen, Carl-Philipp; Gottschalk, Sophie; Nerz, Corinna; Labudek, Sarah; Kramer-Gmeiner, Franziska; Klenk, Jochen; Clemson, Lindy; Todd, Chris; Dams, Judith; Konig, Hans-Helmut; Becker, Clemens; Schwenk, Michael; Comparison of falls and cost-effectiveness of the group versus individually delivered Lifestyle-integrated Functional Exercise (LiFE) program: final results from the LiFE-is-LiFE non-inferiority trial.; Age and ageing; 2023; vol. 52 (no. 1)

Study details

Secondary publication of another included study- see primary study for details	NA
Other publications associated with this study included in review	NA
Trial name / registration number	Life-is-Life; NCT03462654
Study type	Randomised controlled trial (RCT)
Study location	Germany
Study setting	Community setting
Sources of funding	German Federal Ministry of Education
Inclusion criteria	at least 70 years of age Experienced at least one injurious or multiple non-injurious falls in the year prior to study participation.

	Designated as having high risk of falls when indicating balance decline in the past 12 months and needing ≥12 s for the 'Timed Up-and-Go' (TUG)
Exclusion criteria	Already performing the WHO Physical Activity (PA) recommendation levels of 150 min of moderate to vigorous PA per week or exercising more than once per week
Recruitment / selection of participants	Participants were drawn from municipality registries.
Intervention(s)	LIFE: Performed in the participants home through 7 sessions during 11 weeks plus booster phone calls at week 4 and 10 after the last intervention session. Exercises included balance and strength activities and physical activity promoting activities. Sessions lasted 1h and were led by one trainer.
Population subgroups	None
Comparator	GLIFE: Performed in groups through 7 sessions during 11 weeks plus booster phone calls at week 4 and 10 after the last intervention session. Exercises included balance and strength activities and physical activity promoting activities. Sessions lasted 2h and were led by two trainers (physio or occupational therapy) with up to 12 participants in one group.
Number of participants	N=309 Life: n=156 GLife: n=153
Duration of follow-up	12 months
Indirectness	None

Study arms

Life (Individual exercise) (N = 156)

GLife (Group exercise) (N = 153)

Characteristics

Study-level characteristics

Characteristic	Study (N =)
% Female Nominal	73.5
Mean age (SD) Mean (SD)	78.7 (0.3)
Comorbidities Mean (SE)	2.5 (0.1)

Outcomes

Study timepoints

12 month

Outcomes

Outcome	Life (Individual exercise), 12 month, N = 156	GLife (Group exercise), 12 month, N = 153
Number of falls No of events	n = 112	n = 106

Critical appraisal - Cochrane Risk of Bias tool (RoB 2.0) Normal RCT

Outcomes-Number of falls -No of events -Life (Individual exercise)-GLife (Group exercise)-t12

Section	Question	Answer
Overall bias and Directness	Risk of bias judgement	High *(High risk of bias due to participants and people delivering the intervention were aware of the assigned intervention)*
Overall bias and Directness	Overall Directness	Directly applicable *(Directly applicable)*

Li, 2018

Bibliographic Reference	Li, Fuzhong; Harmer, Peter; Fitzgerald, Kathleen; Eckstrom, Elizabeth; Akers, Laura; Chou, Li-Shan; Pidgeon, Dawna; Voit, Jan; Winters-Stone, Kerri; Effectiveness of a Therapeutic Tai Ji Quan Intervention vs a Multimodal Exercise Intervention to Prevent Falls Among Older Adults at High Risk of Falling: A Randomized Clinical Trial.; JAMA internal medicine; 2018; vol. 178 (no. 10); 1301-1310

Study details

Secondary publication of another included study- see primary study for details	NA
Other publications associated with this study included in review	Li 2019a
Trial name / registration number	NCT02287740

Study type	Randomised controlled trial (RCT)
Study location	Canada
Study setting	Community setting
Study dates	January 2015 - August 2018
Sources of funding	National Institute on Aging
Inclusion criteria	70 years or older And either Fallen at least once in the preceding 12 months and having a clinician's referral indicating the participant was at risk of falling. or Having impaired mobility (Timed Up & Go >13.5 seconds) Being able to walk 1 or 2 blocks, with or without the use of an assistive device. Being able to exercise safely as determined by a healthcare provider. Willingness to be randomly assigned to an intervention condition and complete the 6-month intervention
Exclusion criteria	Participating in daily and/or structured vigorous physical activity or walking for exercise that lasted 15 minutes or longer or muscle-strengthening activities (e.g., weightlifting) on 2 or more days a week in the previous 3 months Severe cognitive impairment (Mini-Mental State Examination [MMSE] score ≤20 on a range of 0 to 30) Major medical or physical conditions determined by their healthcare provider to preclude exercise

Recruitment / selection of participants	Participants were recruited through flyers posted at local community centres, newspaper ads, medical clinics, and mass mailings.
Intervention(s)	Tai Ji Chuan Modified tai ji quan exercises consisted of breathing techniques and exercises performed with weight shifting, unilateral weight bearing, head shoulder trunk alignment and rotation, and coordinated eye head hand movements. Participants performed 3-4 sets with 3-5 repetitions each. Multimodal Multimodal exercise programme consisted of aerobic conditioning, strength, balance, and flexibility activities. Exercises progressed in their difficulty and intensity increasing from 4 repetitions to 25 repetitions in month 5. Sessions were performed twice weekly for 24 weeks lasting 1h each.
Population subgroups	None
Comparator	Stretching exercises Exercises were mostly performed in a seating position and consisted of breathing, stretching and relaxation techniques.
Number of participants	N=670 Tai Ji Chuan: n=224 Multimodal: n=223 Stretching: n=223

Duration of follow-up	24 weeks
Indirectness	None

Study arms

Tai Ji Chuan (N = 224)

Multimodal (N = 223)

Stretching exercise (N = 223)

Characteristics

Arm-level characteristics

Characteristic	Tai Ji Chuan (N = 224)	Multimodal (N = 223)	Stretching exercise (N = 223)
% Female Nominal	65.2	64.1	65.9
Mean age (SD) Mean (SD)	77.5 (5.6)	77.8 (5.3)	77.8 (5.9)
White Nominal	203	203	211
African American Nominal	13	14	4
Other	8	6	8

Characteristic	Tai Ji Chuan (N = 224)	Multimodal (N = 223)	Stretching exercise (N = 223)
Nominal			

Outcomes

Study timepoints.

24 week

Outcomes

Outcome	Tai Ji Chuan, 24 week, N = 224	Multimodal, 24 week, N = 223	Stretching exercise, 24 week, N = 223
Number of fallers Nominal	85	112	127

Critical appraisal - Cochrane Risk of Bias tool (RoB 2.0) Normal RCT

Outcomes-Number of fallers - Nominal-Tai Ji Chuan-Multimodal-Stretching exercise-t24

Section	Question	Answer
Overall bias and Directness	Risk of bias judgement	High *(High risk of bias due to participants and people delivering the intervention were aware of the assigned intervention)*
Overall bias and Directness	Overall Directness	Directly applicable *(Directly applicable)*

Li, 2022

Bibliographic Reference	Li, Zhen-Rui; Ma, Yun-Jing; Zhuang, Jie; Tao, Xun-Chen; Guo, Chao-Yang; Liu, Shu-Ting; Zhu, Ran-Ran; Wang, Jin-Xiang; Fang, Lei; Ditangquan exercises based on safe-landing strategies prevent falls and injury among older individuals with sarcopenia.; Frontiers in medicine; 2022; vol. 9; 936314

Study details

Secondary publication of another included study- see primary study for details	NA
Other publications associated with this study included in review	NA
Trial name / registration number	ChiCTR1800016562
Study type	Randomised controlled trial (RCT)
Study location	China
Study setting	Community
Study dates	June 2019 to December 2021
Sources of funding	This work was supported by the Three-Year Action Plan for the Development of TCM in Shanghai–Highland Construction for International Standardization of TCM [No. ZY (2021–2023)-0212]

Inclusion criteria	A history of falling in the past 2 years, have a Timed Up and Go test cut off of 15.96 s, met the diagnostic criteria for sarcopenia, between the ages of 60-80 (no gender limits), agreed to not engage in other forms of exercise during the study period, have a BMI between 18-25 kg/m2, and be alert and able to walk independently or with the help of an aid (such as a cane).
Exclusion criteria	Chronic metabolic disorders, serious cardiovascular disease, hypertension and/or obesity, mental illness, recent muscle, joint, or bone injuries, other diseases affecting limb function and movement, experience of high-intensity physical activities, muscle strength training, or other exercises for more than 15 minutes per time more than twice per week in the past 3 months, participation in other forms of exercise during the study period.
Recruitment / selection of participants	Participants were recruited from the community, posters, internet advertisements, and WeChat.
Intervention(s)	Ditangquan exercise- 10 minutes of warm up, 40 minutes of Ditangquan exercise and 10 minutes of cool down (3 times per week over the course of 24 weeks).
Population subgroups	NA
Comparator	Control group- conventional exercises under the guidance of professionals. Included 10 minutes of warm up, 20 minutes of strength exercises, 20 minutes of aerobic activity, and 10 minutes of cool down, including gentle stretches and controlled breathing.
Number of participants	70 participants
Duration of follow-up	24 weeks
Indirectness	None
Additional comments	

Study arms

Ditangquan exercise group (N = 35)

10 minutes of warm up, 40 minutes of Ditangquan exercise and 10 minutes of cool down (3 times per week over the course of 24 weeks).

Control group (N = 35)

Conventional exercises under the guidance of professionals. Included 10 minutes of warm up, 20 minutes of strength exercises, 20 minutes of aerobic activity, and 10 minutes of cool down, including gentle stretches and controlled breathing.

Characteristics

Study-level characteristics

Characteristic	Study (N = 70)
% Female Sample size	n = NA; % = NA
Ditangquan exercise group Sample size	n = 25; % = NR
Control group Sample size	n = 24; % = NR
Mean age (SD)	NA (NA)

Characteristic	Study (N = 70)
Mean (SD)	
Ditangquan group Mean (SD)	80.57 (8.93)
Control group Mean (SD)	77.89 (10.38)

Outcomes

Number of falls

Outcome	Ditangquan exercise group, N = 35	Control group, N = 35
Number of falls No of events	n = 1; % = NR	n = 8; % = NR

Critical appraisal - Cochrane Risk of Bias tool (RoB 2.0) Normal RCT

Number of falls-No Of Events-Ditangquan exercise group-Control group

Section	Question	Answer
Overall bias and Directness	Risk of bias judgement	High *(High risk of bias due to participants and people delivering the intervention were likely aware of the assigned intervention)*
Overall bias and Directness	Overall Directness	Directly applicable *(Directly applicable)*

Liang, 2020

Bibliographic Reference	Liang, Yuxiang; Wang, Renjie; Jiang, Jiaojiao; Tan, Lingling; Yang, Ming; A randomized controlled trial of resistance and balance exercise for sarcopenic patients aged 80-99 years.; Scientific reports; 2020; vol. 10 (no. 1); 18756

Study details

Secondary publication of another included study- see primary study for details	Not reported
Other publications associated with this study included in review	Not reported
Trial name / registration number	NCT04216368
Study type	Randomised controlled trial (RCT)

Study location	China
Study setting	Community setting
Study dates	Not reported
Sources of funding	National Key R&D Program of China
Inclusion criteria	Aged 80 years or older with sarcopenia defined by the recommendation from the Asian Working Group for Sarcopenia (AWGS) Ambulate capabilities (assistance was allowed if necessary) Ability to communicate and collaborate with medical staff
Exclusion criteria	Terminal illness Acute lower respiratory infection Uncontrolled arrhythmias Uncontrolled heart failure Recent myocardial infarction Uncontrolled respiratory failure Acute pulmonary embolism Recent major surgery Recent dialysis Bone fracture in the past 3 months, or expected length of stay less than 12 weeks

Recruitment / selection of participants	Screening was conducted by a physiotherapist within 48h of admission from acute care units
Intervention(s)	Resistance and balance exercises were individually designed and supervised by a physiotherapist. Exercises were performed twice weekly for 12 weeks lasting 55 minutes each. Sessions included a 5 minute warm up and cool down and consisted of 20minutes focused balance exercises and 20minutes focused resistance exercises.
Population subgroups	Not reported
Comparator	Control group performed resistance exercises twice weekly for 12 weeks 30 minutes each including a 5minute warm up and 5minute cool down.
Number of participants	N=60 I: n=30 C: n=30
Duration of follow-up	12 weeks
Indirectness	None

Study arms

Resistance and Balance exercise (N = 30)

Control (Resistance exercise) (N = 30)

Characteristics

Arm-level characteristics

Characteristic	Resistance and Balance exercise (N = 30)	Control (Resistance exercise) (N = 30)
% Female Nominal	50	36.7
Mean age (SD) Mean (SD)	87.3 (6)	86.8 (4.7)
Diabetes Nominal	4	8
Hypertension Nominal	18	15
Stroke Nominal	7	5
COPD Nominal	8	6
CHD Nominal	4	10
Patients with at least a fall in the past year Nominal	9	10

Outcomes

Study timepoints

12 week

Outcomes

Outcome	Resistance and Balance exercise, 12 week, N = 30	Control (Resistance exercise), 12 week, N = 30
Number of fallers No of events	n = 4; % = 13.3	n = 7; % = 23.3

Liu-Ambrose, 2019

Bibliographic Reference	Liu-Ambrose, Teresa; Davis, Jennifer C; Best, John R; Dian, Larry; Madden, Kenneth; Cook, Wendy; Hsu, Chun Liang; Khan, Karim M; Effect of a Home-Based Exercise Program on Subsequent Falls Among Community-Dwelling High-Risk Older Adults After a Fall: A Randomized Clinical Trial.; JAMA; 2019; vol. 321 (no. 21); 2092-2100

Study details

Secondary publication of another included study- see primary study for details	Not reported
Other publications associated with this study included in review	Not reported

Trial name / registration number	NCT01029171; NCT00323596
Study type	Randomised controlled trial (RCT)
Study location	Canada
Study setting	Community setting
Study dates	April 2009- May 2017
Sources of funding	Canadian Institutes for Health Research
Inclusion criteria	Aged at least 70 years receiving care at the Falls Prevention Clinic after a nonsyncopal fall in the previous 12 months English speaking High risk of future falls Timed Up and Go Test result >15 seconds History of ≥2 nonsyncopal falls in the previous 12months Mini-Mental State Examination score higher than 15 Life expectancy greater than 12 months
Exclusion criteria	Neurodegenerative disease Dementia History of stroke or carotid sinus sensitivity (i.e., syncopal falls) Inability to walk 3 m

Recruitment / selection of participants	Participants were recruited from the Fall Prevention Clinic
Intervention(s)	Participants performed the Otago Exercise Programme which is an individualised home based strength and balance exercise programme delivered by a physical therapist. Participants were asked to perform exercises 3 times a week and walk 30 minutes at least twice a week. The physical therapist visited participants biweekly for 3 more visits for 1h in the first 2 months. The final visit occurred 6 months after baseline.
Population subgroups	Not reported
Comparator	Usual Care
Number of participants	N=245 Intervention: n=173 Control: n=172
Duration of follow-up	12 months
Indirectness	None

Study arms

Exercise intervention (N = 173)

Usual care (N = 172)

Characteristics

Arm-level characteristics

Characteristic	Exercise intervention (N = 173)	Usual care (N = 172)
% Female Nominal	64	31
Mean age (SD) Mean (SD)	81.2 (6.1)	81.9 (6)

Outcomes

Outcomes

Outcome	Exercise intervention, N = 173	Usual care, N = 172
Number of falls No of events	n = 236	n = 366
Number of fall related fractures Nominal	15	12

Critical appraisal - Cochrane Risk of Bias tool (RoB 2.0) Normal RCT

Outcomes-Number of falls-No Of Events-Exercise intervention-Usual care

Section	Question	Answer
Overall bias and Directness	Risk of bias judgement	High *(High risk of bias due to participants being aware of the assigned intervention, the self-reported nature of the outcome, and issues with adherence)*

Section	Question	Answer
Overall bias and Directness	Overall Directness	Directly applicable *(Directly applicable)*

Lurie, 2020

Bibliographic Reference	Lurie, Jon D; Zagaria, Alexandra B; Ellis, Lisa; Pidgeon, Dawna; Gill-Body, Kathleen M; Burke, Christina; Armbrust, Kurt; Cass, Sharil; Spratt, Kevin F; McDonough, Christine M; Surface Perturbation Training to Prevent Falls in Older Adults: A Highly Pragmatic, Randomized Controlled Trial.; Physical therapy; 2020; vol. 100 (no. 7); 1153-1162

Study details

Secondary publication of another included study- see primary study for details	None
Other publications associated with this study included in review	None
Trial name / registration number	NCT01006967
Study type	Randomised controlled trial (RCT)
Study location	US

Study setting	Community setting
Study dates	April 2010 - July 2015
Sources of funding	Agency for Healthcare Research and Quality
Inclusion criteria	Aged 65 years and older. Referred to gait and balance physical therapy. Fall in last year TUG > 13.5 seconds; or DGI ≤ 19/24; or BBS < 50/56; or ABC < 67%. For patients with Parkinson's disease, the thresholds differed (TUG ≥ 8 seconds, DGI ≤ 22/24, or BBS < 54/56)
Exclusion criteria	Primary problem related to positional vertigo. Those who were not candidates for either treatment due to severe physical limitations
Recruitment / selection of participants	NR
Intervention(s)	Perturbation: Training sessions included participants being harnessed when standing or sitting while being delivered with postural disturbances. Sessions were 15min each.
Population subgroups	Not reported
Comparator	Usual balance training: 2-3 sessions per week at 45min each for 4-6 weeks. Sessions included strength, balance, mobility training, flexibility. Home exercises were also recommended.
Number of participants	N= 506 Perturbation: n=253

	Usual Balance: n=253
Duration of follow-up	12 months
Indirectness	None

Study arms

Perturbation (N = 253)

Standard Balance (N = 253)

Characteristics

Arm-level characteristics

Characteristic	Perturbation (N = 253)	Standard Balance (N = 253)
% Female Nominal	47	47
Mean age (SD) Mean (SD)	78 (NR)	78 (NR)

Outcomes

Study timepoints

12 month

Outcomes

Outcome	Perturbation, 12 month, N = 253	Standard Balance, 12 month, N = 253
Number of fallers No of events	n = 60; % = 32.1	n = 65; % = 34

Critical appraisal - Cochrane Risk of Bias tool (RoB 2.0) Normal RCT

Outcomes-Number of fallers- No Of Events-Perturbation -Standard Balance-t12

Section	Question	Answer
Overall bias and Directness	Risk of bias judgement	High *(Participants, people delivering the intervention, and assessors were not blinded.)*
Overall bias and Directness	Overall Directness	Directly applicable

Lytras, 2022

Bibliographic Reference	Lytras, Dimitrios; Sykaras, Evaggelos; Iakovidis, Paris; Komisopoulos, Christos; Chasapis, Georgios; Mouratidou, Charikleia; Effects of a modified Otago exercise program delivered through outpatient physical therapy to community-dwelling older adult fallers in Greece during the COVID-19 pandemic: a controlled, randomized, multicenter trial.; European geriatric medicine; 2022; vol. 13 (no. 4); 893-906

Study details

Secondary publication of another included study- see primary study for details	Not reported
Other publications associated with this study included in review	Not reported
Trial name / registration number	NCT04330053
Study type	Randomised controlled trial (RCT)
Study location	Greece
Study setting	Community setting
Study dates	Recruitment: December 2019–February 2020
Sources of funding	Not reported
Inclusion criteria	Aged 65–80, History of at least one fall in the last 12 months Be ambulatory. Score on the Timed Up-and-Go (TUG) test of less than 15 s
Exclusion criteria	Neurodegenerative disease diagnosis (e.g., Parkinson's disease)

	Recent stroke (less than 12 months prior) Cognitive impairment (Mini-Mental State Exam score less than 24)
Recruitment / selection of participants	Recruitment occurred through telephone invitations of registered member from a total of 15 open care centres for the elderly.
Intervention(s)	Participants received consulting and training on fall prevention through printed information material and a physical therapist. Participants also performed a modified Otago Exercise programme 3 times a week for the first 3 weeks and once a week after that for a total of 6 months. Participants were asked to perform exercises at home at least twice a week lasting 45minutes each. Weekly sessions were performed in outpatient clinics by a specialised Otago Exercise programme trainer. Exercises included resistance exercises, balance exercises and motion exercises.
Population subgroups	None
Comparator	Participants received consulting and training on fall prevention through printed information material and a physical therapist. Information included breathing, relaxation exercises and gentle upper limb exercises lasting 45 minutes each. Participants were asked to perform exercises 3 times a week.
Number of participants	N=150 Intervention: n=75 Control: n=75
Duration of follow-up	12 months
Indirectness	None

Study arms

Intervention (N = 75)

Control (N = 75)

Characteristics

Arm-level characteristics

Characteristic	Intervention (N = 75)	Control (N = 75)
% Female Nominal	90.7	86.7
Mean age (SD) Mean (SD)	70 (NR)	70 (NR)
Vision impairment Nominal	22	23
Osteoarthritis Nominal	14	16
Diabetes Nominal	12	8
Osteoporosis Nominal	18	16

Outcomes

Study timepoints

12 month

Outcomes

Outcome	Intervention, 12 month, N = 75	Control, 12 month, N = 75
Number of falls No of events	n = 46	n = 126

Critical appraisal - Cochrane Risk of Bias tool (RoB 2.0) Normal RCT

Outcomes-Number of falls -No of events -Intervention-Control-t12

Section	Question	Answer
Overall bias and Directness	Risk of bias judgement	High *(High risk of bias due to participants and people delivering the intervention were aware of the assigned intervention)*
Overall bias and Directness	Overall Directness	Directly applicable *(Directly applicable)*

Rogers, 2021

Bibliographic Reference	Rogers, Mark W; Creath, Robert A; Gray, Vicki; Abarro, Janice; McCombe Waller, Sandy; Beamer, Brock A; Sorkin, John D; Comparison of Lateral Perturbation-Induced Step Training and Hip Muscle Strengthening Exercise on Balance and Falls in Community-Dwelling Older Adults: A Blinded Randomized Controlled Trial.; The journals of gerontology. Series A, Biological sciences and medical sciences; 2021; vol. 76 (no. 9); e194-e202

Study details

Secondary publication of another included	NR

study- see primary study for details	
Other publications associated with this study included in review	NR
Trial name / registration number	NCT01370174
Study type	Randomised controlled trial (RCT)
Study location	US
Study setting	Community setting
Study dates	January 2012 - February 2017
Sources of funding	National Institutes of Health; National Institute on Disability and Rehabilitation Research; National Institute on Disability, Independent Living, and Rehabilitation Research
Inclusion criteria	Aged at least 65 years
Exclusion criteria	Cognitive impairment (Mini-Mental Score Exam <24) Sedative use Non-ambulatory Any clinically significant functional impairment related to musculoskeletal, neurological, cardiopulmonary, metabolic, or other general medical problem Diabetes, renal, or liver disease by routine chemistry

Recruitment / selection of participants	Recruitment occurred through the Biostatistics, Informatics and Translational Science Core of the University of Maryland Older Adult Independence Centre and the Geriatric Assessment Clinic of the Gerontology Research, Education and Clinical Centre of the Baltimore Veteran's Administration Medical Centre.
Intervention(s)	Perturbation-induced step training Participants received 43 randomly assigned waist-pull trials in block of 10 trials, whereby participants were 'pulled' to any direction and asked to react naturally to the pull and trying to maintain their balance. Hip strength training. Training consisted of 3 resistance exercises performed for 3 sets of 10 repetitions. Induced stepping and hip strength training Included both the stepping exercises and hip strength training. All training was conducted by trainers 3 times a week for 12 weeks. Exercise intensities were determined by a licensed physical therapist.
Population subgroups	None
Comparator	Standard flexibility and relaxation exercises Minimal intensity flexibility and relaxation exercises performed while seated.
Number of participants	N=102 Induced stepping and hip strengthening: n=25 Induced step training: n=25 Hip strengthening: n=26

	Flexibility and relaxation: n=26
Duration of follow-up	12 months
Indirectness	None

Study arms

Induced step and hip strengthening (N = 25)

Induced step training (N = 25)

Hip strengthening (N = 26)

Flexibility and relaxation (N = 26)

Characteristics

Arm-level characteristics

Characteristic	Induced step and hip strengthening (N = 25)	Induced step training (N = 25)	Hip strengthening (N = 26)	Flexibility and relaxation (N = 26)
% Female Nominal	41.2	60	63.2	72.7
Mean age (SD) Mean (SD)	73.6 (6.5)	73.7 (6.3)	72.5 (7.2)	70.8 (4.4)

Outcomes

Study timepoints

12 month

Outcomes

Outcome	Induced step and hip strengthening, 12 month, N = 24	Induced step training, 12 month, N = 25	Hip strengthening, 12 month, N = 26	Flexibility and relaxation, 12 month, N = 26
Number of fallers Nominal	13	18	15	17

Critical appraisal - Cochrane Risk of Bias tool (RoB 2.0) Normal RCT

Outcomes-Number of fallers-Nominal-Induced step and hip strengthening-Induced step training-Hip strengthening-Flexibility and relaxation-t12

Section	Question	Answer
Overall bias and Directness	Risk of bias judgement	High *(High risk of bias due to participants and people delivering the intervention were aware of the assigned intervention)*
Overall bias and Directness	Overall Directness	Directly applicable *(Directly applicable)*

Sherrington, 2020

Bibliographic Reference	Sherrington, Catherine; Fairhall, Nicola; Kirkham, Catherine; Clemson, Lindy; Tiedemann, Anne; Vogler, Constance; Close, Jacqueline C T; O'Rourke, Sandra; Moseley, Anne M; Cameron, Ian D; Mak, Jenson C S; Lord, Stephen R; Exercise to Reduce Mobility Disability and Prevent Falls After Fall-Related Leg or Pelvic Fracture: RESTORE Randomized Controlled Trial.; Journal of general internal medicine; 2020; vol. 35 (no. 10); 2907-2916

Study details

Secondary publication of another included study- see primary study for details	Not reported
Other publications associated with this study included in review	Not reported
Trial name / registration number	RESTORE ACTRN12610000805077
Study type	Randomised controlled trial (RCT)
Study location	Australia
Study setting	Community setting
Study dates	April 2010 - December 2015
Sources of funding	Australian National Health and Medical Research Council
Inclusion criteria	Not reported
Exclusion criteria	Residing in a high-care residential facility (nursing home) Cognitive impairment (a Mini-Mental State Examination (MMSE) score of less than 24)

	Insufficient English language to understand study procedures. Unable to walk more than 10 m despite assistance from a walking aid and/or another person. Medical condition precluding exercise (e.g., unstable cardiac disease or progressive neurological disease) Currently receiving a treatment program from a rehabilitation facility
Recruitment / selection of participants	Participants were recruited from 11 hospitals in New South Wales. Potential participants were identified through discussions with hospital staff and ward lists. Advertisements were also placed on hospital boards, community centres and newspapers.
Intervention(s)	Exercises were home-based lower limb and strength exercises. Participants were asked to perform exercises at least 3 times a week lasting between 20-30minutes each. Experienced physiotherapists visited participants at least 10 times during the 12 months. Participants also received advice about fall prevention. Participants were also asked where possible to attend a group-based programme (7 2h sessions) based on the Stepping on Programme. Participants received an education booklet about fall prevention.
Population subgroups	None
Comparator	Participants received an education booklet about fall prevention.
Number of participants	N=336 Intervention: n=168 Control: n=168
Duration of follow-up	12 months
Indirectness	None

Study arms

Intervention (N = 168)

Control (N = 168)

Characteristics

Arm-level characteristics

Characteristic	Intervention (N = 168)	Control (N = 168)
% Female Nominal	74	77
Mean age (SD) Mean (SD)	77.6 (8.9)	77.8 (8.6)
Comorbidities Mean (SD)	7.9 (3.5)	8.2 (3.3)

Outcomes

Study timepoints

12 month

Outcomes

Outcome	Intervention, 12 month, N = 168	Control, 12 month, N = 168
Number of falls No of events	n = 131	n = 129

Outcome	Intervention, 12 month, N = 168	Control, 12 month, N = 168
Number of fall related fractures No of events	n = 12	n = 18

Critical appraisal - Cochrane Risk of Bias tool (RoB 2.0) Normal RCT

Outcomes-Number of falls -No of events -Intervention-Control-t12

Section	Question	Answer
Overall bias and Directness	Risk of bias judgement	High *(High risk of bias due to participants and people delivering the intervention were aware of the assigned intervention)*
Overall bias and Directness	Overall Directness	Directly applicable *(Directly applicable)*

Outcomes-Numberoffallrelated fractures -No of events -Intervention-Control-t12

Section	Question	Answer
Overall bias and Directness	Risk of bias judgement	High *(High risk of bias due to participants and people delivering the intervention were aware of the assigned intervention)*
Overall bias and Directness	Overall Directness	Directly applicable *(Directly applicable)*

Stanmore, 2019

Bibliographic Reference	Stanmore, Emma K; Mavroeidi, Alexandra; de Jong, Lex D; Skelton, Dawn A; Sutton, Chris J; Benedetto, Valerio; Munford, Luke A; Meekes, Wytske; Bell, Vicky; Todd, Chris; The effectiveness and cost-effectiveness of strength and balance Exergames to reduce falls risk for people aged 55 years and older in UK assisted living facilities: a multi-centre, cluster randomised controlled trial.; BMC medicine; 2019; vol. 17 (no. 1); 49

Study details

Secondary publication of another included study- see primary study for details	NA
Other publications associated with this study included in review	NA
Trial name / registration number	NCT02634736
Study type	Cluster randomised controlled trial
Study location	United Kingdom
Study setting	Assisted living facilities
Study dates	January 2016 to May 2016
Sources of funding	Funded by Innovate UK through their Phase I and Phase II SBRI programme

Inclusion criteria	Aged 55 years or older, mental capacity (assessed by a trained healthcare professional) to give informed consent, able to speak English sufficiently to understand exercise instructions, registered with a primary care general practice, able to watch television with or without glasses from 2 meter distance, able to use gaming technology safely as assessed by research physiotherapists (ie able to stand with support of aids and follow game instructions)
Exclusion criteria	Acute illness, severe congestive cardiac failure, uncontrolled hypertension, recent fracture or surgery in past 6 months, on a waiting list to have orthopaedic surgery, myocardial infarction or stroke in the past 6 months, dependence on wheelchair use, severe visual or auditory impairments, peripheral neuropathy or other uncontrolled medical conditions likely to compromise the ability to exercise, and current use of gaming technology to exercise.
Recruitment / selection of participants	Facilities (clusters) were selected
Intervention(s)	12 week strength and balance exergame programme
Population subgroups	NA
Comparator	Standard care
Number of participants	106 participants
Duration of follow-up	3 month follow-up
Indirectness	Indirectness was not a concern for this study
Additional comments	ITT analysis

Study arms

Strength and balance exergame programme (N = 56)

12-week programme

Standard care (N = 50)

Physiotherapy advice and leaflet

Characteristics

Study-level characteristics

Characteristic	Study (N = 106)
% Female Sample size	n = NA ; % = NA
Exergames Sample size	n = 45 ; % = 80.4
Standared care Sample size	n = 38 ; % = 76
Mean age (SD) Mean (SD)	NA (NA)
Exergames Mean (SD)	77.9 (8.9)

Characteristic	Study (N = 106)
Standard care Mean (SD)	77.8 (10.2)
Ethnicity Sample size	n = NA ; % = NA
Exergames- White, British, or Irish Sample size	n = 52 ; % = 92.9
Standard care- White, British, or Irish Sample size	n = 50 ; % = 100
Exergames- Asian or Asian British Sample size	n = 1 ; % = 1.8
Standard care- Asian or Asian British Sample size	n = 0 ; % = 0
Exergames- Mixed Sample size	n = 2 ; % = 3.6
Standard care- Mixed Sample size	n = 0 ; % = 0
Exergames- Other ethnic groups	n = 1 ; % = 1.8

Characteristic	Study (N = 106)
Sample size	
Standard care- Other ethnic groups Sample size	n = 0 ; % = 0

Outcomes

Falls

Outcome	Strength and balance exergame programme, N = 56	Standard care, N = 50
Number of falls self-reported Custom value	17	38
Single fallers Custom value	8	5
Multiple fallers Custom value	3	7
Fall incident rate Falls per person-year Custom value	1.26	3.11

Quality of life

Outcome	Strength and balance exergame programme, N = 56	Standard care, N = 50
Baseline Custom value	71.2	71.2
Baseline Mean (SD)	71.2 (21.4)	71.2 (18.3)
12 weeks Custom value	70.6	67.2
12 weeks Mean (SD)	70.6 (21.1)	67.2 (22.7)

EQ-5D5L-VAS

Critical appraisal - Cochrane Risk of Bias tool (RoB 2.0) Normal RCT

Falls-Numberoffalls-Strength and balance exergame programme -Standard care

Section	Question	Answer
Overall bias and Directness	Risk of bias judgement	Low *(Low risk of bias throughout)*
Overall bias and Directness	Overall Directness	Directly applicable *(Directly applicable)*

Falls-Numberoffalls-Singlefallers-Strength and balance exergame programme -Standard care

Section	Question	Answer
Overall bias and Directness	Risk of bias judgement	Low *(Low risk of bias throughout)*
Overall bias and Directness	Overall Directness	Directly applicable *(Directly applicable)*

Falls-Numberoffalls-Multiplefallers-Strength and balance exergame programme -Standard care

Section	Question	Answer
Overall bias and Directness	Risk of bias judgement	Low *(Low risk of bias throughout)*
Overall bias and Directness	Overall Directness	Directly applicable *(Directly applicable)*

Falls-Fallincidentrate-trength and balance exergame programme -Standard care

Section	Question	Answer
Overall bias and Directness	Risk of bias judgement	Low *(Low risk of bias throughout)*
Overall bias and Directness	Overall Directness	Directly applicable *(Directly applicable)*

Qualityoflife-Baseline-Strength and balance exergame programme -Standard care

Section	Question	Answer
Overall bias and Directness	Risk of bias judgement	Low *(Low risk of bias throughout)*
Overall bias and Directness	Overall Directness	Directly applicable *(Directly applicable)*

Qualityoflife-12weeks-Strength and balance exergame programme -Standard care

Section	Question	Answer
Overall bias and Directness	Risk of bias judgement	Low *(Low risk of bias throughout)*
Overall bias and Directness	Overall Directness	Directly applicable *(Directly applicable)*

Qualityoflife-12weeks-MeanSD-Strength and balance exergame programme -Standard care

Section	Question	Answer
Overall bias and Directness	Risk of bias judgement	Low *(Low risk of bias throughout)*
Overall bias and Directness	Overall Directness	Directly applicable *(Directly applicable)*

Qualityoflife-Baseline-MeanSD-Strength and balance exergame programme -Standard care

Section	Question	Answer
Overall bias and Directness	Risk of bias judgement	Low *(Low risk of bias throughout)*
Overall bias and Directness	Overall Directness	Directly applicable *(Directly applicable)*

Suikkanen, 2021

Bibliographic Reference	Suikkanen, Sara; Soukkio, Paula; Aartolahti, Eeva; Kaaria, Sanna; Kautiainen, Hannu; Hupli, Markku T; Pitkala, Kaisu; Sipila, Sarianna; Kukkonen-Harjula, Katriina; Effect of 12-Month Supervised, Home-Based Physical Exercise on Functioning Among Persons With Signs of Frailty: A Randomized Controlled Trial.; Archives of physical medicine and rehabilitation; 2021; vol. 102 (no. 12); 2283-2290

Study details

Secondary publication of another included study- see primary study for details	Not reported
Other publications associated with this study included in review	Not reported

Trial name / registration number	NCT02305433
Study type	Randomised controlled trial (RCT)
Study location	
Study setting	Community setting
Study dates	December 2014 to August 2016
Sources of funding	South Karelia Social and Health Care District
Inclusion criteria	Weight loss ≥5% during the preceding year Physical activity under 30 minutes/week A feeling of “not getting going” or “everything is an effort” for most or all of the time. Handgrip strength under cut off values based on BMI and gender. Walking speed under 0.46 m/s (walking length either 4 or 2.44 m) Residing at home Ability to walk indoors with or without mobility aids. Scoring ≥17 in Mini-Mental State Examination (MMSE) test Ability to communicate in Finnish
Exclusion criteria	Institutional care facility or nursing home Alcohol or drug abuse problems

	Severe problems with hearing or eyesight Terminal illnesses (e.g., cancers) Other severe illnesses (e.g., a cardiovascular disease with New York Heart Association Functional Classification class III or IV Severe pulmonary disease or a stroke that was contraindication to physical exercise
Recruitment / selection of participants	Participants went through a 2-phase recruitment process. Firstly, participants were evaluated using the FRAIL questionnaire. If participants scored more than 1 point on the FRAIL they moved on to the second phase where eligibility criteria was checked.
Intervention(s)	Home based exercises performed twice weekly for 1hour supervised by a physiotherapist. Exercises were structured, periodical, progressive and multicomponent including strength, balance, mobility and functional exercises.
Population subgroups	Not reported
Comparator	Control group received usual care.
Number of participants	N=299 Intervention: n=150 Control: n=149
Duration of follow-up	12 months
Indirectness	None

Study arms

Intervention (N = 150)

Control (N = 149)

Characteristics

Arm-level characteristics

Characteristic	Intervention (N = 150)	Control (N = 149)
% Female Nominal	76	74
Mean age (SD) Mean (SD)	82.2 (6.3)	82.7 (6.3)

Outcomes

Study timepoints

12 month

Outcomes

Outcome	Intervention vs Control, 12 month, N2 = 149, N1 = 150
Rate of falls Custom value	0.47 (95%CI: 0.40 - 0.55)

Critical appraisal - Cochrane Risk of Bias tool (RoB 2.0) Normal RCT

Outcomes-Rate of falls -Intervention-Control-t12

Section	Question	Answer
Overall bias and Directness	Risk of bias judgement	High *(High risk of bias due to participants, people delivering the intervention, and outcome assessors all being aware of the assigned intervention and self-reported outcomes)*
Overall bias and Directness	Overall Directness	Directly applicable *(Directly applicable)*

Wang, 2022

Bibliographic Reference	Wang, Yiru; Wang, Shuaijie; Liu, Xuan; Lee, Anna; Pai, Yi-Chung; Bhatt, Tanvi; Can a single session of treadmill-based slip training reduce daily life falls in community-dwelling older adults? A randomized controlled trial.; Aging clinical and experimental research; 2022; vol. 34 (no. 7); 1593-1602

Study details

Secondary publication of another included study- see primary study for details	Not reported
Other publications associated with this study included in review	Not reported
Trial name / registration number	NCT02126488

Study type	Randomised controlled trial (RCT)
Study location	US
Study setting	Community setting
Study dates	Not reported
Sources of funding	National Institutes of Health
Inclusion criteria	Pass the Mini Mental State Exam (Score>25) Passed the Calcaneal ultrasound screening (T score>− 1.5) Passed the Timed-Up-and-Go test (time<13.5 s)
Exclusion criteria	Self-reported diagnosed neurological, musculoskeletal, or other systemic disorders
Recruitment / selection of participants	NR
Intervention(s)	Participants received 40 treadmill slips in ascending and mixed intensity order including reversing direction.
Population subgroups	None
Comparator	Participants received 30min of treadmill walking.
Number of participants	N=133 Intervention: n=70

	Active Control: n=63
Duration of follow-up	6 months
Indirectness	None

Study arms

Intervention (N = 70)

Active Control (N = 63)

Characteristics

Arm-level characteristics

Characteristic	Intervention (N = 70)	Active Control (N = 63)
% Female Nominal	64.3	63.5
Mean age (SD) Mean (SD)	72.5 (6.3)	72.9 (6.1)

Outcomes

Study timepoints

6 month

Outcomes

Outcome	Intervention, 6 month, N = 70	Active Control, 6 month, N = 63
Number of people falling No of events	n = 18	n = 15

Critical appraisal - Cochrane Risk of Bias tool (RoB 2.0) Normal RCT

Outcomes-Number of people falling-No Of Events-Intervention-Active Control-t6

Section	Question	Answer
Overall bias and Directness	Risk of bias judgement	High *(High risk of bias due to participants and people delivering the intervention being aware of the assigned intervention and limited information regarding the randomisation process)*
Overall bias and Directness	Overall Directness	Directly applicable *(Directly applicable)*

Yalfani, 2022

Bibliographic Reference	Yalfani, Ali; Abedi, Mitra; Raeisi, Zahra; Effects of an 8-Week Virtual Reality Training Program on Pain, Fall Risk, and Quality of Life in Elderly Women with Chronic Low Back Pain: Double-Blind Randomized Clinical Trial.; Games for health journal; 2022; vol. 11 (no. 2); 85-92

Study details

Secondary publication of another included study- see primary study for details	NR

Other publications associated with this study included in review	NR
Trial name / registration number	IRCT20200204046368N5
Study type	Randomised controlled trial (RCT)
Study location	Iran
Study setting	Community setting
Study dates	NR
Sources of funding	No funding received
Inclusion criteria	Aged 65 to 75 years. Lower back pain experience over the last 6 months No history of spinal surgery and hip replacement No neurological disorders No musculoskeletal disorders
Exclusion criteria	History of cardiorespiratory conditions in the past 2 years Visual impairment History of using muscle relaxers during the 30 days before the study

Recruitment / selection of participants	27 women were screened by a lower back pain specialist
Intervention(s)	Participants performed virtual reality exercises lasting a maximum of 30 minutes once a week for 8 weeks. Exercises included fisher, boxing, tennis, football, bowling, beat saber, audioshield, and skiing.
Population subgroups	None
Comparator	Control (no exercise)
Number of participants	N=25 Intervention: n=13 Control: n=12
Duration of follow-up	8 weeks
Indirectness	None

Study arms

Intervention (N = 13)

Control (N = 12)

Characteristics

Arm-level characteristics

Characteristic	Intervention (N = 13)	Control (N = 12)
% Female Nominal	100	100
Mean age (SD) Mean (SD)	68 (1.94)	67.08 (2.9)

Outcomes

Study timepoints

- 8 week

Outcomes

Outcome	Intervention, 8 week, N = 13	Control, 8 week, N = 12
Quality of Life (SF-36) Mean (SD)	69.62 (12.53)	38.94 (15.68)

Critical appraisal - Cochrane Risk of Bias tool (RoB 2.0) Normal RCT

Outcomes-Quality of life (SF-36)-Mean SD -Intervention-Control-t8

Section	Question	Answer
Overall bias and Directness	Risk of bias judgement	High *(High risk of bias due to participants and people delivering the intervention were likely aware of the assigned intervention)*
Overall bias and Directness	Overall Directness	Directly applicable *(Directly applicable)*

Zhang, 2022

Bibliographic Reference	Zhang, F; Wang, Z; Su, H; Zhao, H; Lu, W; Zhou, W; Zhang, H; Effect of a home-based resistance exercise program in elderly participants with osteoporosis: a randomized controlled trial.; Osteoporosis international : a journal established as result of cooperation between the European Foundation for Osteoporosis and the National Osteoporosis Foundation of the USA; 2022; vol. 33 (no. 9); 1937-1947

Study details

Secondary publication of another included study- see primary study for details	NR
Other publications associated with this study included in review	NR

Trial name / registration number	ChiCTR2100051455
Study type	Randomised controlled trial (RCT)
Study location	China
Study setting	Community setting
Study dates	August 2019 - June 2022
Sources of funding	Longhua Hospital Shanghai University of Traditional Chinese Medicine
Inclusion criteria	• Osteoporosis was diagnosed according to the WHO, with bone mineral density 2.5 SD or more below the average value for young healthy women. • Age range from 60 to 80 years • Receiving conventional treatment with anti-osteoporotic medications • No contraindications to exercise and not using assistive mobility devices
Exclusion criteria	• Severe heart, kidney, liver, gastrointestinal, infectious, endocrine disease, or cancer • Secondary osteoporosis or other bone and joint disorders • Participating in another exercise intervention trial
Recruitment / selection of participants	Participants were recruited from the orthopaedic outpatient department and clinical wards at a hospital.
Intervention(s)	Participants performed home based resistance exercises of 45-60 minutes, 3 times per week for 12 weeks. Exercises focused on lower and upper limbs. Prior to the first session participants received one-to-one guidance to ensure accuracy of movements.

Population subgroups	None
Comparator	Usual care
Number of participants	N=72 Intervention: n=36 Control: n=36
Duration of follow-up	12 weeks
Indirectness	None

Study arms

Intervention (N = 36)

Control (N = 36)

Characteristics

Study-level characteristics

Characteristic	Study (N = 72)
% Female Nominal	83.8

Characteristic	Study (N = 72)
Mean age (SD) Mean (SD)	68.4 (4.7)

Outcomes

Study timepoints

- 12 week

Outcomes

Outcome	Intervention, 12 week, N = 34	Control, 12 week, N = 34
HRQOL (total) Mean (SD)	73.8 (6.7)	65.2 (11.5)

Critical appraisal - Cochrane Risk of Bias tool (RoB 2.0) Normal RCT

Outcomes-HRQOL(total)-Mean SD -Intervention-Control-t12

Section	Question	Answer
Overall bias and Directness	Risk of bias judgement	High *(High risk of bias due to participants and people delivering the intervention were aware of the assigned intervention)*
Overall bias and Directness	Overall Directness	Directly applicable *(Directly applicable)*

D.2 Multifactorial interventions

Arkkukangas, 2019

Bibliographic Reference	Arkkukangas, Marina; Soderlund, Anne; Eriksson, Staffan; Johansson, Ann-Christin; Fall Preventive Exercise With or Without Behavior Change Support for Community-Dwelling Older Adults: A Randomized Controlled Trial With Short-Term Follow-up.; Journal of geriatric physical therapy (2001); 2019; vol. 42 (no. 1); 9-17

Study details

Secondary publication of another included study- see primary study for details	No additional information
Other publications associated with this study included in review	Arkkukangas, Marina; Johnson, Susanna Tuvemo; Hellstrom, Karin; Anens, Elisabeth; Tonkonogi, Michail; Larsson, Ulf. Fall Prevention Exercises With or Without Behavior Change Support for Community-Dwelling Older Adults: A Two-Year Follow-Up of a Randomized Controlled Trial. Journal of aging and physical activity; 2019; vol. 28 (no. 1); 34-41 No data extracted from this publication due to data with a greater time outlook being reported in the publication referenced above
Trial name / registration number	NCT01778972
Study type	Randomised controlled trial (RCT)
Study location	Sweden
Study setting	Three communities in Central Sweden

Study dates	October 2012 - May 2015
Sources of funding	Supported by The National Swedish Board of Health and Welfare, Grants for the County of Västmanland. Regional Research Fund for Uppsala and Örebro region, Sweden. Research and Development Department in the Community of Eskilstuna, Sweden
Inclusion criteria	75 years or older Able to walk independently Able to understand written and oral information in Swedish
Exclusion criteria	Score of <25 on the Mini-Mental State Examination Ongoing regular physical therapy treatment Receiving terminal care
Recruitment / selection of participants	Care managers, occupational therapists, and physiotherapists collaborated to recruit participants who had contacted health centres or the municipality to obtain walking aids or home care
Intervention(s)	**Exercise (Otago Exercise Programme)** The Otago Exercise Programme (OEP) is a home-based exercise program designed to improve strength, balance, and endurance. With the support of the PT, the level of difficulty of the individually tailored exercise program was increased successively during the 12 weeks. To ensure the safety and intensity of the program, the PT increased and supervised the exercise closely during the 5 home visits. The exercise was estimated to take 30 minutes and was prescribed at a frequency of 3 times weekly. Ankle cuff weights were used according to the OEP protocol. Walks were recommended for the days between the exercise days. Exercise and walks were reported in the exercise diary by the participant. Each session with the PT was estimated to take 1 hour. **Exercise plus Psychological Intervention (Otago Exercise Programme plus motivational interviewing)**

	Motivational interviewing (MI) was combined with the OEP to follow the participant's motivation to change regarding exercise. The session began with MI, open-ended questions, affirmations, reflective listening and summaries, a collaborative conversation to strengthen and mobilize the participants' inner resources. The session then proceeded to discussion and a decision of the individual setup regarding the OEP. The sessions aimed to keep a flexible intervention tailored to the participant's needs and at the same time keeping the standardized structure of the OEP. Each session was calculated to last approximately 1 hour, equal to the OEP group. **Concomitant interventions:** All participants received a pamphlet with general safety recommendations for older adults, including fall prevention recommendations which was standard care at the time in the 3 communities
Population subgroups	**Vitamin D Status** Not reported
Comparator	Participants in the usual care/control arm received the same pamphlet as the intervention arms, containing general safety recommendations for older adults, including fall prevention recommendations, which was standard care at the time in the 3 communities
Number of participants	175 randomised 61 allocated to exercise, 54 completed 58 allocated to multiple component intervention, 52 completed 56 allocated to usual care/control, 55 completed
Duration of follow-up	12 weeks
Indirectness	None

Additional comments	Per protocol analysis including only participants who completed the 12-week follow-up and were adherent to exercise protocols

Study arms

Exercise (N = 61)

Otago Exercise Programme supported by a physiotherapist in addition to safety instructions and recommendations about fall prevention as part of standard care

Multiple Component Intervention (N = 58)

Otago Exercise Programme supported by a physiotherapist (exercise) plus motivational interviewing (psychological intervention) in addition to safety instructions and recommendations about fall prevention as part of standard care

Usual care/control (N = 56)

Safety instructions and recommendations about fall prevention as part of standard care

Characteristics

Arm-level characteristics

Characteristic	Exercise (N = 61)	Multiple Component Intervention (N = 58)	Usual care/control (N = 56)
% Female Sample size	n = 41; % = 67	n = 40; % = 69	n = 41; % = 73
Mean age (SD) Mean (SD)	83 (5)	84 (4.1)	82 (4.7)
Ethnicity	NR	NR	NR

Characteristic	Exercise (N = 61)	Multiple Component Intervention (N = 58)	Usual care/control (N = 56)
Nominal			
Comorbidities Nominal	NR	NR	NR
Falls in past year With ≥1 fall Sample size	n = 24; % = 39	n = 28; % = 49	n = 21; % = 37
Short Physical Performance Battery Scale range: 0-12 Mean (SD)	7.9 (2.4)	7.7 (2.5)	7.5 (2.5)

Barker, 2019

Bibliographic Reference	Barker, Anna; Cameron, Peter; Flicker, Leon; Arendts, Glenn; Brand, Caroline; Etherton-Beer, Christopher; Forbes, Andrew; Haines, Terry; Hill, Anne-Marie; Hunter, Peter; Lowthian, Judy; Nyman, Samuel R; Redfern, Julie; Smit, De Villiers; Waldron, Nicholas; Boyle, Eileen; MacDonald, Ellen; Ayton, Darshini; Morello, Renata; Hill, Keith; Evaluation of RESPOND, a patient-centred program to prevent falls in older people presenting to the emergency department with a fall: A randomised controlled trial.; PLoS medicine; 2019; vol. 16 (no. 5); e1002807

Study details

Secondary publication of another included study- see primary study for details	NA

Other publications associated with this study included in review	NA
Trial name / registration number	ACTRN12614000336684
Study location	Australia
Study setting	Community (in Emergency department)
Study dates	April 2014 to June 2015
Sources of funding	This project was funded under the Australian National Health and Medical Research Council's Partnership Projects funding scheme (project number APP1056802), with financial and in-kind contributions from the following partner organisations: Health Strategy and Networks Branch, Strategic System Policy and Planning, Department of Health, WA; Aged and Continuing Care Directorate, Department of Health, WA; Royal Perth Hospital; Curtin University; The University of Western Australia; The Royal Perth Hospital Medical Research Foundation; Sir Charles Gairdner Hospital (SCGH) Area Rehabilitation and Aged Care Falls Specialist Program; Injury Control Council of Western Australia (ICCWA); The George Institute for Global Health; The Alfred Hospital; Monash University; Integrated Care, Victorian Department of Health.
Inclusion criteria	Planned hospital stay (ED and/or hospital admission) of 72 hours or less. Participants aged 60-90 years.
Exclusion criteria	Those were having planned discharge to residential aged care, receiving palliative care or presence of a terminal illness, requiring hands-on assistance to walk from another individual (people could use an assistive device such as a walker), being unable to use a telephone, being non-English speaking, the presence of cognitive impairment (Mini Mental State Examination score <23), social aggression, or a history of psychosis. People who lived further than 50 km from trial sites.
Recruitment / selection of participants	People who were discharged directly home from the ED or who had a short inpatient stay on the basis that these people would be least likely to receive comprehensive geriatric assessment and management, including falls risk assessment and management, and therefore remain at risk of further falls.

Intervention(s)	The intervention was delivered in a face-to-face session in the participant's home and then via telephone during the 6 months after recruitment. All clinicians attended a 2-day face-to-face study-specific training session on falls, patient-centred care, the RESPOND program, motivational interviewing, and behaviour change strategies. At the face-to-face session, the clinician discussed the falls risk assessment findings with the participant, their falls risk status, and identified falls risk factors and potential management strategies. Participants were provided educational leaflets with the four RESPOND modules (better strength, better vision, better sleep, and better bones). Participants were encouraged through motivational interviewing to choose one or more of the four modules that appealed to them and develop personalised goals and action plans for each one. Recommendations provided by the ED staff were also reviewed and discussed with participants. Barriers to the patient achieving their action plans were identified by the clinician and through motivational interviewing, were resolved when possible. Clinicians telephoned the participant to review their progress.
Population subgroups	NA
Comparator	Received the same baseline assessment , letter to usual care medical practitioner and standard care as arranged/ initiated by ED staff.
Number of participants	541 randomised 523 allocated 430 at 12 months follow-up
Duration of follow-up	12 months
Indirectness	None

Study arms

RESPOND intervention (N = 263)

Home based risk assessment, 6 months telephone-based education, coaching, goal setting, and support for evidence-based risk factor management, and linkages to existing services

Usual care (N = 260)

Usual care

Characteristics

Study-level characteristics

Characteristic	Study (N = 523)
% Female Sample size	n = NA; % = NA
Intervention Sample size	n = 132; % = 50.2
Control Sample size	n = 156; % = 60
Mean age (SD) Mean (SD)	NA (NA)
Intervention Mean (SD)	73 (8.4)
Control Mean (SD)	73 (8.6)

Characteristic	Study (N = 523)
Comorbidities Sample size	n = NA; % = NA
Arthritis- Intervention Sample size	n = 86; % = 38.4
Arthritis- Control Sample size	n = 103; % = 47.5
Cardiac condition- Intervention Sample size	n = 72; % = 32.1
Cardiac condition- Control Sample size	n = 68; % = 31.3
Respiratory condition- Intervention Sample size	n = 52; % = 23.2
Respiratory condition- Control Sample size	n = 44; % = 20.3
Diabetes- Intervention Sample size	n = 45; % = 20.1
Diabetes- Control	n = 37; % = 17.5

Characteristic	Study (N = 523)
Sample size	
Osteoporosis- Intervention Sample size	n = 36; % = 16.1
Osteoporosis- Control Sample size	n = 34; % = 15.7
Stroke- Intervention Sample size	n = 18; % = 8
Stroke- Control Sample size	n = 23; % = 10.6
Other- Intervention Sample size	n = 73; % = 32.6
Other- Control Sample size	n = 71; % = 32.7

Outcomes

Number of falls

Outcome	RESPOND intervention, N = 217	Usual care , N = 213
Number of falls Custom value	220	355
Rate of falls Rate ratio Custom value	0.65 (0.43-0.99)	NA

Number of fallers

Outcome	RESPOND intervention, N = 217	Usual care , N = 213
Number of fallers Sample size	n = 100; % = 46.1	n = 106; % = 49.8

Number of people who sustained a fall-related fracture

Outcome	RESPOND intervention, N = 217	Usual care , N = 213
Number of people sustaining a fall-related fracture Sample size	n = 10; % = 4.9	n = 23; % = 8.6
Number of people sustaining a fall-related fracture **IRR**	0.37 (0.15-0.91)	NA

Critical appraisal - Cochrane Risk of Bias tool (RoB 2.0) Normal RCT

Number of falls -Number of falls -RESPOND intervention-Usual care

Section	Question	Answer
Overall bias and Directness	Risk of bias judgement	High *(High risk of bias due to participants and people delivering the intervention being aware of the assigned intervention and missing outcome data)*
Overall bias and Directness	Overall Directness	Directly applicable *(Directly applicable)*

Number of falls -Rate of falls -RESPOND intervention-Usual care

Section	Question	Answer
Overall bias and Directness	Risk of bias judgement	High *(High risk of bias due to participants and people delivering the intervention being aware of the assigned intervention and missing outcome data)*
Overall bias and Directness	Overall Directness	Directly applicable *(Directly applicable)*

Bhasin, 2020

Bibliographic Reference	Bhasin, Shalender; Gill, Thomas M; Reuben, David B; Latham, Nancy K; Ganz, David A; Greene, Erich J; Dziura, James; Basaria, Shehzad; Gurwitz, Jerry H; Dykes, Patricia C; McMahon, Siobhan; Storer, Thomas W; Gazarian, Priscilla; Miller, Michael E; Travison, Thomas G; Esserman, Denise; Carnie, Martha B; Goehring, Lori; Fagan, Maureen; Greenspan, Susan L; Alexander, Neil; Wiggins, Jocelyn; Ko, Fred; Siu, Albert L; Volpi, Elena; Wu, Albert W; Rich, Jeremy; Waring, Stephen C; Wallace, Robert B; Casteel, Carri; Resnick, Neil M; Magaziner, Jay; Charpentier, Peter; Lu, Charles; Araujo, Katy; Rajeevan, Haseena; Meng, Can; Allore, Heather; Brawley, Brooke F; Eder, Rich; McGloin, Joanne M; Skokos, Eleni A; Duncan, Pamela W; Baker, Dorothy; Boult, Chad; Correa-de-Araujo, Rosaly; Peduzzi, Peter; A Randomized Trial of a Multifactorial Strategy to Prevent Serious Fall Injuries.; The New England journal of medicine; 2020; vol. 383 (no. 2); 129-140

Study details

Secondary publication of another included study- see primary study for details	NA
Other publications associated with this study included in review	NA
Trial name / registration number	STRIDE/ NCT02475850
Study location	United States
Study setting	Community setting
Study dates	Not specified
Sources of funding	Supported by the Patient-Centred Outcomes Research Institute and the National Institute on Aging of the National Institutes of Health (NIH) through a cooperative agreement (5U01AG048270) between the National Institute on Aging and Brigham and Women’s Hospital. The project is part of the Falls Injuries Prevention Partnership between the National Institute on Aging and Patient-Centred Outcomes Research Institute. This research is partially supported by the Boston Claude D. Pepper Older Americans Independence Centre at Brigham and Women’s Hospital (P30AG013679) and Harvard Catalyst, the Harvard Clinical and Translational Science Centre (National Centre for Research Resources and the National Centre for Advancing Translational Sciences, NIH Award Bhasin et al. Page 9 N Engl J Med. Author manuscript; available in PMC 2021 January 09. Author Manuscript Author Manuscript Author Manuscript Author Manuscript UL1TR001102) and financial contributions from Harvard University and its affiliated academic health care centres. Support was also provided by the Claude D. Pepper Older Americans Independence Centres at the University of California, Los Angeles (P30AG028748), Yale University (P30AG021342), Mount Sinai Medical Centre (P30AG2874106), the University of Texas Medical Branch (P30AG024832), the University of Michigan (P30AG024824), the University of Pittsburgh (P30AG024827), Wake Forest

	University School of Medicine (P30AG021332), and the Older Americans Independence Centre National Coordinating Centre (U24AG059624). Mount Sinai Medical Centre also received grant support from the New York Academy of Medicine. Additional support at Yale University was provided by the Clinical and Translational Science Awards program of the National Centre for Advancing Translational Sciences of the NIH (UL1TR000142) and by the National Institute on Aging to Dr. Gill (Academic Leadership Award K07AG043587). Dr. McMahon was supported by grants (KL2TR000113 and UL1TR000114) from the University of Minnesota Clinical and Translational Science Institute, which is funded by the National Centre for Advancing Translational Sciences of the NIH. The University of Michigan also received support from Michigan Medicine, its academic health care system. The University of Pittsburgh also received support from the University of Pittsburgh Medical Centre, its academic health care system
Inclusion criteria	Information from clinical trials registration page Patient is at least 70 years of age The patient answered 'yes' to the following questions: Have you fallen and hurt yourself in the past year? Have you fallen 2 or more times in the past year? Are you afraid that you might fall because of balance or walking problems
Exclusion criteria	Information from clinical trials registration page The patient is enrolled in hospice The patient resides in a nursing home The patient is not capable of providing informed consent (or assent) and a proxy is not available. The patient does not speak English or Spanish.
Recruitment / selection of participants	Age-eligible persons were mailed a letter asking them to complete a screening questionnaire that assessed their risk of fall injuries (at 9 out of 10 sites). At one site, practice staff screened age-eligible persons during clinic visits.
Intervention(s)	Multifactorial intervention

Population subgroups	Age, sex, fear of falling only, presence of at least two chronic coexisting conditions, and previous hip fracture or other fracture after 50 years of age.
Comparator	Usual care
Number of participants	5451 participants
Duration of follow-up	44 months
Indirectness	None
Additional comments	

Study arms

Multifactorial intervention (N = 2802)

Nurses implemented the fall intervention strategy in partnership with the participants and their primary care providers. The intervention included 5 components. The first component was a standardised assessment of seven modifiable risk factors for fall injuries (impairment of strength, gait, or balance, use of certain medications, postural hypotension, problems with feet or footwear, vision impairment, osteoporosis or vitamin D deficiency, and home safety hazards). The second was standardised protocol-driven recommendations for management of risk factors that were explained using motivational interviewing. An individualised care plan was developed which initially focused on one to three risk factors. The fourth component was implementation of the care plan, including referrals to community-based programs, if needed. Next, follow-up care was conducted by telephone or in person. The risk factors to fall injuries were reassessed annually and the care plan was revised, as needed.

Usual care (N = 2649)

Usual care

Characteristics

Study-level characteristics

Characteristic	Study (N = 5451)
% Female Sample size	n = NA; % = NA
Multifactorial intervention Sample size	n = 1752; % = 62.5
Usual care Sample size	n = 1629; % = 61.5
Mean age (SD) Mean (SD)	NA (NA)
Multifactorial intervention Mean (SD)	79.9 (5.7)
Usual care Mean (SD)	79.5 (5.8)
Ethnicity Sample size	n = NA; % = NA
Multifactorial intervention - White Sample size	n = 2571; % = 91.8
Usual care- White	n = 2394; % = 90.4

Characteristic	Study (N = 5451)
Sample size	
Multifactorial intervention- Black Sample size	n = 128; % = 4.6
Usual care- Black Sample size	n = 164; % = 6.2
Multifactorial intervention - Other or unknown Sample size	n = 103; % = 3.7
Usual care- Other or unknown Sample size	n = 91; % = 3.4
Multifactorial intervention- Hispanic ethnic group Sample size	n = 196; % = 7
Usual care - Hispanic ethnic group Sample size	n = 211; % = 8

Outcomes

Fall-related fractures

Outcome	Multifactorial intervention, N = 2802	Usual care, N = 2649
Fractures No of events	n = 211; % = NR	n = 230; % = NR
Number of people who experienced a fracture Sample size	n = 184; % = 6.9	n = 203; % = 7.7

Serious adverse events

Outcome	Multifactorial intervention, N = 2802	Usual care, N = 2649
Death No of events	n = 235; % = 8.4	n = 220; % = 8.3
Hospitalisation No of events	n = 2344; % = NR	n = 2246; % = NR
Hospitalisation Sample size	n = 1139; % = 40.6	n = 1108; % = 41.8

Critical appraisal - Cochrane Risk of Bias tool (RoB 2.0) Cluster randomised trials

Fall-related fractures -Fractures-No of events -Multifactorial intervention-Usual care

Section	Question	Answer
Overall bias and Directness	Risk of bias judgement	High *(High risk of bias due to participants being aware of their assigned intervention)*

Section	Question	Answer
Overall bias and Directness	Overall Directness	Directly applicable *(Directly applicable)*

Serious adverse events -Death-No of Events -Multifactorial intervention-Usual care

Section	Question	Answer
Overall bias and Directness	Risk of bias judgement	High *(High risk of bias due to participants were aware of their assigned intervention)*
Overall bias and Directness	Overall Directness	Directly applicable *(Directly applicable)*

Serious adverse events -Hospitalisation-No of events -Multifactorial intervention-Usual care

Section	Question	Answer
Overall bias and Directness	Risk of bias judgement	Low *(Low risk of bias)*
Overall bias and Directness	Overall Directness	Directly applicable *(Directly applicable)*

Bruce, 2021

Bibliographic Reference	Bruce, Julie; Hossain, Anower; Lall, Ranjit; Withers, Emma J; Finnegan, Susanne; Underwood, Martin; Ji, Chen; Bojke, Chris; Longo, Roberta; Hulme, Claire; Hennings, Susie; Sheridan, Ray; Westacott, Katharine; Ralhan, Shvaita; Martin, Finbarr; Davison, John; Shaw, Fiona; Skelton, Dawn A; Treml, Jonathan; Willett, Keith; Lamb, Sarah E; Fall prevention interventions in

primary care to reduce fractures and falls in people aged 70 years and over: the PreFIT three-arm cluster RCT.; Health technology assessment (Winchester, England); 2021; vol. 25 (no. 34); 1-114

Study details

Secondary publication of another included study- see primary study for details	NA
Other publications associated with this study included in review	NA
Trial name / registration number	ISRCTN71002650
Study location	England
Study setting	Community
Study dates	September 2010 to March 2016
Sources of funding	This project was funded by the National Institute for Health Research (NIHR) Health Technology Assessment programme.
Inclusion criteria	Community-dwelling adults aged 70 years or older living as a resident in the community or in sheltered housing.
Exclusion criteria	Individuals housed in long-term residential nursing care homes and those with a terminal illness or expected shortened lifespan (defined as <6 months).

Recruitment / selection of participants	9803 participants were recruited from general practices
Intervention(s)	Exercise MFFP
Population subgroups	Age, sex, falls history, cognitive impairment, and frailty
Comparator	Advice leaflet
Number of participants	9803 participants
Duration of follow-up	18 months
Indirectness	None
Additional comments	

Study arms

Advice leaflet only (N = 3323)

Age UK Staying Steady booklet, with an emphasis on remaining steady and physically active.

Exercise (N = 2929)

Exercise intervention was entirely based on the Otago exercise program, with adaptations to the duration of the program to reflect the formulations of the NHS setting. The program consisted of strength training, balance retraining, and a walking plan. The program was home-based and individually prescribed, adapted and progressed based on ability. A menu of five strength exercises and 12 balance exercises was available, with exercises prescribed according to ability.

Multifactorial Fall Prevention (MFFP) (N = 2862)

Developed using the Tinetti MFFP model, which included an assessment and treatment of different risk factors. The assessment includes a falls history interview, screen for 'red flags' (ie suspected cardiac abnormalities, history of syncope, etc.), assess balance and gait, postural hypotension, polypharmacy, medication review, vision assessment, foot and footwear assessment, and assessment of environmental hazards.

Characteristics

Study-level characteristics

Characteristic	**Study (N = 9803)**
% Female Sample size	n = 5150; % = 52.5
Mean age (SD) Mean (SD)	77.9 (5.7)
Ethnicity Sample size	n = NA; % = NA
White Sample size	n = 9630; % = 98.2

Characteristic	Study (N = 9803)
Other Sample size	n = 94; % = 1
Missing Sample size	n = 79; % = 0.8
Comorbidities Sample size	n = NA; % = NA
None Sample size	n = 2311; % = 23.5
One or two Sample size	n = 5672; % = 57.9
Three or more Sample size	n = 1820; % = 18.6

Outcomes

Fall-related fractures

Outcome	Advice leaflet only, N = 2493	Exercise, N = 2500	Multifactorial Fall Prevention (MFFP), N = 2497
Fall-related fractures in the previous year	n = 31; % = 1.2	n = 31; % = 1.2	n = 26; % = 1

Outcome	Advice leaflet only, N = 2493	Exercise, N = 2500	Multifactorial Fall Prevention (MFFP), N = 2497
No of events			

At 18 months

Number of falls

Outcome	Advice leaflet only, N = 2493	Exercise, N = 2500	Multifactorial Fall Prevention (MFFP), N = 2497
One or more falls over 18 months No of events	n = 1276; % = 39.6	n = 1277; % = 38.9	n = 1301; % = 39.4
Two or more falls over 18 months No of events	n = 715; % = 22.2	n = 687; % = 21	n = 743; % = 22.5

Fall rate

Outcome	Multifactorial Fall Prevention (MFFP) vs Advice leaflet only, N2 = 2493, N1 = 2497	Exercise vs Advice leaflet only, N2 = 2493, N1 = 2500
Falls rate (Rate Ratio 95%CI) Custom value	1.12 (0.93 to 1.34)	0.99 (0.86 to 1.14)

Number of fallers

Outcome	Advice leaflet only, N = 2493	Exercise, N = 2500	Multifactorial Fall Prevention (MFFP), N = 2497
Number of fallers Between 12-18 months	n = 455; % = 14.1	n = 450; % = 13.7	n = 470; % = 14.3

Outcome	Advice leaflet only, N = 2493	Exercise, N = 2500	Multifactorial Fall Prevention (MFFP), N = 2497
Sample size			

Quality of life (SF-12)

Outcome	Advice leaflet only, N = 3223	Exercise, N = 3279	Multifactorial Fall Prevention (MFFP), N = 3301
SF12-PCS Custom value	49.9 (10.0)	50.4 (10.0)	49.8 (10.3)
SF-12- MCS Custom value	50.0 (9.0)	50.3 (9.1)	49.9 (9.5)

Daly, 2019

Bibliographic Reference	Daly, R.M.; Gianoudis, J.; Kersh, M.E.; Bailey, C.A.; Ebeling, P.R.; Krug, R.; Nowson, C.A.; Hill, K.; Sanders, K.M.; Effects of a 12-month supervised, community-based, multi-modal exercise program followed by a 6-month research-to-practice transition on bone mineral density, trabecular micro-architecture and physical function in older adults: A randomised controlled trial; Journal of bone and mineral research : the official journal of the American Society for Bone and Mineral Research; 2019

Study details

Secondary publication of another included study- see primary study for details	NA
Other publications associated with this	NA

study included in review	
Trial name / registration number	ACTRN12609000100291
Study location	Australia
Study setting	Community-based health and fitness facilities
Study dates	January 2009 to May 2011
Sources of funding	A grant from the JO & JR Wicking Trust, which is managed by ANZ Trustees, non-financial support from Blackmores during the conduct of the study, and grants from Fonterra Co-operative Group Ltd, outside the submitted work.
Inclusion criteria	Community-dwelling adults aged 60 years or older.
Exclusion criteria	Aged 60 years or younger, had a BMI over 40 kg/m2, reported having osteoporosis (or a recent low-trauma fracture in the past 6 months), or any other medical conditions (including taking any medications) known to influence bone metabolism or fracture risk, reported participation in structured resistance or weight-bearing impact exercise more than once a week over the past 3 months, were a current smoker, had had commenced taking vitamin D or calcium supplements in the preceding 6 months, were planning to undertake travel for >6 weeks throughout the intervention and, for women, were currently taking hormone replacement therapy (>0.625 mg/d premarin or equivalent estrogen) or had done so in the previous 6 months.
Recruitment / selection of participants	Men and women aged 60 years or older living in the Western suburbs and surrounding regions of Melbourne, Australia.
Intervention(s)	A multicomponent exercise program specific to osteoporosis and falls prevention combined with theory based behavioural support to enhance adherence and osteoporosis education to promote disease self-management. All participants received tailored programs.

Population subgroups	NA
Comparator	Usual care
Number of participants	162 participants
Duration of follow-up	18 months
Indirectness	None
Additional comments	Participants in both groups were prescribed 1000 IU of vitamin D and 700 mg of elemental calcium as calcium phosphate daily. Falls incidence, the number of participants sustaining one or more falls or multiple falls, and the time to first fall (HR= 1.15 (95%CI 0.73, 1.83) did not differ between groups

Study arms

Osteo-cise (N = 81)

A multicomponent exercise program specific to osteoporosis and falls prevention combined with theory based behavioural support to enhance adherence and osteoporosis education to promote disease self-management.

Usual care (N = 81)

Usual self-care and general consumer material from Osteoporosis Australia about osteoporosis to enable them to actively take charge of their own musculoskeletal health.

Characteristics

Study-level characteristics

Characteristic	Study (N = 162)
% Female Sample size	n = NR; % = 73
Mean age (SD) Mean (SD)	67.4 (NR)

Outcomes

Number of falls

Outcome	Osteo-cise , N = 81	Usual care, N = 81
Number of falls No of events	n = 59; % = NR	n = 53; % = NR
≥1 falls No of events	n = 37; % = 45.7	n = 35; % = 43.2
≥ 2 falls No of events	n = 15; % = 18.5	n = 10; % = 12.3

Critical appraisal - Cochrane Risk of Bias tool (RoB 2.0) Normal RCT

Number of falls -Number of falls -No of events -Osteo-cise -Usual care

Section	Question	Answer
Overall bias and Directness	Risk of bias judgement	High *(High risk of bias due to no reported baseline characteristics and participants and people delivering the intervention were aware of the assigned intervention)*
Overall bias and Directness	Overall Directness	Directly applicable *(Directly applicable)*

Number of falls -≥1falls-No of events -Osteo-cise -Usual care

Section	Question	Answer
Overall bias and Directness	Risk of bias judgement	High *(High risk of bias due to no reported baseline characteristics and participants and people delivering the intervention were aware of the assigned intervention)*
Overall bias and Directness	Overall Directness	Directly applicable *(Directly applicable)*

Number of falls -≥2falls-No of events -Osteo-cise -Usual care

Section	Question	Answer
Overall bias and Directness	Risk of bias judgement	High *(High risk of bias due to no reported baseline characteristics and participants and people delivering the intervention were aware of the assigned intervention)*

Section	Question	Answer
Overall bias and Directness	Overall Directness	Directly applicable *(Directly applicable)*

Garcia-Gomariz, 2022

Bibliographic Reference	Garcia-Gomariz, Carmen; Igual-Camacho, Celedonia; Sanchis-Sales, Enrique; Hernandez-Guillen, David; Blasco, Jose-M; Effects of Three Interventions Combining Impact or Walking at Intense Pace Training, with or without Calcium and Vitamin Supplements, to Manage Postmenopausal Women with Osteopenia and Osteoporosis.; International journal of environmental research and public health; 2022; vol. 19 (no. 18)

Study details

Secondary publication of another included study- see primary study for details	NA
Other publications associated with this study included in review	NA
Trial name / registration number	NR
Study type	Randomised controlled trial (RCT)
Study location	Spain

Study setting	Community
Study dates	Not specified
Sources of funding	No external funding
Inclusion criteria	Postmenopausal women over 55 years of age who presented with osteopenia or osteoporosis, verified with a diagnosis at the level of the femoral neck or lumbar spine (T-score < −1.0)
Exclusion criteria	Individuals with BMD values within normality
Recruitment / selection of participants	Recruited from a health centre
Intervention(s)	High impact training and Vitamin D and calcium High impact training
Population subgroups	NS
Comparator	Walked at an intense pace and calcium and Vitamin D intake
Number of participants	53 participants
Duration of follow-up	Not specified
Indirectness	None
Additional comments	

Study arms

High impact training (N = 9)

High impact training and Vitamin D and calcium (N = 16)

Walked at an intense pace and calcium and Vitamin D intake (N = 14)

Characteristics

Study-level characteristics

Characteristic	Study (N = 53)
% Female Sample size	n = 53; % = 100
Mean age (SD) Mean (SD)	NR (NR)
Exercise only Mean (SD)	60.3 (6.9)
Exercise and Vitamin D and calcium Mean (SD)	64.9 (7.1)

Characteristic	Study (N = 53)
Walking and Vitamin D and calcium Mean (SD)	59.4 (6.3)
Comorbidities Sample size	n = NR; % = NR
Rheumatoid arthritis- Exercise only Sample size	n = 0; % = NR
Rheumatoid arthritis- Exercise and Vitamin D and calcium Sample size	n = 0; % = NR
Rheumatoid arthritis- Walking and Vitamin D and calcium Sample size	n = 1; % = NR
Hyperthyroidism- Exercise only Sample size	n = 1; % = NR
Hyperthyroidism- Exercise and Vitamin D and calcium Sample size	n = 1; % = NR
Hyperthyroidism- Walking and Vitamin D and calcium Sample size	n = 3; % = NR

Outcomes

Number of fallers

Outcome	High impact training, N = 9	High impact training and Vitamin D and calcium, N = 16	Walked at an intense pace and calcium and Vitamin D intake , N = 14
Number of fallers No of events	n = 0; % = 0	n = 1; % = 6.3	n = 3; % = 21.4

Number of fractures

Outcome	High impact training, N = 9	High impact training and Vitamin D and calcium, N = 16	Walked at an intense pace and calcium and Vitamin D intake, N = 14
Participants with fractures No of events	n = 1; % = 11.1	n = 1; % = 6.3	n = 6; % = 42.9

Critical appraisal - Cochrane Risk of Bias tool (RoB 2.0) Normal RCT

Number of fallers -Number of fallers -No of events -High impact training-High impact training and Vitamin D and calcium-Walked at an intense pace and calcium and Vitamin D intake

Section	Question	Answer
Overall bias and Directness	Risk of bias judgement	High *(High risk of bias due to participants and people delivering the intervention were likely aware of the assigned intervention and no noted protocol for the trial)*
Overall bias and Directness	Overall Directness	Partially applicable *(Partially applicable)*

Number of fractures -Participants with fractures -No of events -High impact training-High impact training and Vitamin D and calcium-Walked at an intense pace and calcium and Vitamin D intake

Section	Question	Answer
Overall bias and Directness	Risk of bias judgement	High *(High risk of bias due to participants and people delivering the intervention were likely aware of the assigned intervention and no noted protocol for the trial)*
Overall bias and Directness	Overall Directness	Partially applicable *(Partially applicable)*

Grede, 2024

Bibliographic Reference	Grede, Nina; Trampisch, Ulrike; Weissbach, Sabine; Heinzel-Gutenbrunner, Monika; Freiberger, Ellen; Sonnichsen, Andreas; Donner-Banzhoff, Norbert; A volunteer-supported walking programme to improve physical function in older people with restricted mobility (the POWER Study): a randomised controlled trial.; BMC geriatrics; 2024; vol. 24 (no. 1); 60

Study details

Secondary publication of another included study- see primary study for details	
Trial name / registration number	DRKS00015188
Study type	Randomised controlled trial (RCT)

Sources of funding	This study is funded by The Federal Ministry of Education and Research. (BMBF) (grant number: 01GL1708A and 01GL1708B).
Inclusion criteria	Participants were eligible if they were≥65 years old and lacked confidence to a walk on their own, which we assessed informally. They had to have reduced physical function defined as a Short Physical Performance Battery (SPPB) score of<9.
Exclusion criteria	People were excluded if they did not give informed consent, had cognitive impairment (a Mini-Mental State Examination [MMSE] score of <18 at baseline), had severely reduced physical function so that volunteer-supported walks were not safe (an SPPB score at baseline of≤ 2 in nursing homes and ≤3 in the community setting, had excellent physical function so that benefit from the intervention was unlikely (an SPPB score of ≥10), were permanently bedridden, could only be mobilised in a wheelchair, already had regular physical activity levels estimated to be at least equivalent to the intervention, had a life expectancy of<6 months as estimated by personal physicians and/or nursing teams, had another foreseeable inability to take part in the intervention for 6 months, had known alcohol or drug addiction or a psychotic episode during the last 12 months, another person of the same household already participated in the study.
Recruitment / selection of participants	People aged ≥65 years in the community
Intervention(s)	They were visited by an assigned volunteer up to three times a week to go for a walk outside. The initial duration and speed of the walk were determined according to the participant's physical ability. The aim was to gradually increase the duration of each walk up to 50 min to meet the WHO recommendation of 150 min per week. The activity could take place indoors in case of bad weather under the supervision of the volunteer. It consisted of exercises for balance and strength based on a programme of the federal centre for health education for health education. Walking pairs of participants and volunteers received an activity diary to record the date, time, duration and type of each exercise episode (outdoors or indoors).
Population subgroups	

Comparator	The control group received to two lectures given by study staff. The lectures covered topics related to healthy ageing, such as diet or the interpretation of blood tests. We presented the topics in an easy-to-understand and entertaining manner. These lectures did not mention physical activity.
Number of participants	224
Duration of follow-up	12 months
Indirectness	None
Additional comments	

Study arms

Walking group (N = 114)

Control group (N = 110)

Characteristics

Arm-level characteristics

Characteristic	Walking group (N = 114)	Control group (N = 110)
% Female	80.7	78.2

Characteristic	Walking group (N = 114)	Control group (N = 110)
Nominal		
Mean age (SD) Median (IQR)	84 (80 to 90)	85 (79 to 90)

Outcomes

Study timepoints

12 month

Dichotomous outcomes

Outcome	Walking group, 12 month, N = 84	Control group, 12 month, N = 83
Number of fallers Nominal	18	19

Narrative outcome

Outcome	Walking group, 12 month, N = 85	Control group, 12 month, N = 82
EQ5D 5L VAS (Median (IQR)) Median (IQR)	54 (50 to 75)	50 (47.5 to 72.5)

Critical appraisal - Cochrane Risk of Bias tool (RoB 2.0) Normal RCT

Dichotomousoutcomes-Numberoffallers-Nominal-Walking group-Control group-t12

Section	Question	Answer
Overall bias and Directness	Risk of bias judgement	Some concerns *(due to missingness of participants)*
Overall bias and Directness	Overall Directness	Directly applicable

Narrativeoutcome-EQ5D5LVAS-MedianIQR-Walking group-Control group-t12

Section	Question	Answer
Overall bias and Directness	Risk of bias judgement	Some concerns *(due to missingness of participants)*
Overall bias and Directness	Overall Directness	Directly applicable

Guerra, 2021

Bibliographic Reference	Guerra, Francisca Valuzia Guedes; Moreira, Rafaella Pessoa; de Oliveira Ferreira, Glauciano; Felicio, Janiel Ferreira; Cavalcante, Tahissa Frota; de Araujo, Thelma Leite; de Araujo, Marcio Flavio Moura; Effectiveness of the fall prevention intervention in older adults with arterial hypertension: randomized clinical trial.; Geriatric nursing (New York, N.Y.); 2021; vol. 42 (no. 1); 27-32

Study details

Secondary publication of another included study- see primary study for details	NA
Other publications associated with this study included in review	NA
Trial name / registration number	NS
Study location	Brazil
Study setting	Community
Study dates	April 2019 to January 2020
Sources of funding	This work was supported by the Brazilian Council for Scientific and Technological Development [grant No. 408460 / 2016-4].
Inclusion criteria	Participants between the ages of 65 and 75 years with hypertension presence of the nursing diagnosis, have a risk for falls, and living with at least one partner or family member.
Exclusion criteria	Potential participants with diabetes mellitus or with mental disorders after the review of medical records and/or reports.
Recruitment / selection of participants	Recruited from two primary health care facilities.

Intervention(s)	Nursing intervention Fall prevention
Population subgroups	NA
Comparator	Control group received routine instructions provided in primary healthcare services.
Number of participants	175 participants
Duration of follow-up	3 months.
Indirectness	None

Study arms

Nursing intervention fall prevention (N = 62)

Guidelines for the modification of environmental and behavioural risk factors for falls.

Control group (N = 62)

Characteristics

Study-level characteristics

Characteristic	Study (N = 175)
% Female	n = 79; % = 66.9

Characteristic	Study (N = 175)
Sample size	
Ethnicity Sample size	n = NA; % = NA
White Sample size	n = 22; % = 18.6
Black Sample size	n = 96; % = 81.4

Outcomes

Number of falls

Outcome	Nursing intervention fall prevention, N = 62	Control group, N = 62
Number of falls No of events	n = 4; % = 6.9	n = 12; % = 20

Critical appraisal - Cochrane Risk of Bias tool (RoB 2.0) Normal RCT

Number of falls -Number of falls -No of events -Nursing intervention fall prevention-Control group

Section	Question	Answer
Overall bias and Directness	Risk of bias judgement	High *(High risk of bias due to participants and people delivering the intervention were likely aware of the assigned intervention, no pre-specified protocol, and the self-reported nature of the outcome.)*
Overall bias and Directness	Overall Directness	Directly applicable *(Directly applicable)*

Hager, 2024

Bibliographic Reference	Hager, Anne-Gabrielle Mittaz; Mathieu, Nicolas; Carrard, Sophie; Bridel, Alice; Wapp, Christina; Hilfiker, Roger; Partially supervised exercise programmes for fall prevention improve physical performance of older people at risk of falling: a three-armed multi-centre randomised controlled trial.; BMC geriatrics; 2024; vol. 24 (no. 1); 311

Study details

Trial name / registration number	NCT02926105
Study location	Switzerland
Study setting	Community
Study dates	Between August 2016 and November 2020, 859 potential participants were screened against eligibility criteria Published 2024
Sources of funding	This study was funded by the Leenaards Foundation in Lausanne (Switzer- land), the University of Applied Sciences and Arts Western Switzerland, the University of Applied Sciences and Arts Valais-Wallis, by the Promotion Santé Suisse Foundation and by the Swiss Association of Physiotherapy.

Inclusion criteria	Inclusion criteria: ≥65 years, living independently at home, able to walk without mobility aids in their home, with a history of falls in the previous 12 months or of perceiving fear of falling (score≥20 on the Fall Efficacy Scale-International [12]), and good understanding of French or German.
Exclusion criteria	Participants were excluded in case of: severe vision impairments that did not permit reading the booklet/tablet or completing the monthly diaries; undergoing physical therapy that included balance training; having cognitive impairments assessed with a score<24 points on the Mini-Mental State Examination scale; or if participation was contraindicated by the treating physician.
Intervention(s)	<u>Balance and strength training programme</u> - 'Test-and-Exercise programme' is an individualised, partially supervised, home-based balance and strength training programme delivered by a trained physical therapist. It contains 50 physical tasks grouped under 14 topics related to home objects or activities. Each topic contains three or four tasks, ranked by increasing difficulty. Unlike most home-based programmes, the physical therapists do not prescribe exercises, but help and coach the participant to build their own exercise programme while ensuring safety and security. The participants choose the tasks they want to perform, perform them once as a “test”, and evaluate the perceived difficulty on a five-level scale. Tasks that are evaluated as "very difficult" or "too difficult" are not included in their programme. The training focuses on: (i) encouragement of autonomy of the participant; (ii) the significance of evaluation of the perceived difficulty; (iii) coaching by the physical therapist; (iv) stimulation for adherence to exercises; not too many exercises at one session, but regularly; (v) the safety of the environment. Participants received a manual, including photographs and task descriptions, a set of cards representing each exercise with difficulty evaluation grids, and a digital tablet containing the programme application. <u>Multiple exercise programme</u> - 'Reference programme': The Otago exercise programme (strength, balance and walking) is an individualised, partially supervised, home-based balance and strength training programme delivered by a trained physical therapist. The programme contains 22 exercises with two to four levels of difficulty: five warm-up exercises, five exercises for muscle strengthening of the lower limbs, and 12 exercises for balance training. Physical therapists propose and adapt the level of the exercises over time. Participants received the manual, including photographs and descriptions of all exercises and cuff weights for strength training exercises.
Comparator	Control group: Self-administered 'Going Safely' exercise programme, contains a booklet with safety advice and 12 exercise cards, comprising five exercises to be performed in a sitting position, six exercises to be performed in a standing position, and one stand-up exercise. Participants received the booklet at a single physical therapy session.

Number of participants	405
Duration of follow-up	12 months
Indirectness	None
Additional comments	

Study arms

Balance and strength training (N = 166)

Experimental group

Multiple categories of exercise (N = 158)

Reference group

Control group (N = 81)

Characteristics

Arm-level characteristics

Characteristic	Balance and strength training (N = 166)	Multiple categories of exercise (N = 158)	Control group (N = 81)
% Female	74	72	74

Characteristic	Balance and strength training (N = 166)	Multiple categories of exercise (N = 158)	Control group (N = 81)
Nominal			
Mean age (SD) Mean (SD)	79 (7)	79 (6.6)	80 (7.6)

Outcomes

Study timepoints

12 month

Adjusted incidence fall rate ratio

Outcome	Balance and strength training vs Control group, 12 month, N2 = 73, N1 = 156	Balance and strength training vs Multiple categories of exercise, 12 month, N2 = 145, N1 = 156
IRR of falls (Adjusted IRR) Adjusted for the stratifcation variables: risk category (moderate or high), urban or rural region, age greater or lower than 80 years Mean (95% CI)	1.71 (0.98 to 2.99)	0.74 (0.49 to 1.12)

Critical appraisal - Cochrane Risk of Bias tool (RoB 2.0) Normal RCT

Adjustedincidencefallrateratio-IRRoffalls-MeanNineFivePercentCI-Balance and strength training-Multiple categories of exercise-Control group-t12

Section	Question	Answer
Overall bias and Directness	Risk of bias judgement	Low
Overall bias and Directness	Overall Directness	Directly applicable

Hentschke, 2021

Bibliographic Reference	Hentschke, Christian; Halle, Martin; Geilhof, Barbara; Landendoerfer, Peter; Blank, Wolfgang; Sieber, Cornel Christian; Siegrist, Monika; Freiberger, Ellen; 24-Months Cluster-Randomized Intervention Trial of a Targeted Fall Prevention Program in a Primary Care Setting.; Journal of general internal medicine; 2021

Study details

Secondary publication of another included study- see primary study for details	NA
Other publications associated with this study included in review	NA

Trial name / registration number	NR
Study location	Germany
Study setting	Community
Study dates	NR
Sources of funding	Open Access funding enabled and organized by Projekt DEAL. This work has been funded by a grant from the Bavarian State Ministry of the Environment and Public Health
Inclusion criteria	Community-dwelling adults aged 65 years or older, and 1 or more fall risk criterion, (≥1 fall in the past 12 months, Timed-up-and-Go-Test or Chair-Stand-Test >10 s, subjective or objective balance deficits or fear of falling).
Exclusion criteria	Dependence or suffering from physical or mental restrictions that did not allow the participation in an exercise program or the assessment of risk of falling
Recruitment / selection of participants	Participants were recruited through GP practices
Intervention(s)	Complex exercise program- A combination of supervised and unsupervised sessions (16 sessions, once per week for 60 minutes). The multicomponent exercise intervention included progressive strength, challenge balance and gait training, behavioural aspects, self-management program, and perceptual functional training conducted by a trained fall prevention instructor.
Population subgroups	NA
Comparator	No intervention

Number of participants	378 participants
Duration of follow-up	24 months
Indirectness	None

Study arms

Complex exercise intervention (N = 222)

A combination of supervised and unsupervised sessions (16 sessions, once per week for 60 minutes). The multicomponent exercise intervention included progressive strength, challenge balance and gait training, behavioural aspects, self-management program, and perceptual functional training conducted by a trained fall prevention instructor.

Control group (N = 156)

No intervention

Characteristics

Study-level characteristics

Characteristic	Study (N = 378)
% Female Sample size	n = NR; % = NR
Intervention group	n = 172; % = NR

Characteristic	Study (N = 378)
Sample size	
Control group Sample size	n = 113; % = NR
Mean age (SD) Mean (SD)	NR (NR)
Intervention group Mean (SD)	77.9 (5.9)
Control group Mean (SD)	78.3 (5.9)

Outcomes

Number of falls

Outcome	Complex exercise intervention, N = 222	Control group, N = 156
Number of falls Custom value	517	588
Fall rate IRR (95%CI)	0.63 (0.44 to 0.94)	NA

Outcome	Complex exercise intervention, N = 222	Control group, N = 156
Custom value		

Number of fallers

Outcome	Complex exercise intervention, N = 212	Control group, N = 144
Number of fallers Sample size	n = 80; % = 45.28	n = 96; % = 55.56

Critical appraisal - Cochrane Risk of Bias tool (RoB 2.0) Cluster randomised trials

Number of falls -Fallrate-Complex exercise intervention-Control group

Section	Question	Answer
Overall bias and Directness	Risk of bias judgement	High *(High risk of bias due to participants and people delivering the intervention were likely aware of the assigned intervention and limited information regarding outcome assessors)*
Overall bias and Directness	Overall Directness	Directly applicable *(Directly applicable)*

Number of falls -Number of falls -Complex exercise intervention-Control group

Section	Question	Answer
Overall bias and Directness	Risk of bias judgement	High *(High risk of bias due to participants and people delivering the intervention were likely aware of the assigned intervention and limited information regarding outcome assessors)*

Section	Question	Answer
Overall bias and Directness	Overall Directness	Directly applicable *(Directly applicable)*

Lipardo, 2020

Bibliographic Reference	Lipardo, Donald S; Tsang, William Wn; Effects of combined physical and cognitive training on fall prevention and risk reduction in older persons with mild cognitive impairment: a randomized controlled study.; Clinical rehabilitation; 2020; vol. 34 (no. 6); 773-782

Study details

Secondary publication of another included study- see primary study for details	Not reported
Other publications associated with this study included in review	Not reported
Trial name / registration number	NCT03167840
Study location	Hong Kong
Study setting	Community setting
Study dates	May 2017 - August 2018

Sources of funding	Research studentship scholarship-Associated Money of the Hong Kong Polytechnic University
Inclusion criteria	Aged 60 years and over Mild cognitive impairment Able to ambulate with or without assistive devices
Exclusion criteria	Not reported
Recruitment / selection of participants	Recruited by trained personnel through the help of the Office of Senior Citizens Affairs. Diagnosis of mild cognitive impairment was determined by a trained neurologist-psychiatrist.
Intervention(s)	Cognitive training: Paper-based cognitive exercises on executive function, memory, attention, and orientation training. Group sessions were 60-90 minutes long and occurred once a week for 12 weeks. The programme was delivered by occupational therapists with at least 2 years of clinical experience.
Population subgroups	None reported
Comparator	Waitlist control
Number of participants	Cognitive training: n=23 Waitlist control: n=23
Duration of follow-up	36 weeks
Indirectness	None

Study arms

Cognitive training (N = 23)

Waitlist Control (N = 23)

Characteristics

Arm-level characteristics

Characteristic	Cognitive training (N = 23)	Waitlist Control (N = 23)
% Female Nominal	18	17
Mean age (SD) Mean (SD)	68 (7.5)	68 (8.5)

Outcomes

Outcomes

Outcome	Cognitive training, N = 23	Waitlist Control, N = 23
Number of falls No of events	n = 7; % = NR	n = 6; % = NR

Critical appraisal - Cochrane Risk of Bias tool (RoB 2.0) Normal RCT

Outcomes-Number of falls -No of events -Cognitive training-Waitlist Control

Section	Question	Answer
Overall bias and Directness	Risk of bias judgement	Some concerns *(Some concerns due to lack of blinding)*
Overall bias and Directness	Overall Directness	Directly applicable

Marrocco, 2023

Bibliographic Reference	Marrocco, Walter; Galli, Antonella; Scotti, Silvestro; Calabrese, Nicola; Misericordia, Paolo; Dalle Vedove, Alessandro; Marrocco, Gianmarco; D'Ingianna, Antonio Pio; Pizzini, Andrea; Fini, Massimo; Tomino, Carlo; Bonassi, Stefano; On Behalf Of The F I M M G Research Premio, Group; A Multicomponent Primary-Care Intervention for Preventing Falls in Older Adults Living in the Community: The PREMIO Study.; Journal of clinical medicine; 2023; vol. 12 (no. 22)

Study details

Trial name / registration number	
Study type	Randomised controlled trial (RCT)
Study location	Switzerland
Study setting	
Study dates	2023

Sources of funding	No external funding
Inclusion criteria	Inclusion criteria required the presence of at least five of the following fall risk factors: history of previous falls, fear of falling, polypharmacy (≥5 medications), treatment with medications that increase the risk of falling, impaired mobility, altered vision, social isolation, major cerebral- or cardiovascular disease, difficulty extending the knees, mental confusion, creatinine clearance < 65 mL/min and arthritis and/or arthrosis. The five-factor threshold was arbitrarily defined as a reliable compromise for sample enrichment that was helpful in identifying a population who were at high risk for falls but also fit enough to actively participate in a low-intensity program of physical activity. Other inclusion criteria were age ≥ 65 years, living at home regularly and signing the informed consent.
Exclusion criteria	Individuals with a life expectancy of <1 year; those with Parkinson’s disease, epilepsy or depression (under antidepressant treatment); bedridden patients and, in general, all subjects with serious psychophysical conditions that prevented their participation in the study were excluded from the selection procedures.
Recruitment / selection of participants	The first 20 consecutive patients who met the inclusion criteria and agreed to participate in the study were recruited by their respective GPs during clinic or home visits
Intervention(s)	The intervention plan was multicomponent and included the following: medical review of treatments, with the aim of limiting medications that increase the risk of falling, recommendation of 1–2 daily training sessions with gentle physical exercise (5 min of stationary exercise plus 5 min of slow walking and 5 min of fast walking, gradually increasing up to 30 min, followed by 5 min of slow walking, inspection of patients’ homes, followed by recommendations of home modifications to reduce structural hazards (e.g., installing a handrail on stairs or equipping the shower stall or bathtub with non-slip mats, dietary modification recommendations and a falls diary.
Comparator	Dietary modification recommendations and a falls diary
Number of participants	
Duration of follow-up	12 months

Study arms

Multicomponent intervention (N = 875)

Medication review, exercise and home assessment for modifications

Control group (N = 882)

Characteristics

Arm-level characteristics

Characteristic	Multicomponent intervention (N = 875)	Control group (N = 882)
% Female Nominal	23.2	24
Mean age (SD) Mean (SD)	59.3 (4.4)	59.4 (4.4)

Outcomes

Study timepoints

12-month

Dichotomous outcomes

Outcome	Multicomponent intervention, 12-month, N = 603	Control group, 12 month, N = 622
Mean number falls used to calculate rate of falls Mean (SD)	0.94 (2.2)	1.27 (0.94)
Number of fallers Nominal	158	179
Fall related fracture Nominal	23	10
Hospital/emergency room admission Nominal	70	87
Visit to GP clinic (medical attention) Nominal	136	154

Critical appraisal - Cochrane Risk of Bias tool (RoB 2.0) Normal RCT

Dichotomous outcomes-Mean number falls-Mean SD -Multicomponent Intervention-Control group-t12

Section	Question	Answer
Overall bias and Directness	Risk of bias judgement	High *(Attrition)*
Overall bias and Directness	Overall Directness	Directly applicable

Dichotomousoutcomes-Number of fallers -Nominal-Multicomponent intervention-Control group-t12

Section	Question	Answer
Overall bias and Directness	Risk of bias judgement	High *(Attrition)*
Overall bias and Directness	Overall Directness	Directly applicable

Dichotomous outcomes-Fall related fracture-Nominal-Multicomponent Intervention-Control group-t12

Section	Question	Answer
Overall bias and Directness	Risk of bias judgement	High *(Attrition)*
Overall bias and Directness	Overall Directness	Directly applicable

Dichotomousoutcomes-Hospital/emergencyroomadmission-Nominal-Multicomponent Intervention-Control group-t12

Section	Question	Answer
Overall bias and Directness	Risk of bias judgement	High *(Attrition)*
Overall bias and Directness	Overall Directness	Directly applicable

Dichotomous outcomes-VisittoGPclinic(medicalattention)-Nominal-Multicomponent Intervention-Control group-t12

Section	Question	Answer
Overall bias and Directness	Risk of bias judgement	High *(Attrition)*
Overall bias and Directness	Overall Directness	Directly applicable

Oliveira, 2019

Bibliographic Reference	Oliveira, Juliana S; Sherrington, Catherine; Paul, Serene S; Ramsay, Elisabeth; Chamberlain, Kathryn; Kirkham, Catherine; O'Rourke, Sandra D; Hassett, Leanne; Tiedemann, Anne; A combined physical activity and fall prevention intervention improved mobility-related goal attainment but not physical activity in older adults: a randomised trial.; Journal of physiotherapy; 2019; vol. 65 (no. 1); 16-22

Study details

Secondary publication of another included	NA

study- see primary study for details	
Other publications associated with this study included in review	NA
Trial name / registration number	ACTRN12614000016639
Study location	Australia
Study setting	Community
Study dates	January 2014 to August 2016
Sources of funding	A research bequest in addition to a Marrickville Council Community Grant and funding from the NSW Office of Communities, Sport and Recreation Participation and Facility Program
Inclusion criteria	Community-dwelling adults aged 60 years or older, living at home, regular weekly users of the Internet via a computer or tablet device, and regularly able to leave the house without physical assistance from another person
Exclusion criteria	Housebound (not having gone outside without physical assistance from another person in the last month), had a cognitive impairment, and had insufficient English language skills to fully participate in the program, had a progressive neurological disease, had a medical condition precluding exercise, were already meeting the Australian Physical Activity Guidelines for older adults, or already had a fall risk assessment in the past year (since they may have already been receiving a fall prevention intervention).
Recruitment / selection of participants	Participants were recruited via community-based newspaper advertisements, council websites, and newsletters/mailing lists of established organisations for older people

Intervention(s)	Received a 2-hour home visit by a physiotherapist, including a face-to-face health coaching session, setting two mobility-related goals, receiving and setting up a pedometer, undergoing a fall risk assessment, tailored advice, and a fall prevention advice brochure
Population subgroups	NA
Comparator	Fall prevention brochure and usual activities
Number of participants	131 participants
Duration of follow-up	12 months
Indirectness	None

Study arms

Intervention group (N = 64)

Received a 2-hour home visit by a physiotherapist, including a face-to-face health coaching session, setting two mobility-related goals, receiving and setting up a pedometer, undergoing a fall risk assessment, tailored advice, and a fall prevention advice brochure

Control group (N = 67)

Fall prevention brochure and usual activities

Characteristics

Study-level characteristics

Characteristic	Study (N = 131)
% Female Sample size	n = NR; % = NR
Intervention group Sample size	n = 43; % = 67
Control group Sample size	n = 50; % = 75
Mean age (SD) Mean (SD)	NR (NR)
Intervention group Mean (SD)	71 (6)
Control group Mean (SD)	72 (7)

Outcomes

Number of falls

Outcome	Intervention group, N = 64	Control group, N = 67
Number of falls	n = 57; % = NR	n = 52; % = NR

Outcome	Intervention group, N = 64	Control group, N = 67
No of events		
Fall rate IRR (95%CI) Custom value	IRR 1.0 (0.7 to 2.2)	NA

Adverse events

Outcome	Intervention group, N = 64	Control group, N = 67
Low back pain No of events	n = 2; % = NR	n = NR; % = NR
Hip pain No of events	n = 1; % = NR	n = NR; % = NR
Calf pain No of events	n = 1; % = NR	n = NR; % = NR
Tightness in the chest No of events	n = 1; % = NR	n = NR; % = NR

EQ-5D-3L

Outcome	Intervention group, N = 46	Control group, N = 52
EQ-5D-3L 12 months Custom value	0.8 (0.1)	0.8 (0.1)

Critical appraisal - Cochrane Risk of Bias tool (RoB 2.0) Normal RCT

EQ-5D-3L-EQ-5D-3L-Intervention Group-Control group

Section	Question	Answer
Overall bias and Directness	Risk of bias judgement	High *(High risk of bias due to participants and people delivering the intervention were aware of the intervention, issues with adherence, and missing data)*
Overall bias and Directness	Overall Directness	Directly applicable *(Directly applicable)*

Adverse events-Tightness in the chest-No of events -Intervention Group-Control group

Section	Question	Answer
Overall bias and Directness	Risk of bias judgement	High *(High risk of bias due to participants and people delivering the intervention were aware of the intervention, issues with adherence, and missing data)*

Section	Question	Answer
Overall bias and Directness	Overall Directness	Directly applicable *(Directly applicable)*

Adverse events-Calf Pain-No of events -Intervention group-Control group

Section	Question	Answer
Overall bias and Directness	Risk of bias judgement	High *(High risk of bias due to participants and people delivering the intervention were aware of the intervention, issues with adherence, and missing data)*
Overall bias and Directness	Overall Directness	Directly applicable *(Directly applicable)*

Adverse events-Hip pain-No of events -Intervention group-Control group

Section	Question	Answer
Overall bias and Directness	Risk of bias judgement	High *(High risk of bias due to participants and people delivering the intervention were aware of the intervention, issues with adherence, and missing data)*
Overall bias and Directness	Overall Directness	Directly applicable *(Directly applicable)*

Adverse events-Low back pain-No of events -Intervention Group-Control group

Section	Question	Answer
Overall bias and Directness	Risk of bias judgement	High *(High risk of bias due to participants and people delivering the intervention were aware of the intervention, issues with adherence, and missing data)*
Overall bias and Directness	Overall Directness	Directly applicable *(Directly applicable)*

Number of falls -Fallrate-Intervention Group-Control group

Section	Question	Answer
Overall bias and Directness	Risk of bias judgement	High *(High risk of bias due to participants and people delivering the intervention were aware of the intervention, issues with adherence, and missing data)*
Overall bias and Directness	Overall Directness	Directly applicable *(Directly applicable)*

Oliveira, 2024

Bibliographic Reference	Oliveira, Juliana S; Sherrington, Catherine; Rissel, Chris; Howard, Kirsten; Tong, Allison; Merom, Dafna; Wickham, James; Bauman, Adrian E; Lord, Stephen R; Lindley, Richard I; Simpson, Judy M; Allman-Farinelli, Margaret; Kirkham, Catherine; Ramsay, Elisabeth; O'Rourke, Sandra; Tiedemann, Anne; Effect of a coaching intervention to enhance physical activity and prevent falls in community-dwelling people aged 60+ years: a cluster randomised controlled trial.; British journal of sports medicine; 2024; vol. 58 (no. 7); 382-391

Study details

Trial name / registration number	ACTRN12615001190594
Study type	Cluster randomised controlled trial
Study location	Australia
Study setting	Community
Study dates	Published 2024
Sources of funding	This trial is funded by the National Health and Medical Research Council of Australia (APP1083495). Authors ATi, ATo, SRL and CS receive salary funding from National Health and Medical Research Council of Australia Fellowships
Inclusion criteria	Community-based organisations including members predominantly aged 60+ years and held meetings or events at least once every 2months. Group members were potentially eligible for the trial if they: were 60+ years, were living in a private dwelling or retirement village, regularly attended meetings (at least once every 2 months) or other activities at the participating community group.
Exclusion criteria	People were excluded from participation if they: self-reported undertaking 30min of moderate-to-vigorous-intensity physical activity at least 5 days per week, had a fall risk assessment and intervention programme in the past year, had a diagnosis of dementia or a cognitive impairment assessed by Memory Impairment Screen51 (score <5), had insufficient English language skills to fully participate in the programme, had a progressive neurological disease, had a medical condition precluding exercise participation, were unable to leave the house without physical assistance from another person.
Recruitment / selection of participants	Recruited community-living people from metropolitan Sydney and the regional Orange community (New South Wales (NSW), Australia) via direct contact with established community-based organisations
Intervention(s)	Balance and strength training: participants received written information, fall risk assessment and prevention advice by a physiotherapist involving recommendations on strength and balance exercises and guidance related to the results of a QuickScreen fall assessment, specifically addressing aspects such as vision, peripheral sensation and medications.

	Additionally, it included home safety tips to prevent falls, activity tracker and telephone-based coaching from a physiotherapist focused on safe physical activity. Participants received up to 19 sessions of telephone coaching over 12 months.
Comparator	Control group received 12-month nutrition programme with a booklet about healthy nutrition and access to telephone-based health coaching focused on healthy eating. Participants received up to 19 sessions of telephone coaching over 12 months.
Number of participants	72 clusters with 605 participants in total
Duration of follow-up	12 months
Indirectness	None

Study arms

Balance and strength training (N = 209)

CHAnGE programme

Control group (N = 315)

healthy eating programme

Characteristics

Arm-level characteristics

Characteristic	Balance and strength training (N = 209)	Control group (N = 315)
% Female Nominal	71	70
Mean age (SD) Mean (SD)	74 (7.5)	75 (8.5)

Outcomes

Study timepoints

12 month

dichotomous outcomes

Outcome	Balance and strength training, 12 month, N = 280	Control group, 12 month, N = 304
number of people with atleast 1 fall Nominal	73	65
Rate of falls IRR (95% CI) Nominal	0.86 (0.65, 1.14)	

Continuous outcomes

Outcome	Balance and strength training, 12 month, N = 257	Control group, 12 month, N = 252
EQ5D 5L VAS Mean (SE)	84.2 (14.52)	81.65 (15.31)

Critical appraisal - Cochrane Risk of Bias tool (RoB 2.0) Cluster randomised trials

dichotomousoutcomes-numberofpeoplewithatleast1fall-Nominal-Balance and strength training-Control group-t12

Section	Question	Answer
Overall bias and Directness	Risk of bias judgement	Low
Overall bias and Directness	Overall Directness	Directly applicable

Continuousoutcomes-EQ5D5LVAS-MeanSE-Balance and strength training-Control group-t12

Section	Question	Answer
Overall bias and Directness	Risk of bias judgement	Low
Overall bias and Directness	Overall Directness	Directly applicable

dichotomousoutcomes-Numberoffalls-Nominal-Balance and strength training-Control group-t12

Section	Question	Answer
Overall bias and Directness	Risk of bias judgement	Low
Overall bias and Directness	Overall Directness	Directly applicable

Rikkonen, 2023

Bibliographic Reference	**Rikkonen, Toni; Sund, Reijo; Koivumaa-Honkanen, Heli; Sirola, Joonas; Honkanen, Risto; Kroger, Heikki; Effectiveness of exercise on fall prevention in community-dwelling older adults: a 2-year randomized controlled study of 914 women.; Age and ageing; 2023; vol. 52 (no. 4)**

Study details

Trial name / registration number	NCT02665169
Study type	Randomised controlled trial (RCT)
Study location	Finland
Study setting	Community
Study dates	Recruitment January-March 2016 Randomisation March 2016 to April 2017 Published 2023

Sources of funding	The work was supported by the Juho Vainio Foundation, the Ministry of Education and Culture, the Academy of Finland (Grant No. 310831/2017) and the KUH Research Fund (to V.T.R.).
Inclusion criteria	Home dwelling women living within a 10-km radium of the city centre
Exclusion criteria	Self-reported unstable angina pectoris, severe pulmonary disease, at least moderate dementia, or being non-ambulatory.
Recruitment / selection of participants	All the participants living in Kuopio urban area, born between 1932 and 1945, were invited through mass mailings using their home addresses.
Intervention(s)	The women randomized to exercise intervention were allocated to 27 groups, each including 15–18 attendees. Same groups were maintained in both Tai Chi and gym sessions. The intervention groups were provided with a personal electronic access card for free access to all the city exercise premises including swimming halls, gyms and other sports premises administered by the municipality for the first 12 months. In addition to free use of premises, supervised exercise intervention was carried out during the first 6 months, aiming to improve muscle strength focusing on lower limbs, postural balance, active range of motion and joint mobility. The protocol included a 1-hour circuit type gym session and a 1-hour Tai Chi session each week, with a warm-up and 50 minutes of training. The adherence was measured by women's participation to supervised sessions, based on logging data of the access cards. Group exercises were discontinued after the initial 6 months. However, women who wanted to continue gym training or Tai Chi at their own expense were not restricted from doing so.
Comparator	The control group received education on fall prevention at the baseline visit and was free to pursue their personal activities as before.
Number of participants	914
Duration of follow-up	24 months
Indirectness	None

Additional comments	

Study arms

Multiple categories of exercise (N = 457)

Control group (N = 457)

Characteristics

Arm-level characteristics

Characteristic	Multiple categories of exercise (N = 457)	Control group (N = 457)
% Female Nominal	100	100
Mean age (SD) Mean (SD)	76.4 (3.3)	76.6 (3.2)

Outcomes

Study timepoints

24 month

Dichotomous data

Outcome	Multiple categories of exercise, 24 month, N = 457	Control group, 24 month, N = 457
Number of fallers Nominal	268	278
Number of fractures Nominal	28	45
Total falls Nominal	641	739

Critical appraisal - Cochrane Risk of Bias tool (RoB 2.0) Normal RCT

Dichotomousdata-Numberoffallers-Nominal-Multiple categories of exercise-Control group-t24

Section	Question	Answer
Overall bias and Directness	Risk of bias judgement	Low
Overall bias and Directness	Overall Directness	Directly applicable

Dichotomousdata-Numberoffractures-Nominal-Multiple categories of exercise-Control group-t24

Section	Question	Answer
Overall bias and Directness	Risk of bias judgement	Low
Overall bias and Directness	Overall Directness	Directly applicable

Dichotomousdata-Totalfalls-Nominal-Multiple categories of exercise-Control group-t24

Section	Question	Answer
Overall bias and Directness	Risk of bias judgement	Low
Overall bias and Directness	Overall Directness	Directly applicable

Rosado, 2021

Bibliographic Reference	Rosado, Hugo; Bravo, Jorge; Raimundo, Armando; Carvalho, Joana; Marmeleira, Jose; Pereira, Catarina; Effects of two 24-week multimodal exercise programs on reaction time, mobility, and dual-task performance in community-dwelling older adults at risk of falling: a randomized controlled trial.; BMC public health; 2021; vol. 21 (no. suppl2); 408

Study details

Secondary publication of another included study- see primary study for details	NA

Other publications associated with this study included in review	NA
Trial name / registration number	(NCT03446352)
Study location	Portugal
Study setting	Community
Study dates	March 2018 to January 2019
Sources of funding	This study was supported by the European Fund for regional development through Horizon 2020 - Portugal 2020 - Programa Operacional Regional do Alentejo (ALT20-03-0145-FEDER-000007) with respect to the “Ageing Safety in Alentejo - Understanding for action (ESACA)”. Hugo Rosado holds an “Fundação para a Ciência e a Tecnologia” doctoral fellowship (SFRH/BD/ 147398/2019.
Inclusion criteria	Male or female community-dwelling older adults aged 65 years or older, had a moderate or high level of physical independence (≥ 18 points), as assessed by the 12-item Composite Physical Function (CPF) scale, and reported at least one fall in the previous 6 months or were at high risk of falling (a score of ≤25 points on the Fullerton Advanced Balance Scale).
Exclusion criteria	Cognitive impairment as assessed by the Mini Mental State Examination (MMSE ≤22 points), the presence of motor impairment compromising program participation, a musculoskeletal condition (diagnosis of severe osteoporosis [index T ≤ −2.5], lower limb fracture <4 months ago, hip or knee prostheses), a cardiovascular condition a neurological condition (epilepsy or loss of consciousness leading to a fall), tumours or metastases, and participation in a structured exercise program in the previous 6 months
Recruitment / selection of participants	Older adults were recruited via pamphlets distributed in strategic locations and verbal communication at recreational and senior centres.

Intervention(s)	Psychomotor intervention program Combined exercise and psychomotor intervention program
Population subgroups	NA
Comparator	Control group- usual daily activities
Number of participants	56 participants
Duration of follow-up	12 weeks
Indirectness	None

Study arms

Psychomotor intervention program (N = 18)

A therapy that uses the body and movement as intervention mediators to optimize cognitive, motor, and relational competences of psychomotor functioning.

Combined exercise and psychomotor intervention program (N = 19)

Usual daily activities (N = 19)

Usual daily activities

Characteristics

Study-level characteristics

Characteristic	Study (N = 56)
% Female Sample size	n = NR; % = NR
Psychomotor intervention program Sample size	n = 14; % = 87.5
Combined exercise and psychomotor intervention program Sample size	n = 15; % = 93.8
Usual daily activities Sample size	n = 13; % = 68.4
Psychomotor intervention program Mean (SD)	74.3 (5.4)
Combined exercise and psychomotor intervention program Mean (SD)	74.7 (5.5)
Usual daily activities Mean (SD)	76.8 (5.8)

Outcomes

Number of falls

Outcome	Psychomotor intervention program, N = 18	Combined exercise and psychomotor intervention program, N = 19	Usual daily activities, N = 19
Number of falls Custom value	0.63 ±0.7	0.44 ±0.7	0.95 ±1

Critical appraisal - Cochrane Risk of Bias tool (RoB 2.0) Normal RCT

Number of falls -Number of falls -Psychomotor intervention program-Combined exercise and psychomotor intervention program -Usual daily activities

Section	Question	Answer
Overall bias and Directness	Risk of bias judgement	High *(High risk of bias due to participants and people delivering the intervention were likely aware of the assigned intervention)*
Overall bias and Directness	Overall Directness	Directly applicable *(Directly applicable)*

Stathi, 2022

Bibliographic Reference	Stathi, Afroditi; Greaves, Colin J; Thompson, Janice L; Withall, Janet; Ladlow, Peter; Taylor, Gordon; Medina-Lara, Antonieta; Snowsill, Tristan; Gray, Selena; Green, Colin; Johansen-Berg, Heidi; Sexton, Claire E; Bilzon, James L J; deKoning, Jolanthe; Bollen, Jessica C; Moorlock, Sarah J; Western, Max J; Demnitz, Naiara; Seager, Poppy; Guralnik, Jack M; Rejeski, W Jack; Hillsdon, Melvyn; Fox, Kenneth R; Effect of a physical activity and behaviour maintenance programme on functional mobility decline in older adults: the REACT (Retirement in Action) randomised controlled trial.; The Lancet. Public health; 2022; vol. 7 (no. 4); e316-e326

Study details

Secondary publication of another included study- see primary study for details	NA
Other publications associated with this study included in review	NA
Trial name / registration number	REACT/ ISRCTN45627165
Study location	United Kingdom
Study setting	Primary care practices within urban and semi-rural locations (Bath and Bristol, Birmingham and Devon)
Study dates	11 March 2016 to 28 October 2019
Sources of funding	This work was supported by the NIHR Public Health Research Programme (13/164/51). HJ-B is funded by the Wellcome Trust (110027/Z/15/Z) and the Oxford NIHR Biomedical Research Centre.
Inclusion criteria	Community-dwelling adults aged 65 years or older who are not in full-time employment and who scored between 4 and 9 (inclusive) on the Short Physical Performance Battery (SPPB).
Exclusion criteria	People who were unable to walk across a room without the help of another person, living in residential care, awaiting hip or knee surgery, or receiving radiation therapy or chemotherapy, along with people who had recent heart or spinal surgery or had an illness that would prevent participation such as those with severe arthritis, diagnosed moderate-to-severe dementia, severe kidney disease, unstable heart disease, and severe psychiatric illness.

Recruitment / selection of participants	Participants were recruited from primary practices in urban or semi-rural locations. Recruitment was done mainly through invitation letters from general practitioners and advertised by third sector or charity organisations, local media and word of mouth.
Intervention(s)	A manualised 12-month exercise and behavioural maintenance programme. The exercise sessions were designed to improve lower limb muscle strength and balance. The 1 hour exercise sessions were delivered twice a week for 12 weeks, reduced to once a week for a further 40 weeks to groups of around 15 participants. After 9 weeks, the behavioural maintenance programme commenced as a 45-minute session delivered once a week, immediately following the exercise class.
Population subgroups	Yes- Comparing participants attending at least 50% and those attending at least 75% of the group sessions with all controls.
Comparator	Brief advice- Attend 3 workshops lasting 60-90 minutes each delivered before 6 month, 12 month, and 24 month assessments. The workshops covered healthy aging topics with no physical activity content.
Number of participants	777 randomly assigned participants (628 analysed)
Duration of follow-up	24 months
Indirectness	None
Additional comments	

Study arms

Brief advice (N = 367)

Attend 3 workshops lasting 60-90 minutes each delivered before 6 month, 12 month, and 24 month assessments. The workshops covered healthy aging topics with no physical activity content.

Intervention (N = 410)

A manualised 12-month exercise and behavioural maintenance programme. The 1-hour exercise sessions were delivered twice a week for 12 weeks, reduced to once a week for a further 40 weeks (64 sessions in total over 12 months) to groups of around 15 participants. Despite being delivered in a group setting, exercise programmes were personalised on the basis of participants' functional status and goals, using the Rate of Perceived Exertion scale. During the 12-month exercise intervention, strength-based exercises were prescribed to reflect intensities rated from moderate to vigorous. Towards the end of each session, games-based activities lasting 15–20 min were delivered at intensities from light to moderate. Following the exercise class, a 45-minute behavioural maintenance session was delivered.

Characteristics

Study-level characteristics

Characteristic	**Study (N = 777)**
% Female Sample size	n = NA; % = NA
Control group Sample size	n = 241; % = 66
Intervention group Sample size	n = 273; % = 67
Mean age (SD) Mean (SD)	NA (NA)
Control group	77.3 (6.64)

Characteristic	Study (N = 777)
Mean (SD)	
Intervention group Mean (SD)	77.8 (6.93)
Ethnicity Sample size	n = NA; % = NA
Caucasian or White- Control group Sample size	n = 352; % = 96
Caucasian or White- Intervention group Sample size	n = 387; % = 94
African or Caribbean- Control group Sample size	n = 9; % = 2
African or Caribbean- Intervention group Sample size	n = 14; % = 3
Asian- Control group Sample size	n = 4; % = 1
Asian- Intervention group Sample size	n = 5; % = 1

Characteristic	Study (N = 777)
Other or mixed- Control group Sample size	n = 2; % = 1
Other or mixed- Intervention group Sample size	n = 4; % = 1

Outcomes

Number of falls

Outcome	Brief advice, N = 294	Intervention , N = 334
Number of falls Mean (SD)	0.73 (1.05)	0.7 (1.05)
Number of falls Total Nominal	300	330

Number of falls in past 6 months (at 24 months)

Quality of life (SF-36)

Outcome	Brief advice, N = 294	Intervention , N = 334
SF36 physical component Mean (SD)	29.38 (9.39)	30.84 (10.04)

Outcome	Brief advice, N = 294	Intervention , N = 334
SF-36 mental component Mean (SD)	54.73 (7.64)	54.33 (9.18)

Quality of life (EUROQOL-5)

Outcome	Brief advice, N = 294	Intervention , N = 334
EUROQUOL-5 dimensions score Mean (SD)	0.67 (0.16)	0.69 (0.16)

Critical appraisal - Cochrane Risk of Bias tool (RoB 2.0) Normal RCT

Quality of life (EUROQOL-5)-EUROQUOL-5dimensionsscore-Mean SD -Brief Advice-Intervention

Section	Question	Answer
Overall bias and Directness	Risk of bias judgement	High *(High risk of bias due to participants and people delivering the intervention being aware of the assigned intervention)*
Overall bias and Directness	Overall Directness	Directly applicable *(Directly applicable)*

Number of falls -Number of falls -Mean SD -Brief Advice-Intervention

Section	Question	Answer
Overall bias and Directness	Risk of bias judgement	High *(High risk of bias due to participants and people delivering the intervention being aware of the assigned intervention)*
Overall bias and Directness	Overall Directness	Directly applicable *(Directly applicable)*

Number of falls -Number of falls -Nominal-Brief advice-Intervention

Section	Question	Answer
Overall bias and Directness	Risk of bias judgement	High *(High risk of bias due to participants and people delivering the intervention being aware of the assigned intervention)*
Overall bias and Directness	Overall Directness	Directly applicable *(Directly applicable)*

Sturnieks, 2024

Bibliographic Reference	Sturnieks, Daina L; Hicks, Cameron; Smith, Natassia; Ratanapongleka, Mayna; Menant, Jasmine; Turner, Jessica; Lo, Joanne; Chaplin, Carly; Garcia, Jaime; Valenzuela, Michael J; Delbaere, Kim; Herbert, Robert D; Sherrington, Catherine; Toson, Barbara; Lord, Stephen R; Exergame and cognitive training for preventing falls in community-dwelling older people: a randomized controlled trial.; Nature medicine; 2024; vol. 30 (no. 1); 98-105

Study details

Trial name / registration number	ACTRN12616001325493
Study type	Randomised controlled trial (RCT)
Study location	Australia
Study setting	Community
Study dates	Publication date 2024
Sources of funding	This work is supported by the National Health and Medical Research Council of Australia Project Grant (ID: 1086804) and Program Grant (ID: 1055084). Authors MV, KD, CS, RH and SL also received salary funding from the National Health and Medical Research Council of Australia Fellowships. DLS is supported by a Bushell Foundation Rising Star Fellowship. The funder of the study had no role in study design, data collection, data analysis, data interpretation, or writing of the report.
Inclusion criteria	Aged 65 years or older, english-speaking; living in the Sydney metropolitan area; independent in activities of daily living; able to walk 10m without the use of a walking aid and willing to provide informed consent
Exclusion criteria	An unstable medical condition that would preclude safe participation, a neurological condition (such as Parkinson's disease, multiple sclerosis, stroke), an acute psychiatric condition with psychosis; cognitive impairment defined as a Pfeiffer Short Portable Mental Status Questionnaire (SPMSQ) score <8, residing in residential aged care, or currently participating in a fall prevention trial.
Recruitment / selection of participants	Between 2016 and 2019, healthy older people living in the community in Sydney, Australia, were invited to participate via advertisements in newspapers, community group circulars and flyers, and invitations sent to members of a health insurance company.
Intervention(s)	The training interventions involved use of the smart±step computer gaming system. A personal computer running custom software delivered eight games, which were displayed on a television or computer screen. The exergame step training group played the same games while standing and stepping onto a Bluetooth connected (wireless) step mat. For both the touch pad and step mat the sensing targets corresponded to forward, backward, left and right moves. The smart±step

	games challenged speed, accuracy and motor control, and targeted specific cognitive functions including working memory, visuospatial skills, dual-tasking, inhibition and attention. Participants received an initial installation and follow-up home visit from research staff (Exercise Science graduates) and were instructed to undertake 120 minutes of training per week for 12 months. Weekly game play was capped at 150 minutes to help ensure equal doses between the two intervention groups. Participants were encouraged to progress to more challenging levels when confident to do so and to try to beat their highest score, which was best achieved by playing the exergames at the higher difficulty levels. Adherence to the interventions was monitored via automatic data transfer from each participant's smart±step personal computer to a centralised database over the internet. Participants who were engaging in less than 80 minutes of training per week for two consecutive weeks (and had not informed the research team of absence or illness) were contacted by telephone to encourage improved participation, assist with goal setting and help address any barriers to training. All participants received an evidence-based education booklet on healthy ageing and fall prevention.
Population subgroups	
Comparator	All participants received an evidence-based education booklet on healthy ageing and fall prevention.
Number of participants	Intervention group: 252 Control group: 255
Duration of follow-up	12 months
Indirectness	None

Study arms

Balance and strength training (N = 252)

Exergame step training

Control group (N = 255)

Characteristics

Arm-level characteristics

Characteristic	Balance and strength training (N = 252)	Control group (N = 255)
% Female Nominal	70.6	71.4
Mean age (SD) Mean (SD)	72.6 (5.7)	72.5 (5.5)

Outcomes

Study timepoints

12 month

Dichotomous outcomes

Outcome	Balance and strength training, 12 month, N = 252	Control group, 12 month, N = 255
Number of fallers Nominal	91	123

Inference rate ratio

Outcome	Balance and strength training vs Control group, 12 month, N2 = 255, N1 = 252
Rate of falls (IRR (95% CI)) Mean (95% CI)	0.74 (0.56 to 0.98)

Critical appraisal - Cochrane Risk of Bias tool (RoB 2.0) Normal RCT

Dichotomousoutcomes-Numberoffallers-Nominal-Balance and strength training-Control group-t12

Section	Question	Answer
Overall bias and Directness	Risk of bias judgement	Low
Overall bias and Directness	Overall Directness	Directly applicable

Inferencerateratio-Rateoffalls-MeanNineFivePercentCI-Balance and strength training-Control group-t12

Section	Question	Answer
Overall bias and Directness	Risk of bias judgement	Low

Section	Question	Answer
Overall bias and Directness	Overall Directness	Directly applicable

Tan, 2018

Bibliographic Reference	Tan, Pey June; Khoo, Ee Ming; Chinna, Karuthan; Saedon, Nor I'zzati; Zakaria, Mohd Idzwan; Ahmad Zahedi, Ahmad Zulkarnain; Ramli, Norlina; Khalidin, Nurliza; Mazlan, Mazlina; Chee, Kok Han; Zainal Abidin, Imran; Nalathamby, Nemala; Mat, Sumaiyah; Jaafar, Mohamad Hasif; Khor, Hui Min; Khannas, Norfazilah Mohamad; Majid, Lokman Abdul; Tan, Kit Mun; Chin, Ai-Vyrn; Kamaruzzaman, Shahrul Bahyah; Poi, Philip; Morgan, Karen; Hill, Keith D; MacKenzie, Lynette; Tan, Maw Pin; Individually-tailored multifactorial intervention to reduce falls in the Malaysian Falls Assessment and Intervention Trial (MyFAIT): A randomized controlled trial.; PloS one; 2018; vol. 13 (no. 8); e0199219

Study details

Secondary publication of another included study- see primary study for details	NA
Other publications associated with this study included in review	NA
Trial name / registration number	ISRCTN11674947

Study location	Kuala Lumpur, Malaysia
Study setting	Emergency room/ outpatient clinic
Study dates	2012 to February 2016
Sources of funding	This work was supported by the University Malaya Research Grant (grant number UMRG-RP-010-2012, the University of Malaya Postgraduate Research Fund (grant number PPP-2015B-4805, Ministry of Science and Technology Science Fund (grant number SF017-2013, and the University of Malaya Grand Challenge fund (grant number GC002- 14HTM.
Inclusion criteria	Community-dwelling individuals aged 65 years and older with a history of two or more falls or one injurious fall over the past 12 months.
Exclusion criteria	Clinically-diagnosed dementia, major psychiatric illnesses and inability to stand.
Recruitment / selection of participants	Recruited from the emergency department, medical outpatients and primary care clinic at a teaching hospital in Kuala Lumpur, Malaysia.
Intervention(s)	Multifactorial intervention in which all participants were assessed using standardised assessment tools to identify potential risk factors for falls (ie gait and balance, visual impairment, falls risk medications, cardiovascular risk, fear-of-falling and depression).
Population subgroups	NA
Comparator	Conventional treatment
Number of participants	268 participants

Duration of follow-up	12 months
Indirectness	None

Study arms

Individually tailored multifactorial intervention (N = 134)

Including cardiovascular intervention, visual intervention modified Otago exercises, and home hazard modification, if required. All participants received footwear review, medication review, and falls education

Conventional treatment and health advice (N = 134)

Conventional treatment

Characteristics

Study-level characteristics

Characteristic	**Study (N = 268)**
% Female Sample size	n = NA; % = NA
Intervention Sample size	n = 93; % = 69.4

Characteristic	Study (N = 268)
Control Sample size	n = 88; % = 65.7
Mean age (SD) Mean (SD)	NA (NA)
Intervention Mean (SD)	74.5 (6.8)
Control Mean (SD)	76.1 (7.5)
Ethnicity Sample size	n = NA; % = NA
Malay- Intervention Sample size	n = 24; % = 17.9
Malay- control Sample size	n = 21; % = 15.5
Chinese- Intervention Sample size	n = 76; % = 56.7
Chinese- Control	n = 90; % = 67.2

Characteristic	Study (N = 268)
Sample size	
Indian- Intervention Sample size	n = 30; % = 22.4
Indian- Control Sample size	n = 21; % = 15.7
Others- Intervention Sample size	n = 4; % = 3
Others- Control Sample size	n = 2; % = 1.5
Comorbidities Sample size	n = NA; % = NA

Outcomes

Rate of fall

Outcome	Individually tailored multifactorial intervention vs Conventional treatment and health advice, N2 = 134, N1 = 134
Rate of Falls (RR 95% CI)	1.16 (0.85- 1.58)

Outcome	**Individually tailored multifactorial intervention vs Conventional treatment and health advice, N2 = 134, N1 = 134**
Custom value	

Critical appraisal - Cochrane Risk of Bias tool (RoB 2.0) Normal RCT

Rate of fall -rate of fall -Individually tailored multifactorial intervention-Conventional treatment and health advice

Section	**Question**	**Answer**
Overall bias and Directness	Risk of bias judgement	High *(High risk of bias due to participants and people delivering the intervention being aware of the assigned intervention, and outcome assessors were likely aware of the assigned intervention, and the self-reported nature of the outcome.)*
Overall bias and Directness	Overall Directness	Directly applicable *(Directly applicable)*

Critical appraisal - Cochrane Risk of Bias tool (RoB 2.0) Normal RCT

Rate of fall -rate of fall -Individually tailored multifactorial intervention-Conventional treatment and health advice

Section	**Question**	**Answer**
Overall bias and Directness	Risk of bias judgement	High *(High risk of bias due to participants and people delivering the intervention being aware of the assigned intervention, and outcome assessors were likely aware of the assigned intervention, and the self-reported nature of the outcome.)*
Overall bias and Directness	Overall Directness	Directly applicable *(Directly applicable)*

Tannenbaum, 2019

Bibliographic Reference	Tannenbaum, Cara; Fritel, Xavier; Halme, Alex; van den Heuvel, Eleanor; Jutai, Jeffrey; Wagg, Adrian; Long-term effect of community-based continence promotion on urinary symptoms, falls and healthy active life expectancy among older women: cluster randomised trial.; Age and ageing; 2019; vol. 48 (no. 4); 526-532

Study details

Secondary publication of another included study- see primary study for details	NA
Other publications associated with this study included in review	NA
Trial name / registration number	CACTUS-D/ NCT01858493
Study location	France, UK, and Canada
Study setting	Community
Study dates	March 2013 to June 2016
Sources of funding	The study was funded by a joint collaboration between the European Research Area on Ageing2 (ERA-AGE2) programme, with contributions from the Canadian Institutes of Health Research, the Fonds de la Recherche en Santé du Québec, the

	Economic and Social Research Council of the UK, the Institut National de Prévention et Éducation pour la Santé de la France, and the Observatoire régional de la Santé, Poitou-Charentes Publique de Poitou-Charentes
Inclusion criteria	Women from consenting organisations aged 65 years or older, spoke English or French, self-reported at least 2 incontinence episodes weekly, were not taking medications to treat incontinence, and had not sought professional advice for incontinence symptoms within the past year.
Exclusion criteria	Participants with major neurocognitive disorder
Recruitment / selection of participants	Recruited from 377 community organisations across the UK, France, and Canada.
Intervention(s)	Incontinence self-management program
Population subgroups	NA
Comparator	Healthy ageing workshop
Number of participants	909 participants
Duration of follow-up	1 year
Indirectness	None
Additional comments	Number of fallers calculated from given percentages 36% of 461 = 166 and 34% of 448 = 152

Study arms

Continence promotion intervention (N = 461)

Healthy aging workshop (control) (N = 448)

Characteristics

Study-level characteristics

Characteristic	Study (N = 909)
% Female Sample size	n = 909; % = 100
Mean age (SD) Mean (SD)	NA (NA)
Incontinence prevention program Mean (SD)	77.4 (7.8)
Healthy ageing workshop Mean (SD)	78.6 (7.9)
Comorbidities Sample size	n = NA; % = NA
Depression- Incontinence prevention program Sample size	n = NR; % = 23.6

Characteristic	Study (N = 909)
Depression- Healthy ageing workshop Sample size	n = NR; % = 24.5
Heart disease- Incontinence prevention program Sample size	n = NR; % = 27.5
Heart disease- Healthy ageing workshop Sample size	n = NR; % = 31.9
Arthritis- Incontinence prevention program Sample size	n = NR; % = 44.7
Arthritis- Healthy ageing workshop Sample size	n = NR; % = 48.7
Diabetes- Incontinence prevention program Sample size	n = NR; % = 16.9
Diabetes- Incontinence prevention program Sample size	n = NR; % = 19.4
Hypertension- Incontinence prevention program Sample size	n = NR; % = 55.3
Hypertension- Healthy ageing workshop	n = NR; % = 56.9

Characteristic	Study (N = 909)
Sample size	

Outcomes

Number of fallers

Outcome	Continence promotion intervention, N = 461	Healthy aging workshop (control), N = 448
Number of fallers 12 months Sample size	n = NR; % = 36	n = NR; % = 34

Health-related quality of life

Outcome	Continence promotion intervention, N = 461	Healthy aging workshop (control), N = 448
Gain in Incontinence Quality of Life Scale (I-QOL) Custom value	6.7 (5.6- 7.8)	5.4 (4.3- 6.6)

Critical appraisal - Cochrane Risk of Bias tool (RoB 2.0) Cluster randomised trials

Health-related Quality of life -Gain in Incontinence Quality of life Scale(I-QOL)-CustomValue0-Continence promotion intervention-Healthy aging workshop (control)

Section	Question	Answer
Overall bias and Directness	Risk of bias judgement	High *(High risk of bias due to participants, people delivering the intervention, and outcome assessors being aware of the assigned intervention)*
Overall bias and Directness	Overall Directness	Directly applicable *(Directly applicable)*

Taylor, 2021

Bibliographic Reference	Taylor, Morag E; Wesson, Jacqueline; Sherrington, Catherine; Hill, Keith D; Kurrle, Susan; Lord, Stephen R; Brodaty, Henry; Howard, Kirsten; O'Rourke, Sandra D; Clemson, Lindy; Payne, Narelle; Toson, Barbara; Webster, Lyndell; Savage, Roslyn; Zelma, Genevieve; Koch, Cecelia; John, Beatrice; Lockwood, Keri; Close, Jacqueline C T; Tailored Exercise and Home Hazard Reduction Program for Fall Prevention in Older People With Cognitive Impairment: The i-FOCIS Randomized Controlled Trial.; The journals of gerontology. Series A, Biological sciences and medical sciences; 2021; vol. 76 (no. 4); 655-665

Study details

Secondary publication of another included study- see primary study for details	NA
Other publications associated with this study included in review	NA

Trial name / registration number	i-FOCIS/ ACTRN12614000603617
Study location	Australia
Study setting	Community
Study dates	Not specified
Sources of funding	The Australian National Health and Medical Research Council (NHMRC) reference number 1060191.lk
Inclusion criteria	Aged 65 years or older, community-dwelling, and cognitively impaired (defined as a Mini-Mental State Examination [MMSE] score or Mini-Addenbrooke's Cognitive Examination Australian Version [m-ACE] <24, an Addenbrooke's Cognitive Examination-III, Australian Version [ACE-III] <83 or a specialist clinician diagnosis of cognitive impairment). Participants also had to have a "person responsible/ caregiver" who was willing to assist with reporting falls and supervising the exercise intervention and who had at least 3.5 hours of face-to-face contact with the participant per week.
Exclusion criteria	Residing in a residential aged care facility, severe cognitive impairment, insufficient English to understand the assessment and intervention procedures, inability to walk more than 1 meter with the use of a walking aid and/or another person, blindness, severe psychiatric condition, a progressive neurological disease other than dementia, and/or any medical condition precluding exercise.
Recruitment / selection of participants	Participants were recruited from health-related services including aged care, memory and cognitive disorders clinics, and dementia-specific day centres from 2 sites in Sydney.
Intervention(s)	Exercise session length and frequency, amount and type of caregiver supervision, home safety recommendations, and caregiver education to support participants' during the program. The intervention visit schedule comprised 11 visits (a variable combination of physiotherapy and occupational therapy based on identified need) and up to 10 support telephone calls during the 12-month study period. The occupational therapists assessed participant function in their home environment (90- to 120-minute sessions). Home safety recommendations were made to minimize or eliminate identified hazards and were prioritised in accordance with risk and negotiation with participants and their caregivers. Experienced

	physiotherapists delivered the exercise intervention in the participants' homes adapting their approach to align with each participant's physical and cognitive function. The exercise sessions with the physiotherapist were 40–60 minutes in duration and were more frequent in the initial part of the study period to ensure safety, tailoring and progression.
Population subgroups	NA
Comparator	Usual care from health care providers
Number of participants	309 participants
Duration of follow-up	12 months
Indirectness	None
Additional comments	

Study arms

Exercise and home hazard reduction program (N = 153)

Exercise session length and frequency, amount and type of caregiver supervision, home safety recommendations, and caregiver education to support participants' during the program. The intervention visit schedule comprised 11 visits (a variable combination of physiotherapy and occupational therapy based on identified need) and up to 10 support telephone calls during the 12-month study period. The occupational therapists assessed participant function in their home environment (90- to 120-minute sessions). Home safety recommendations were made to minimize or eliminate identified hazards and were prioritised in accordance with risk and negotiation with participants and their caregivers. Experienced physiotherapists delivered the exercise intervention in the participants' homes adapting their approach to align with each participant's physical and cognitive function. The exercise sessions with the physiotherapist were 40–60 minutes in duration and were more frequent in the initial part of the study period to ensure safety, tailoring and progression.

Usual care (N = 156)

Usual care

Characteristics

Study-level characteristics

Characteristic	Study (N = 309)
% Female Sample size	n = 151; % = 48.9
Mean age (SD) Mean (95% CI)	82.3 (81.6 to 83.1)
Comorbidities Sample size	n = NA; % = NA
Arthritis Sample size	n = 172; % = 55.7
Dementia Sample size	n = 225; % = 73.5
Diabetes Sample size	n = 50; % = 16.2

Characteristic	Study (N = 309)
Stroke Sample size	n = 38; % = 12.3
Hypertension Sample size	n = 150; % = 48.5
Depression Sample size	n = 79; % = 25.6

Outcomes

Rate of falls

Outcome	Exercise and home hazard reduction program, N = 153	Ususal care, N = 156
Incidence rate (95% CI) per 365 person-days Custom value	2.32 (2.09- 2.58)	2.26 (2.03- 2.52)
Incidence rate (95%CI) 365 person-days (Falls capped at 12) Custom value	1.68 (1.48- 1.90)	1.94 (1.73- 2.18)

Rate of falls

Outcome	Exercise and home hazard reduction program vs Ususal care, N2 = 153, N1 = 156
Rate of Falls (IRR 95%CI) Custom value	0.78 (0.57-1.07)

Number of fallers

Outcome	Exercise and home hazard reduction program, N = 153	Ususal care, N = 156
Number of fallers No of events	n = 94; % = 61.4	n = 87; % = 55.8

Fall-related fracture

Outcome	Exercise and home hazard reduction program, N = 153	Ususal care, N = 156
Fall-related fracture No of events	n = 10; % = 6.5	n = 9; % = 5.8

Quality of life (EQ-5D-5L)

Outcome	Exercise and home hazard reduction program, N = 153	Ususal care, N = 156
Quality of Life (EQ-5D-5L) Custom value	0.78 (0.74- 0.82)	0.77 (0.73- 0.81)

12 months

Critical appraisal - Cochrane Risk of Bias tool (RoB 2.0) Normal RCT

Quality of life (EQ-5D-5L)-Quality of life (EQ-5D-5L)-Exercise and home hazard reduction program-Ususal care

Section	Question	Answer
Overall bias and Directness	Risk of bias judgement	High *(High risk of bias due to participants and people delivering the intervention were likely aware of the assigned intervention and the noted deviations from the intended intervention, issues with adherence, and failures in implementing the intervention)*
Overall bias and Directness	Overall Directness	Directly applicable *(Directly applicable)*

Fall-related fracture-Fall-related fracture-No of events -Exercise and home hazard reduction program-Ususal care

Section	Question	Answer
Overall bias and Directness	Risk of bias judgement	High *(High risk of bias due to participants and people delivering the intervention were likely aware of the assigned intervention and the noted deviations from the intended intervention, issues with adherence, and failures in implementing the intervention)*
Overall bias and Directness	Overall Directness	Directly applicable *(Directly applicable)*

Number of fallers   -Number of fallers   -No of events -Exercise and home hazard reduction program-Usual care

Section	Question	Answer
Overall bias and Directness	Risk of bias judgement	High *(High risk of bias due to participants and people delivering the intervention were likely aware of the assigned*

Section	Question	Answer
		intervention and the noted deviations from the intended intervention, issues with adherence, and failures in implementing the intervention)
Overall bias and Directness	Overall Directness	Directly applicable *(Directly applicable)*

Rate of falls -IRR-Exercise and home hazard reduction program-Usual care

Section	Question	Answer
Overall bias and Directness	Risk of bias judgement	High *(High risk of bias due to participants and people delivering the intervention were likely aware of the assigned intervention and the noted deviations from the intended intervention, issues with adherence, and failures in implementing the intervention)*
Overall bias and Directness	Overall Directness	Directly applicable *(Directly applicable)*

Rate of falls -Incidence rate-Exercise and home hazard reduction program-Usual care

Section	Question	Answer
Overall bias and Directness	Risk of bias judgement	High *(High risk of bias due to participants and people delivering the intervention were likely aware of the assigned intervention and the noted deviations from the intended intervention, issues with adherence, and failures in implementing the intervention)*

Section	Question	Answer
Overall bias and Directness	Overall Directness	Directly applicable *(Directly applicable)*

Rate of falls -Incidence rate--Exercise and home hazard reduction program-Usual care

Section	Question	Answer
Overall bias and Directness	Risk of bias judgement	High *(High risk of bias due to participants and people delivering the intervention were likely aware of the assigned intervention and the noted deviations from the intended intervention, issues with adherence, and failures in implementing the intervention)*
Overall bias and Directness	Overall Directness	Directly applicable *(Directly applicable)*

Ueda, 2022

Bibliographic Reference	Ueda, Tetsuya; Higuchi, Yumi; Hattori, Gentoku; Nomura, Hiromi; Yamanaka, Gen; Hosaka, Akiko; Sakuma, Mina; Fukuda, Takato; Fukumoto, Takanori; Nemoto, Takashi; Effectiveness of a Tailored Fall-Prevention Program for Discharged Older Patients: A Multicenter, Preliminary, Randomized Controlled Trial.; International journal of environmental research and public health; 2022; vol. 19 (no. 3)

Study details

Secondary publication of another included	Linked to Ueda, 2017 (Hopewell, 2018)

study- see primary study for details	
Other publications associated with this study included in review	Linked to Ueda, 2017 (Hopewell, 2018)
Trial name / registration number	UMIN-CTR; UMIN000029798
Study location	Japan
Study setting	Community (discharged from acute-care hospitals)
Study dates	November 2017 to January 2019
Sources of funding	Supported by JSPS KAKENHI, grant number JP17H00697
Inclusion criteria	Adults aged 65 years or older who were admitted to the orthopaedic ward at acute-care hospitals and had a history of falls in the past year and had been discharged with the ability to walk indoors.
Exclusion criteria	Patients with cognitive impairment (as defined by Mini Mental State Examination <18 points), spoke little Japanese or could not speak the Japanese language, patients with severe neurological and/or visual disorders, patients planning to move in the next month, patients who could not get consent, and patients who declined to participate.
Recruitment / selection of participants	Participants were recruited who had been discharged from acute-care hospitals
Intervention(s)	Physical therapist-led tailored education program using home floor plans.

Population subgroups	NA
Comparator	Usual care
Number of participants	65 participants
Duration of follow-up	1 month follow-up
Indirectness	None

Study arms

Physical therapist-led education program (N = 32)

Tailored education plans using participant home floor plans

Usual care (N = 33)

Usual care

Characteristics

Study-level characteristics

Characteristic	**Study (N = 65)**
% Female	n = NA; % = NA

Characteristic	Study (N = 65)
Sample size	
Tailored fall-prevention program Sample size	n = 22; % = 68.8
Usual care Sample size	n = 25; % = 75.8
Mean age (SD) Mean (SD)	NA (NA)
Tailored fall-prevention program Mean (SD)	75.1 (6.8)
Usual Care Mean (SD)	77.9 (6.6)
Comorbidities Sample size	n = NA; % = NA
Hypertension- Tailored fall-prevention program Sample size	n = 17; % = 53.1
Hypertension- Usual care Sample size	n = 15; % = 45.5

Characteristic	Study (N = 65)
Diabetes mellitus- Tailored fall-prevention program Sample size	n = 10; % = 31.3
Diabetes mellitus- Usual care Sample size	n = 8; % = 24.2
Chronic obstructive pulmonary disease- Tailored fall-prevention program Sample size	n = 0; % = 0
Chronic obstructive pulmonary disease- Usual care Sample size	n = 0; % = 0
Stroke- Tailored fall-prevention program Sample size	n = 2; % = 6.3
Stroke- Usual care Sample size	n = 2; % = 6.1
Heart disease- Tailored fall-prevention program Sample size	n = 7; % = 21.9
Heart disease- Usual care Sample size	n = 12; % = 36.4

Outcomes

Number of fallers

Outcome	Physical therapist-led education program, N = 27	Usual care, N = 26
Number of fallers No of events	n = 0; % = 0	n = 1; % = 4.3

Total number of falls

Outcome	Physical therapist-led education program, N = 27	Usual care, N = 26
Total number of falls Nominal	0	1

Critical appraisal - Cochrane Risk of Bias tool (RoB 2.0) Normal RCT

Number of fallers   -Number of fallers   -No of events -Physical therapist-led education program-Usual care

Section	Question	Answer
Overall bias and Directness	Risk of bias judgement	High *(High risk of bias due to participants and people delivering the intervention being aware of the assigned intervention)*
Overall bias and Directness	Overall Directness	Directly applicable *(Directly applicable)*

Total number of falls-Total number of falls-Nominal-Physical therapist-led education program-Usual care

Section	Question	Answer
Overall bias and Directness	Risk of bias judgement	High *(High risk of bias due to participants and people delivering the intervention being aware of the assigned intervention)*
Overall bias and Directness	Overall Directness	Directly applicable *(Directly applicable)*

D.3 Environmental interventions

See Clemson 2023[41] Cochrane review for the effectiveness evidence.

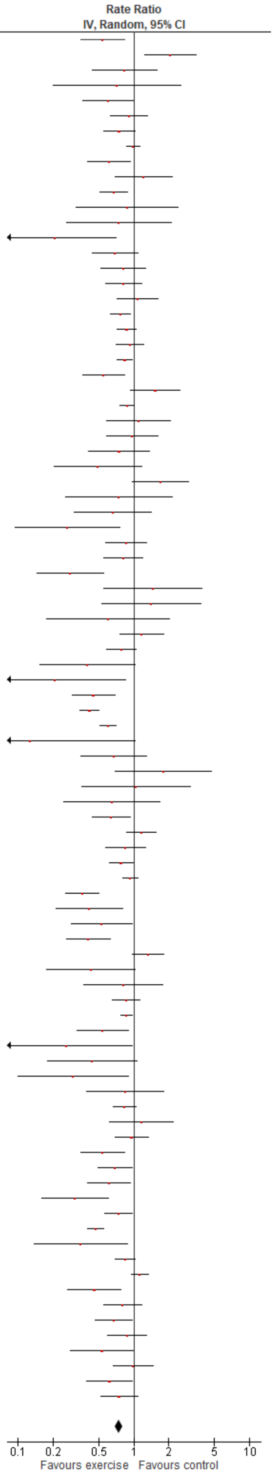
Appendix E Forest plots

E.1 Exercise interventions

Figure 1: Exercise versus control – Rate of falls

Study or Subgroup	log[Rate Ratio]	SE	Exercise Total	Control Total	Weight	Rate Ratio IV, Random, 95% CI
Altamirano 2022	-0.6162	0.2212	222	156	1.2%	0.54 [0.35, 0.83]
Ansai 2015 (1)	0.73	0.26	23	11	1.1%	2.08 [1.25, 3.45]
Ansai 2015 (2)	-0.18	0.33	22	11	0.8%	0.84 [0.44, 1.59]
Arkkukangas 2015	-0.33	0.65	27	13	0.3%	0.72 [0.20, 2.57]
Barnett 2003	-0.51	0.26	76	74	1.1%	0.60 [0.36, 1.00]
Bates 2022	-0.0943	0.1876	290	289	1.4%	0.91 [0.63, 1.31]
Boongrid 2017	-0.29	0.16	218	219	1.5%	0.75 [0.55, 1.02]
Bruce 2021	-0.0101	0.0718	2500	2493	1.9%	0.99 [0.86, 1.14]
Buchner 1997	-0.49	0.22	70	30	1.2%	0.61 [0.40, 0.94]
Bunout 2005	0.2	0.29	111	130	1.0%	1.22 [0.69, 2.16]
Campbell 1997	-0.39	0.14	116	117	1.6%	0.68 [0.51, 0.89]
Carter 2002	-0.13	0.52	40	40	0.4%	0.88 [0.32, 2.43]
Clegg 2014	-0.29	0.53	40	30	0.4%	0.75 [0.26, 2.11]
Clemson 2010	-1.56	0.62	18	16	0.3%	0.21 [0.06, 0.71]
Clemson 2012 (3)	-0.37	0.23	107	53	1.2%	0.69 [0.44, 1.08]
Clemson 2012 (4)	-0.21	0.23	105	53	1.2%	0.81 [0.52, 1.27]
Cornillon 2002	-0.2	0.18	150	153	1.4%	0.82 [0.58, 1.17]
Coyle 2020	0.077	0.2069	123	125	1.3%	1.08 [0.72, 1.62]
Dadgari 2016	-0.26	0.1	160	157	1.8%	0.77 [0.63, 0.94]
Day 2002	-0.14	0.1	135	137	1.8%	0.87 [0.71, 1.06]
Day 2015 (5)	-0.07	0.14	204	205	1.6%	0.93 [0.71, 1.23]
Delbaere 2021	-0.1744	0.0786	254	249	1.9%	0.84 [0.72, 0.98]
Duque 2013	-0.6	0.21	30	30	1.3%	0.55 [0.36, 0.83]
Ebrahim 1997	0.43	0.25	52	50	1.1%	1.54 [0.94, 2.51]
El-Khoury 2015	-0.13	0.07	352	354	1.9%	0.88 [0.77, 1.01]
Fahlstrom 2018	0.0953	0.3266	87	72	0.8%	1.10 [0.58, 2.09]
Giangrego 2018	-0.0305	0.2624	71	70	1.1%	0.97 [0.58, 1.62]
Grahn Kronhed 2009	-0.29	0.31	34	31	0.9%	0.75 [0.41, 1.37]
Gschwind 2015	-0.71	0.44	71	65	0.6%	0.49 [0.21, 1.16]
Hager 2024	0.5365	0.284	156	73	1.0%	1.71 [0.98, 2.98]
Hamrick 2017	-0.29	0.54	19	19	0.4%	0.75 [0.26, 2.16]
Hirase 2015 (6)	-0.42	0.39	29	14	0.7%	0.66 [0.31, 1.41]
Hirase 2015 (7)	-1.32	0.53	29	14	0.4%	0.27 [0.09, 0.75]
Iliffe 2015 (8)	-0.15	0.21	227	126	1.3%	0.86 [0.57, 1.30]
Iliffe 2015 (9)	-0.21	0.2	230	126	1.3%	0.81 [0.55, 1.20]
Irez 2011	-1.26	0.34	30	30	0.8%	0.28 [0.15, 0.55]
Karinkanta 2007 (10)	0.38	0.5	36	12	0.5%	1.46 [0.55, 3.90]
Karinkanta 2007 (11)	0.35	0.5	35	12	0.5%	1.42 [0.53, 3.78]
Karinkanta 2007 (12)	-0.51	0.62	37	12	0.3%	0.60 [0.18, 2.02]
Kerse 2010	0.16	0.22	98	95	1.2%	1.17 [0.76, 1.81]
Korpelainen 2006	-0.24	0.15	84	76	1.6%	0.79 [0.59, 1.06]
Kovacs 2013	-0.92	0.48	36	36	0.5%	0.40 [0.16, 1.02]
Lehtola 2000	-1.56	0.71	92	39	0.3%	0.21 [0.05, 0.84]
Li 2005	-0.8	0.22	95	93	1.2%	0.45 [0.29, 0.69]
Li 2018 (13)	-0.8747	0.0967	224	223	1.8%	0.42 [0.34, 0.50]
Li 2018 (2) (14)	-0.5099	0.0857	0	0	1.9%	0.60 [0.51, 0.71]
Li 2022	-2.0557	1.061	35	36	0.1%	0.13 [0.02, 1.02]
Lin 2007	-0.4	0.33	50	50	0.8%	0.67 [0.35, 1.28]
Liu-Ambrose 2004 (15)	0.59	0.49	32	16	0.5%	1.80 [0.69, 4.71]
Liu-Ambrose 2004 (16)	0.04	0.55	34	16	0.4%	1.04 [0.35, 3.06]
Liu-Ambrose 2008	-0.43	0.49	31	28	0.5%	0.65 [0.25, 1.70]
Liu-Ambrose 2021 (17)	-0.4463	0.1912	290	289	1.4%	0.64 [0.44, 0.93]
Logghe 2009	0.15	0.15	138	131	1.6%	1.16 [0.87, 1.56]
Lord 1995	-0.16	0.2	75	94	1.3%	0.85 [0.58, 1.26]
Lord 2003	-0.25	0.12	259	249	1.7%	0.78 [0.62, 0.99]
Luukinen 2007	-0.07	0.08	217	220	1.9%	0.93 [0.80, 1.09]
Lytras 2022	-1.0217	0.166	75	75	1.5%	0.36 [0.26, 0.50]
Madureira 2007	-0.88	0.34	30	30	0.8%	0.41 [0.21, 0.81]
McMurdo 1997	-0.64	0.31	44	48	0.9%	0.53 [0.29, 0.97]
Means 2005	-0.9	0.22	144	94	1.2%	0.41 [0.26, 0.63]
Merom 2016	0.29	0.16	275	247	1.5%	1.34 [0.98, 1.83]
Miko 2017	-0.85	0.45	49	48	0.5%	0.43 [0.18, 1.03]
Nitz 2004 (18)	-0.21	0.4	24	21	0.6%	0.81 [0.37, 1.78]
Oliveira 2024	-0.1508	0.1428	280	304	1.6%	0.86 [0.65, 1.14]
Rikkonen 2023	-0.1427	0.054	457	457	2.0%	0.87 [0.78, 0.96]
Robertson 2001a	-0.62	0.26	121	119	1.1%	0.54 [0.32, 0.90]
Rogers 2021 (a) (19)	-1.3471	0.6695	25	27	0.3%	0.26 [0.07, 0.97]
Rogers 2021 (b) (20)	-0.821	0.456	25	27	0.5%	0.44 [0.18, 1.08]
Rogers 2021 (c) (21)	-1.204	0.5605	25	27	0.4%	0.30 [0.10, 0.90]
Rubenstein 2000	-0.17	0.39	31	28	0.7%	0.84 [0.39, 1.81]
Sakamoto 2013	-0.18	0.12	410	455	1.7%	0.84 [0.66, 1.06]
Sales 2017	0.15	0.32	27	21	0.8%	1.16 [0.62, 2.18]
Sherrington 2020	-0.0408	0.1685	168	168	1.5%	0.96 [0.69, 1.34]
Siegrist 2016	-0.62	0.22	222	156	1.2%	0.54 [0.35, 0.83]
Skelton 2005 (22)	-0.37	0.17	50	31	1.5%	0.69 [0.50, 0.96]
Smulders 2010	-0.49	0.22	47	45	1.2%	0.61 [0.40, 0.94]
Stanmore 2019	-1.1712	0.3375	56	50	0.8%	0.31 [0.16, 0.60]
Sturnieks 2024	-0.3011	0.1422	252	255	1.6%	0.74 [0.56, 0.98]
Suikkanen 2021	-0.755	0.0823	150	149	1.9%	0.47 [0.40, 0.55]
Suzuki 2004	-1.05	0.47	22	22	0.5%	0.35 [0.14, 0.88]
Taylor 2012 (23)	-0.17	0.1	220	115	1.8%	0.84 [0.69, 1.03]
Taylor 2012 (24)	0.12	0.09	233	115	1.9%	1.13 [0.95, 1.35]
Trombetti 2011	-0.78	0.27	66	68	1.0%	0.46 [0.27, 0.78]
Uusi-Rasi 2015	-0.22	0.19	86	89	1.4%	0.80 [0.55, 1.16]
Voukelatos 2007	-0.4	0.19	347	337	1.4%	0.67 [0.46, 0.97]
Voukelatos 2015	-0.13	0.2	159	180	1.3%	0.88 [0.59, 1.30]
Weerdesteyn 2006	-0.63	0.32	30	28	0.8%	0.53 [0.28, 1.00]
Wolf 1996 (25)	-0.01	0.2	64	32	1.3%	0.99 [0.67, 1.47]
Wolf 1996 (26)	-0.48	0.23	72	32	1.2%	0.62 [0.39, 0.97]
Wolf 2003	-0.29	0.19	145	141	1.4%	0.75 [0.52, 1.09]
Total (95% CI)			**12757**	**11603**	**100.0%**	**0.74 [0.69, 0.80]**

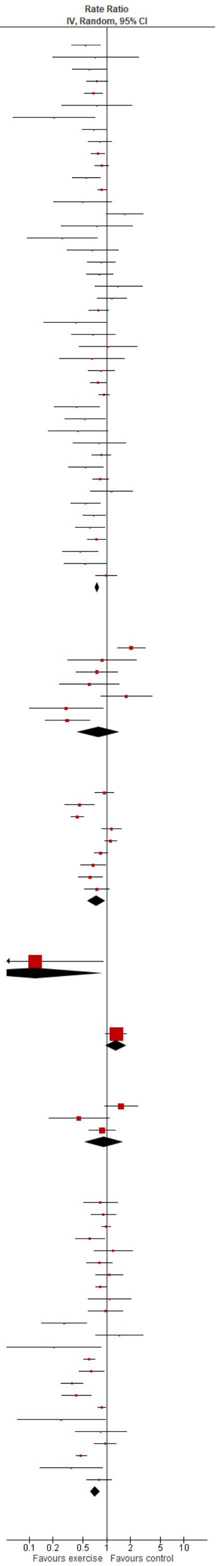
Heterogeneity: Tau² = 0.07; Chi² = 316.46, df = 89 (P < 0.00001); I² = 72%
Test for overall effect: Z = 7.77 (P < 0.00001)



Footnotes
(1) Group based progressive strength vs Control
(2) Group based balance, strength and aerobic vs Control
(3) LiFE (Lifestyle approach to reducing Falls through Exercise) programme - progressive balance and strength training embedded in daily life activities...
(4) Individual balance and strength training vs Low intensity flexibility and balance training
(5) Group based Tai chi vs Group based flexibility training
(6) Group based balance training on stable surface vs Control
(7) Group based balance training on foam rubber vs Control
(8) Individual Otago Exercise Programme vs Control
(9) Group based FaME plus home training based on Otago Exercise Programme vs Control
(10) Combined group based balance, agility and resistance training vs Control
(11) Group based balance and agility training vs Control
(12) Group based resistance training vs Control
(13) Tai chi vs stretching
(14) multimodal exercise vs stretching
(15) Supervised high-intensity resistance training vs Flexibility training
(16) Supervised agility training vs Flexibility training
(17) adjusted for sex
(18) Group based balance vs Group based gentle exercise and stretching
(19) Step training + hip abduction strengthening training vs control
(20) Step training vs control
(21) hip abduction strengthening training vs control
(22) Group based FaME balance and strength training plus home practice vs Individual seated gentle exercise
(23) Group based Tai Chi 2x/week vs Group based seated gentle lower limb exercise
(24) Group based Tai Chi 1x/week vs Group based seated gentle lower limb exercise
(25) Individual computerised balance training on force platform vs Control
(26) Group based Tai Chi vs Control

Figure 2: Exercise versus control – Rate of falls subgrouped by exercise type

Study or Subgroup	log[Rate Ratio]	SE	Exercise Total	Control Total	Weight	Rate Ratio IV, Random, 95% CI
1.2.1 Balance and functional exercises vs control						
Altamirano 2022	-0.6162	0.2212	222	156	2.1%	0.54 [0.35, 0.83]
Arkkukangas 2015	-0.33	0.65	27	13	0.3%	0.72 [0.20, 2.57]
Barnett 2003	-0.51	0.26	76	74	1.7%	0.60 [0.36, 1.00]
Boongrid 2017	-0.29	0.16	218	219	3.3%	0.75 [0.55, 1.02]
Campbell 1997	-0.39	0.14	116	117	3.8%	0.68 [0.51, 0.89]
Clegg 2014	-0.29	0.53	40	30	0.5%	0.75 [0.26, 2.11]
Clemson 2010	-1.56	0.62	18	16	0.4%	0.21 [0.06, 0.71]
Clemson 2012 (1)	-0.37	0.18	107	105	2.9%	0.69 [0.49, 0.98]
Cornillon 2002	-0.2	0.18	150	153	2.9%	0.82 [0.58, 1.17]
Dadgari 2016	-0.26	0.1	160	157	5.2%	0.77 [0.63, 0.94]
Day 2002	-0.14	0.1	135	137	5.2%	0.87 [0.71, 1.06]
Duque 2013	-0.6	0.21	30	30	2.3%	0.55 [0.36, 0.83]
El-Khoury 2015	-0.13	0.07	352	354	6.3%	0.88 [0.77, 1.01]
Gschwind 2015	-0.71	0.44	71	65	0.7%	0.49 [0.21, 1.16]
Hager 2024	0.5365	0.284	156	73	1.5%	1.71 [0.98, 2.98]
Hamrick 2017	-0.29	0.54	19	19	0.5%	0.75 [0.26, 2.16]
Hirase 2015 (2)	-1.32	0.53	29	14	0.5%	0.27 [0.09, 0.75]
Hirase 2015 (3)	-0.42	0.39	29	14	0.8%	0.66 [0.31, 1.41]
Iliffe 2015 (4)	-0.15	0.21	227	126	2.3%	0.86 [0.57, 1.30]
Iliffe 2015 (5)	-0.21	0.2	230	126	2.5%	0.81 [0.55, 1.20]
Karinkanta 2007 (6)	0.35	0.36	35	36	1.0%	1.42 [0.70, 2.87]
Kerse 2010	0.16	0.22	98	95	2.2%	1.17 [0.76, 1.81]
Korpelainen 2006	-0.24	0.15	84	76	3.6%	0.79 [0.59, 1.06]
Kovacs 2013	-0.92	0.48	36	36	0.6%	0.40 [0.16, 1.02]
Lin 2007	-0.4	0.33	50	50	1.1%	0.67 [0.35, 1.28]
Liu-Ambrose 2004 (7)	0.04	0.44	34	32	0.7%	1.04 [0.44, 2.47]
Liu-Ambrose 2008	-0.43	0.49	31	28	0.6%	0.65 [0.25, 1.70]
Lord 1995	-0.16	0.2	75	94	2.5%	0.85 [0.58, 1.26]
Lord 2003	-0.25	0.12	259	249	4.5%	0.78 [0.62, 0.99]
Luukinen 2007	-0.07	0.08	217	220	5.9%	0.93 [0.80, 1.09]
Madureira 2007	-0.88	0.34	30	30	1.1%	0.41 [0.21, 0.81]
McMurdo 1997	-0.64	0.31	44	48	1.3%	0.53 [0.29, 0.97]
Miko 2017	-0.85	0.45	49	48	0.6%	0.43 [0.18, 1.03]
Nitz 2004 (8)	-0.21	0.4	24	21	0.8%	0.81 [0.37, 1.78]
Oliveira 2024	-0.1508	0.1428	280	304	3.8%	0.86 [0.65, 1.14]
Robertson 2001a	-0.62	0.26	121	119	1.7%	0.54 [0.32, 0.90]
Sakamoto 2013	-0.18	0.12	410	455	4.5%	0.84 [0.66, 1.06]
Sales 2017	0.15	0.32	27	21	1.2%	1.16 [0.62, 2.18]
Siegrist 2016	-0.62	0.22	222	156	2.2%	0.54 [0.35, 0.83]
Skelton 2005 (9)	-0.37	0.17	50	31	3.1%	0.69 [0.50, 0.96]
Smulders 2010	-0.49	0.22	47	45	2.2%	0.61 [0.40, 0.94]
Sturnieks 2024	-0.3011	0.1422	252	255	3.8%	0.74 [0.56, 0.98]
Trombetti 2011	-0.78	0.27	66	68	1.6%	0.46 [0.27, 0.78]
Weerdesteyn 2006	-0.63	0.32	30	28	1.2%	0.53 [0.28, 1.00]
Wolf 1996 (10)	-0.01	0.16	64	28	3.3%	0.99 [0.72, 1.35]
Subtotal (95% CI)			**5047**	**4571**	**100.0%**	**0.76 [0.70, 0.82]**
Heterogeneity: Tau² = 0.02; Chi² = 67.33, df = 44 (P = 0.01); I² = 35%						
Test for overall effect: Z = 7.33 (P < 0.00001)						
1.2.2 Resistance exercise vs control						
Ansai 2015 (11)	0.73	0.21	23	22	16.9%	2.08 [1.37, 3.13]
Carter 2002	-0.13	0.52	40	40	12.4%	0.88 [0.32, 2.43]
Grahn Kronhed 2009	-0.29	0.31	34	31	15.6%	0.75 [0.41, 1.37]
Karinkanta 2007 (12)	-0.51	0.45	37	36	13.5%	0.60 [0.25, 1.45]
Liu-Ambrose 2004 (13)	0.59	0.39	32	32	14.4%	1.80 [0.84, 3.87]
Rogers 2021 (c) (14)	-1.204	0.5605	25	27	11.8%	0.30 [0.10, 0.90]
Stanmore 2019	-1.1712	0.3375	56	50	15.2%	0.31 [0.16, 0.60]
Subtotal (95% CI)			**247**	**238**	**100.0%**	**0.78 [0.42, 1.48]**
Heterogeneity: Tau² = 0.58; Chi² = 33.25, df = 6 (P < 0.00001); I² = 82%						
Test for overall effect: Z = 0.75 (P = 0.46)						
1.2.3 3D exercise (Tai Chi) vs control						
Day 2015 (15)	-0.07	0.14	204	205	11.4%	0.93 [0.71, 1.23]
Li 2005	-0.8	0.22	95	93	9.7%	0.45 [0.29, 0.69]
Li 2018 (16)	-0.8747	0.0967	224	223	12.1%	0.42 [0.34, 0.50]
Logghe 2009	0.15	0.15	138	131	11.2%	1.16 [0.87, 1.56]
Taylor 2012 (17)	0.12	0.09	233	115	12.2%	1.13 [0.95, 1.35]
Taylor 2012 (18)	-0.17	0.1	220	115	12.1%	0.84 [0.69, 1.03]
Voukelatos 2007	-0.4	0.19	347	337	10.4%	0.67 [0.46, 0.97]
Wolf 1996 (19)	-0.48	0.18	72	64	10.6%	0.62 [0.43, 0.88]
Wolf 2003	-0.29	0.19	145	141	10.4%	0.75 [0.52, 1.09]
Subtotal (95% CI)			**1678**	**1424**	**100.0%**	**0.74 [0.56, 0.97]**
Heterogeneity: Tau² = 0.15; Chi² = 76.41, df = 8 (P < 0.00001); I² = 90%						
Test for overall effect: Z = 2.17 (P = 0.03)						
1.2.4 3D exercise (Ditangquan) vs control						
Li 2022	-2.1203	1.028	35	36	100.0%	0.12 [0.02, 0.90]
Subtotal (95% CI)			**35**	**36**	**100.0%**	**0.12 [0.02, 0.90]**
Heterogeneity: Not applicable						
Test for overall effect: Z = 2.06 (P = 0.04)						
1.2.5 3D exercise (dance) vs control						
Merom 2016	0.29	0.16	275	247	100.0%	1.34 [0.98, 1.83]
Subtotal (95% CI)			**275**	**247**	**100.0%**	**1.34 [0.98, 1.83]**
Heterogeneity: Not applicable						
Test for overall effect: Z = 1.81 (P = 0.07)						
1.2.6 Walking programme vs control						
Ebrahim 1997	0.43	0.25	52	50	36.7%	1.54 [0.94, 2.51]
Rogers 2021 (b) (20)	-0.821	0.456	25	27	22.8%	0.44 [0.18, 1.08]
Voukelatos 2015	-0.13	0.2	159	180	40.5%	0.88 [0.59, 1.30]
Subtotal (95% CI)			**236**	**257**	**100.0%**	**0.92 [0.52, 1.65]**
Heterogeneity: Tau² = 0.18; Chi² = 6.62, df = 2 (P = 0.04); I² = 70%						
Test for overall effect: Z = 0.28 (P = 0.78)						
1.2.7 Multiple categories of exercise vs control						
Ansai 2015 (21)	-0.18	0.26	22	22	3.8%	0.84 [0.50, 1.39]
Bates 2022	-0.0943	0.1876	290	289	4.8%	0.91 [0.63, 1.31]
Bruce 2021	-0.0101	0.0718	2500	2493	6.3%	0.99 [0.86, 1.14]
Buchner 1997	-0.49	0.22	70	30	4.3%	0.61 [0.40, 0.94]
Bunout 2005	0.2	0.29	111	130	3.4%	1.22 [0.69, 2.16]
Clemson 2012 (22)	-0.21	0.19	105	105	4.8%	0.81 [0.56, 1.18]
Coyle 2020	0.077	0.2069	123	125	4.5%	1.08 [0.72, 1.62]
Delbaere 2021	-0.1744	0.0786	254	249	6.3%	0.84 [0.72, 0.98]
Fahlstrom 2018	0.0953	0.3266	87	72	3.0%	1.10 [0.58, 2.09]
Giangrego 2018	-0.0305	0.2624	0	0	3.8%	0.97 [0.58, 1.62]
Irez 2011	-1.26	0.34	30	30	2.9%	0.28 [0.15, 0.55]
Karinkanta 2007 (23)	0.38	0.36	36	36	2.7%	1.46 [0.72, 2.96]
Lehtola 2000	-1.56	0.71	92	39	1.0%	0.21 [0.05, 0.84]
Li 2018 (2) (24)	-0.5099	0.0857	0	0	6.2%	0.60 [0.51, 0.71]
Liu-Ambrose 2021 (25)	-0.4463	0.1912	172	172	4.7%	0.64 [0.44, 0.93]
Lytras 2022	-1.0217	0.166	75	75	5.1%	0.36 [0.26, 0.50]
Means 2005	-0.9	0.22	144	94	4.3%	0.41 [0.26, 0.63]
Rikkonen 2023	-0.1427	0.054	457	457	6.5%	0.87 [0.78, 0.96]
Rogers 2021 (a) (26)	-1.3471	0.6695	25	27	1.1%	0.26 [0.07, 0.97]
Rubenstein 2000	-0.17	0.39	31	28	2.5%	0.84 [0.39, 1.81]
Sherrington 2020	-0.0408	0.1685	168	168	5.1%	0.96 [0.69, 1.34]
Suikkanen 2021	-0.755	0.0823	150	149	6.2%	0.47 [0.40, 0.55]
Suzuki 2004	-1.05	0.47	22	22	1.9%	0.35 [0.14, 0.88]
Uusi-Rasi 2015	-0.22	0.19	86	89	4.8%	0.80 [0.55, 1.16]
Subtotal (95% CI)			**5050**	**4901**	**100.0%**	**0.71 [0.61, 0.83]**
Heterogeneity: Tau² = 0.09; Chi² = 124.01, df = 23 (P < 0.00001); I² = 81%						
Test for overall effect: Z = 4.35 (P < 0.0001)						



Test for subgroup differences: Chi² = 16.68, df = 6 (P = 0.01), I² = 64.0%

Footnotes
(1) LiFE (Lifestyle approach to reducing Falls through Exercise) programme - progressive balance and strength training embedded in daily life activities...
(2) Group based balance training on foam rubber vs Control
(3) Group based balance training on stable surface vs Control
(4) Individual Otago Exercise Programme vs Control
(5) Group based FaME plus home training based on Otago Exercise Programme vs Control
(6) Group based balance and agility training vs Control
(7) Supervised agility training vs Flexibility training
(8) Group based balance vs Group based gentle exercise and stretching
(9) Group based FaME balance and strength training plus home practice vs Individual seated gentle exercise
(10) Individual computerised balance training on force platform vs Control
(11) Group based progressive strength vs Control
(12) Group based resistance training vs Control
(13) Supervised high-intensity resistance training vs Flexibility training
(14) hip abduction strengthening training vs control
(15) Group based Tai chi vs Group based flexibility training
(16) Tai chi vs stretching
(17) Group based Tai Chi 1x/week vs Group based seated gentle lower limb exercise
(18) Group based Tai Chi 2x/week vs Group based seated gentle lower limb exercise
(19) Group based Tai Chi vs Control
(20) Step training vs control
(21) Group based balance, strength and aerobic vs Control
(22) Individual balance and strength training vs Low intensity flexibility and balance training
(23) Combined group based balance, agility and resistance training vs Control
(24) multimodal exercise vs stretching
(25) adjusted for sex
(26) Step training + hip abduction strengthening training vs control

Figure 3: Exercise versus control – Mean time to fall

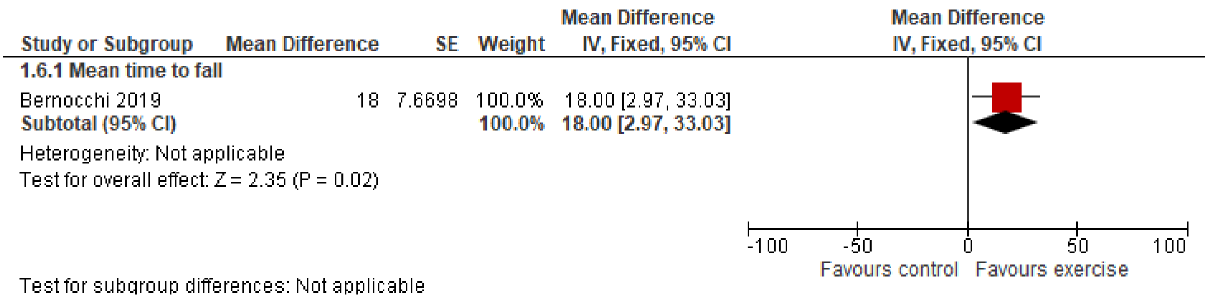
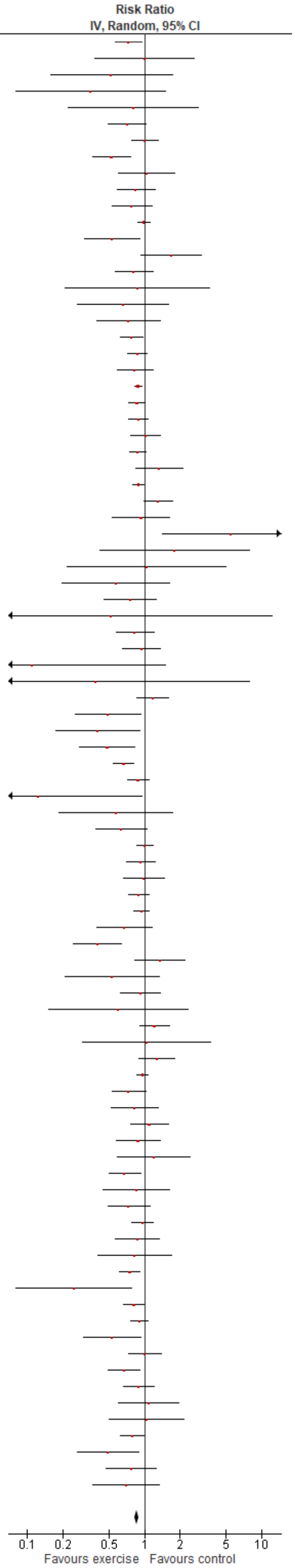


Figure 4: Exercise versus control – Number of fallers

Study or Subgroup	log[Risk Ratio]	SE	Exercise Total	Control Total	Weight	Risk Ratio IV, Random, 95% CI
Altamirano 2022	-0.3109	0.1307	222	156	1.8%	0.73 [0.57, 0.95]
Ansai 2015 (1)	0	0.5	23	11	0.2%	1.00 [0.38, 2.66]
Ansai 2015 (2)	-0.65	0.61	22	11	0.1%	0.52 [0.16, 1.73]
Arantes 2015	-1.06	0.75	15	13	0.1%	0.35 [0.08, 1.51]
Arkkukangas 2015	-0.22	0.65	27	13	0.1%	0.80 [0.22, 2.87]
Barnett 2003	-0.34	0.19	76	74	1.1%	0.71 [0.49, 1.03]
Bates 2022	0.0093	0.1363	290	289	1.7%	1.01 [0.77, 1.32]
Bernocchi 2019	-0.6499	0.1898	122	123	1.1%	0.52 [0.36, 0.76]
Beyer 2007	0.04	0.28	24	29	0.6%	1.04 [0.60, 1.80]
Boongrid 2017	-0.17	0.19	218	219	1.1%	0.84 [0.58, 1.22]
Brown 2002	-0.25	0.2	39	32	1.0%	0.78 [0.53, 1.15]
Bruce 2021	-0.0139	0.0602	2500	2493	3.3%	0.99 [0.88, 1.11]
Buchner 1997	-0.63	0.28	70	30	0.6%	0.53 [0.31, 0.92]
Bunout 2005	0.52	0.3	111	130	0.5%	1.68 [0.93, 3.03]
Campbell 1997	-0.21	0.19	116	117	1.1%	0.81 [0.56, 1.18]
Cerny 1998	-0.14	0.72	15	13	0.1%	0.87 [0.21, 3.57]
Clegg 2014	-0.42	0.46	40	30	0.2%	0.66 [0.27, 1.62]
Clemson 2010	-0.31	0.32	17	14	0.5%	0.73 [0.39, 1.37]
Clemson 2012 (3)	-0.25	0.11	99	46	2.2%	0.78 [0.63, 0.97]
Clemson 2012 (4)	-0.14	0.1	96	46	2.4%	0.87 [0.71, 1.06]
Cornillon 2002	-0.19	0.18	150	153	1.2%	0.83 [0.58, 1.18]
Dadgari 2016	-0.12	0.04	160	157	3.8%	0.89 [0.82, 0.96]
Dangour 2011	-0.15	0.08	325	294	2.8%	0.86 [0.74, 1.01]
Day 2002	-0.12	0.1	135	137	2.4%	0.89 [0.73, 1.08]
Day 2015 (5)	0.02	0.15	204	205	1.5%	1.02 [0.76, 1.37]
Delbaere 2021	-0.1393	0.0826	254	249	2.8%	0.87 [0.74, 1.02]
Ebrahim 1997	0.29	0.24	52	50	0.8%	1.34 [0.83, 2.14]
El-Khoury 2015	-0.12	0.06	306	294	3.3%	0.89 [0.79, 1.00]
Giangrego 2018	0.2735	0.1423	71	70	1.6%	1.31 [0.99, 1.74]
Grede 2024	-0.066	0.2902	84	83	0.6%	0.94 [0.53, 1.65]
Halvarsson 2013	1.69	0.68	30	18	0.1%	5.42 [1.43, 20.55]
Halvarsson 2016 (6)	0.59	0.75	18	13	0.1%	1.80 [0.41, 7.85]
Halvarsson 2016 (7)	0.04	0.8	25	13	0.1%	1.04 [0.22, 4.99]
Hamrick 2017	-0.56	0.54	19	19	0.2%	0.57 [0.20, 1.65]
Hauer 2001	-0.28	0.26	31	25	0.7%	0.76 [0.45, 1.26]
Huang 2010	-0.65	1.61	31	47	0.0%	0.52 [0.02, 12.25]
Iliffe 2015 (8)	-0.19	0.19	230	126	1.1%	0.83 [0.57, 1.20]
Iliffe 2015 (9)	-0.06	0.19	227	126	1.1%	0.94 [0.65, 1.37]
Iwamoto 2009	-2.21	1.34	34	33	0.0%	0.11 [0.01, 1.52]
Kamide 2009	-0.97	1.55	20	23	0.0%	0.38 [0.02, 7.91]
Kerse 2010	0.16	0.16	98	95	1.4%	1.17 [0.86, 1.61]
Kim 2014	-0.72	0.33	51	52	0.4%	0.49 [0.25, 0.93]
Kovacs 2013	-0.92	0.42	36	36	0.3%	0.40 [0.17, 0.91]
Li 2005	-0.73	0.28	95	93	0.6%	0.48 [0.28, 0.83]
Li 2018 (10)	-0.406	0.1034	224	112	2.3%	0.67 [0.54, 0.82]
Li 2018 (2) (11)	-0.1223	0.1063	223	111	2.3%	0.88 [0.72, 1.09]
Li 2022	-2.0794	1.0334	35	35	0.0%	0.13 [0.02, 0.95]
Liang 2020	-0.5596	0.5711	30	30	0.2%	0.57 [0.19, 1.75]
Liu-Ambrose 2008	-0.45	0.26	28	24	0.7%	0.64 [0.38, 1.06]
Liu-Ambrose 2019	0.0096	0.0867	172	172	2.7%	1.01 [0.85, 1.20]
Logghe 2009	-0.07	0.14	138	131	1.7%	0.93 [0.71, 1.23]
Lord 1995	-0.01	0.21	75	94	0.9%	0.99 [0.66, 1.49]
Lord 2003	-0.11	0.1	259	249	2.4%	0.90 [0.74, 1.09]
Luukinen 2007	-0.06	0.08	217	220	2.8%	0.94 [0.81, 1.10]
McMurdo 1997	-0.39	0.28	44	48	0.6%	0.68 [0.39, 1.17]
Means 2005	-0.92	0.24	144	94	0.8%	0.40 [0.25, 0.64]
Merom 2016	0.3	0.25	275	247	0.7%	1.35 [0.83, 2.20]
Miko 2017	-0.63	0.47	49	48	0.2%	0.53 [0.21, 1.34]
Morgan 2004	-0.08	0.2	119	110	1.0%	0.92 [0.62, 1.37]
Ng 2015	-0.51	0.7	46	46	0.1%	0.60 [0.15, 2.37]
Oliveira 2024	0.1983	0.1491	280	304	1.5%	1.22 [0.91, 1.63]
Park 2008	0.04	0.64	22	23	0.1%	1.04 [0.30, 3.65]
Reinsch 1992	0.25	0.18	129	101	1.2%	1.28 [0.90, 1.83]
Rikkonen 2023	-0.0366	0.0543	457	457	3.5%	0.96 [0.87, 1.07]
Robertson 2001a	-0.31	0.17	121	119	1.3%	0.73 [0.53, 1.02]
Rogers 2021 (a)	-0.1882	0.2358	24	26	0.8%	0.83 [0.52, 1.32]
Rogers 2021 (b)	0.0964	0.1895	25	26	1.1%	1.10 [0.76, 1.60]
Rogers 2021 (c)	-0.1252	0.2204	26	26	0.9%	0.88 [0.57, 1.36]
Rubenstein 2000	0.18	0.36	31	28	0.4%	1.20 [0.59, 2.42]
Sakamoto 2013	-0.39	0.16	410	455	1.4%	0.68 [0.49, 0.93]
Sales 2017	-0.16	0.33	27	21	0.4%	0.85 [0.45, 1.63]
Siegrist 2016	-0.31	0.21	222	156	0.9%	0.73 [0.49, 1.11]
Skelton 2005 (12)	-0.04	0.11	43	27	2.2%	0.96 [0.77, 1.19]
Smulders 2010	-0.14	0.22	47	45	0.9%	0.87 [0.56, 1.34]
Stanmore 2019	-0.2003	0.3693	56	50	0.4%	0.82 [0.40, 1.69]
Sturnieks 2024	-0.2895	0.106	252	255	2.3%	0.75 [0.61, 0.92]
Suzuki 2004	-1.39	0.58	22	22	0.2%	0.25 [0.08, 0.78]
Taylor 2012 (13)	-0.21	0.1	210	107	2.4%	0.81 [0.67, 0.99]
Taylor 2012 (14)	-0.1	0.09	222	107	2.6%	0.90 [0.76, 1.08]
Trombetti 2011	-0.63	0.29	66	68	0.6%	0.53 [0.30, 0.94]
Uusi-Rasi 2015	0.01	0.16	86	89	1.4%	1.01 [0.74, 1.38]
Voukelatos 2007	-0.4	0.16	347	337	1.4%	0.67 [0.49, 0.92]
Voukelatos 2015	-0.11	0.15	159	180	1.5%	0.90 [0.67, 1.20]
Wang 2022a	0.077	0.3034	70	63	0.5%	1.08 [0.60, 1.96]
Weerdesteyn 2006	0.04	0.37	30	28	0.4%	1.04 [0.50, 2.15]
Wolf 2003	-0.24	0.12	145	141	2.0%	0.79 [0.62, 1.00]
Woo 2007 (15)	-0.71	0.31	58	30	0.5%	0.49 [0.27, 0.90]
Woo 2007 (16)	-0.26	0.25	59	30	0.7%	0.77 [0.47, 1.26]
Yang 2012	-0.36	0.33	59	62	0.4%	0.70 [0.37, 1.33]
Total (95% CI)			**12611**	**11454**	**100.0%**	**0.86 [0.82, 0.90]**

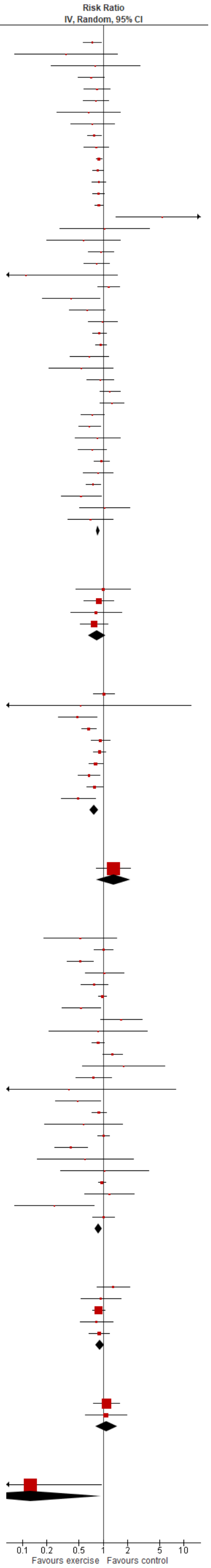
Heterogeneity: Tau² = 0.01; Chi² = 140.32, df = 88 (P = 0.0003); I² = 37%
Test for overall effect: Z = 6.38 (P < 0.00001)



Footnotes
(1) Group based progressive strength vs Control
(2) Group based balance, strength and aerobic vs Control
(3) LiFE (Lifestyle approach to reducing Falls through Exercise) programme - progressive balance and strength training embedded in daily life...
(4) Individual balance and strength training vs Low intensity flexibility and balance training
(5) Group based Tai chi v Group based flexibility training
(6) Group based progressive balance training plus walking vs Control
(7) Group based progressive balance training vs Control
(8) Group based FaME plus home training based on Otago Exercise Programme vs Control
(9) Individual Otago Exercise Programme vs Control
(10) Tai chi vs stretching
(11) multimodal exercise vs stretching
(12) Group based FaME balance and strength training plus home practice vs Individual seated gentle exercise
(13) Group based Tai Chi 2x/week vs Group based seated gentle lower limb exercise
(14) Group based Tai Chi 1x/week vs Group based seated gentle lower limb exercise
(15) Group based Tai Chi vs Control
(16) Group based resistance training vs Control

Figure 5: Exercise vs control – Number of fallers subgrouped by exercise type

Study or Subgroup	log[Risk Ratio]	SE	Exercise Total	Control Total	Weight	Risk Ratio IV, Random, 95% CI
2.6.1 Balance and functional exercises vs control						
Altamirano 2022	-0.3109	0.1307	222	156	3.2%	0.73 [0.57, 0.95]
Arantes 2015	-1.06	0.75	15	13	0.1%	0.35 [0.08, 1.51]
Arkkukangas 2015	-0.22	0.65	27	13	0.2%	0.80 [0.22, 2.87]
Barnett 2003	-0.34	0.19	76	74	1.7%	0.71 [0.49, 1.03]
Boongrid 2017	-0.17	0.19	218	219	1.7%	0.84 [0.58, 1.22]
Campbell 1997	-0.21	0.19	116	117	1.7%	0.81 [0.56, 1.18]
Clegg 2014	-0.42	0.46	40	30	0.3%	0.66 [0.27, 1.62]
Clemson 2010	-0.31	0.32	17	14	0.6%	0.73 [0.39, 1.37]
Clemson 2012 (1)	-0.25	0.1	99	91	4.8%	0.78 [0.64, 0.95]
Cornillon 2002	-0.19	0.18	150	153	1.8%	0.83 [0.58, 1.18]
Dadgari 2016	-0.12	0.04	160	157	12.2%	0.89 [0.82, 0.96]
Dangour 2011	-0.15	0.08	325	294	6.5%	0.86 [0.74, 1.01]
Day 2002	-0.12	0.1	135	137	4.8%	0.89 [0.73, 1.08]
Delbaere 2021	-0.1393	0.0826	254	249	6.2%	0.87 [0.74, 1.02]
El-Khoury 2015	-0.12	0.06	306	294	8.9%	0.89 [0.79, 1.00]
Halvarsson 2013	1.69	0.68	30	18	0.1%	5.42 [1.43, 20.55]
Halvarsson 2016 (2)	0.04	0.65	25	26	0.2%	1.04 [0.29, 3.72]
Hamrick 2017	-0.56	0.54	19	19	0.2%	0.57 [0.20, 1.65]
Iliffe 2015 (3)	-0.06	0.19	227	126	1.7%	0.94 [0.65, 1.37]
Iliffe 2015 (4)	-0.19	0.19	230	126	1.7%	0.83 [0.57, 1.20]
Iwamoto 2009	-2.21	1.34	34	33	0.0%	0.11 [0.01, 1.52]
Kerse 2010	0.16	0.16	98	95	2.3%	1.17 [0.86, 1.61]
Kovacs 2013	-0.92	0.42	36	36	0.4%	0.40 [0.17, 0.91]
Liu-Ambrose 2008	-0.45	0.26	28	24	0.9%	0.64 [0.38, 1.06]
Lord 1995	-0.01	0.21	75	94	1.4%	0.99 [0.66, 1.49]
Lord 2003	-0.11	0.1	259	249	4.8%	0.90 [0.74, 1.09]
Luukinen 2007	-0.06	0.08	217	220	6.5%	0.94 [0.81, 1.10]
McMurdo 1997	-0.39	0.28	44	48	0.8%	0.68 [0.39, 1.17]
Miko 2017	-0.63	0.47	49	48	0.3%	0.53 [0.21, 1.34]
Morgan 2004	-0.08	0.2	119	110	1.5%	0.92 [0.62, 1.37]
Oliveira 2024	0.1983	0.1491	280	304	2.6%	1.22 [0.91, 1.63]
Reinsch 1992	0.25	0.18	129	101	1.8%	1.28 [0.90, 1.83]
Robertson 2001a	-0.31	0.17	121	119	2.0%	0.73 [0.53, 1.02]
Sakamoto 2013	-0.39	0.16	410	455	2.3%	0.68 [0.49, 0.93]
Sales 2017	-0.16	0.33	27	21	0.6%	0.85 [0.45, 1.63]
Siegrist 2016	-0.31	0.21	222	156	1.4%	0.73 [0.49, 1.11]
Skelton 2005 (5)	-0.04	0.11	43	27	4.2%	0.96 [0.77, 1.19]
Smulders 2010	-0.14	0.22	47	45	1.3%	0.87 [0.56, 1.34]
Sturnieks 2024	-0.2895	0.106	252	255	4.4%	0.75 [0.61, 0.92]
Trombetti 2011	-0.63	0.29	66	68	0.8%	0.53 [0.30, 0.94]
Weerdesteyn 2006	0.04	0.37	30	28	0.5%	1.04 [0.50, 2.15]
Yang 2012	-0.36	0.33	59	62	0.6%	0.70 [0.37, 1.33]
Subtotal (95% CI)			**5336**	**4924**	**100.0%**	**0.86 [0.82, 0.91]**
Heterogeneity: Tau² = 0.00; Chi² = 49.54, df = 41 (P = 0.17); I² = 17%						
Test for overall effect: Z = 5.76 (P < 0.00001)						
2.6.2 Resistance exercise vs control						
Ansai 2015 (6)	0	0.4	23	22	10.6%	1.00 [0.46, 2.19]
Rogers 2021 (c)	-0.1252	0.2204	26	26	34.8%	0.88 [0.57, 1.36]
Stanmore 2019	-0.2003	0.3693	56	50	12.4%	0.82 [0.40, 1.69]
Woo 2007 (7)	-0.26	0.2	59	59	42.3%	0.77 [0.52, 1.14]
Subtotal (95% CI)			**164**	**157**	**100.0%**	**0.84 [0.65, 1.08]**
Heterogeneity: Tau² = 0.00; Chi² = 0.43, df = 3 (P = 0.93); I² = 0%						
Test for overall effect: Z = 1.37 (P = 0.17)						
2.6.3 3D exercise (Tai Chi) vs control						
Day 2015 (8)	0.02	0.15	204	205	10.4%	1.02 [0.76, 1.37]
Huang 2010	-0.65	1.61	31	47	0.2%	0.52 [0.02, 12.25]
Li 2005	-0.73	0.28	95	93	4.3%	0.48 [0.28, 0.83]
Li 2018	-0.406	0.1034	224	223	14.7%	0.67 [0.54, 0.82]
Logghe 2009	-0.07	0.14	138	131	11.2%	0.93 [0.71, 1.23]
Taylor 2012 (9)	-0.1	0.09	222	107	16.2%	0.90 [0.76, 1.08]
Taylor 2012 (10)	-0.21	0.1	210	107	15.1%	0.81 [0.67, 0.99]
Voukelatos 2007	-0.4	0.16	347	337	9.6%	0.67 [0.49, 0.92]
Wolf 2003	-0.24	0.12	145	141	13.0%	0.79 [0.62, 1.00]
Woo 2007 (11)	-0.71	0.25	58	59	5.2%	0.49 [0.30, 0.80]
Subtotal (95% CI)			**1674**	**1450**	**100.0%**	**0.78 [0.68, 0.88]**
Heterogeneity: Tau² = 0.02; Chi² = 17.19, df = 9 (P = 0.05); I² = 48%						
Test for overall effect: Z = 3.92 (P < 0.0001)						
2.6.4 3D exercise (dance) vs control						
Merom 2016	0.3	0.25	275	247	100.0%	1.35 [0.83, 2.20]
Subtotal (95% CI)			**275**	**247**	**100.0%**	**1.35 [0.83, 2.20]**
Heterogeneity: Not applicable						
Test for overall effect: Z = 1.20 (P = 0.23)						
2.6.5 Multiple categories of exercise vs control						
Ansai 2015 (12)	-0.65	0.53	22	22	1.0%	0.52 [0.18, 1.48]
Bates 2022	0.0093	0.1363	290	289	6.8%	1.01 [0.77, 1.32]
Bernocchi 2019	-0.6499	0.1898	122	123	4.9%	0.52 [0.36, 0.76]
Beyer 2007	0.04	0.28	24	29	3.0%	1.04 [0.60, 1.80]
Brown 2002	-0.25	0.2	39	32	4.6%	0.78 [0.53, 1.15]
Bruce 2021	-0.0139	0.0602	2500	2493	9.9%	0.99 [0.88, 1.11]
Buchner 1997	-0.63	0.28	70	30	3.0%	0.53 [0.31, 0.92]
Bunout 2005	0.52	0.3	111	130	2.7%	1.68 [0.93, 3.03]
Cerny 1998	-0.14	0.72	15	13	0.6%	0.87 [0.21, 3.57]
Clemson 2012 (13)	-0.14	0.09	96	91	8.7%	0.87 [0.73, 1.04]
Giangrego 2018	0.2735	0.1423	71	70	6.5%	1.31 [0.99, 1.74]
Halvarsson 2016 (14)	0.59	0.6	18	26	0.8%	1.80 [0.56, 5.85]
Hauer 2001	-0.28	0.26	31	25	3.3%	0.76 [0.45, 1.26]
Kamide 2009	-0.97	1.55	20	23	0.1%	0.38 [0.02, 7.91]
Kim 2014	-0.72	0.33	51	52	2.3%	0.49 [0.25, 0.93]
Li 2018 (2) (15)	-0.1223	0.1063	223	111	8.0%	0.88 [0.72, 1.09]
Liang 2020	-0.5596	0.5711	30	30	0.9%	0.57 [0.19, 1.75]
Liu-Ambrose 2019	0.0096	0.0867	172	172	8.9%	1.01 [0.85, 1.20]
Means 2005	-0.92	0.24	144	94	3.7%	0.40 [0.25, 0.64]
Ng 2015	-0.51	0.7	46	46	0.6%	0.60 [0.15, 2.37]
Park 2008	0.04	0.64	22	23	0.7%	1.04 [0.30, 3.65]
Rikkonen 2023	-0.0366	0.0543	457	457	10.2%	0.96 [0.87, 1.07]
Rubenstein 2000	0.18	0.36	31	28	2.0%	1.20 [0.59, 2.42]
Suzuki 2004	-1.39	0.58	22	22	0.9%	0.25 [0.08, 0.78]
Uusi-Rasi 2015	0.01	0.16	86	89	5.9%	1.01 [0.74, 1.38]
Subtotal (95% CI)			**4713**	**4520**	**100.0%**	**0.87 [0.78, 0.98]**
Heterogeneity: Tau² = 0.03; Chi² = 54.17, df = 24 (P = 0.0004); I² = 56%						
Test for overall effect: Z = 2.39 (P = 0.02)						
2.6.6 Walking programme vs control						
Ebrahim 1997	0.29	0.24	52	50	7.9%	1.34 [0.83, 2.14]
Grede 2024	-0.066	0.2902	84	83	5.4%	0.94 [0.53, 1.65]
Li 2018	-0.1257	0.0885	223	223	58.2%	0.88 [0.74, 1.05]
Rogers 2021 (a)	-0.1882	0.2358	24	26	8.2%	0.83 [0.52, 1.32]
Voukelatos 2015	-0.11	0.15	159	180	20.3%	0.90 [0.67, 1.20]
Subtotal (95% CI)			**542**	**562**	**100.0%**	**0.91 [0.80, 1.04]**
Heterogeneity: Tau² = 0.00; Chi² = 2.87, df = 4 (P = 0.58); I² = 0%						
Test for overall effect: Z = 1.36 (P = 0.18)						
2.6.7 Step and slip exercises vs control						
Rogers 2021 (b)	0.0964	0.1895	25	26	71.9%	1.10 [0.76, 1.60]
Wang 2022a	0.077	0.3034	70	63	28.1%	1.08 [0.60, 1.96]
Subtotal (95% CI)			**95**	**89**	**100.0%**	**1.10 [0.80, 1.50]**
Heterogeneity: Tau² = 0.00; Chi² = 0.00, df = 1 (P = 0.96); I² = 0%						
Test for overall effect: Z = 0.57 (P = 0.57)						
2.6.8 3D exercise (ditangguan) vs control						
Li 2022	-2.0794	1.0334	35	35	100.0%	0.13 [0.02, 0.95]
Subtotal (95% CI)			**35**	**35**	**100.0%**	**0.13 [0.02, 0.95]**
Heterogeneity: Not applicable						
Test for overall effect: Z = 2.01 (P = 0.04)						



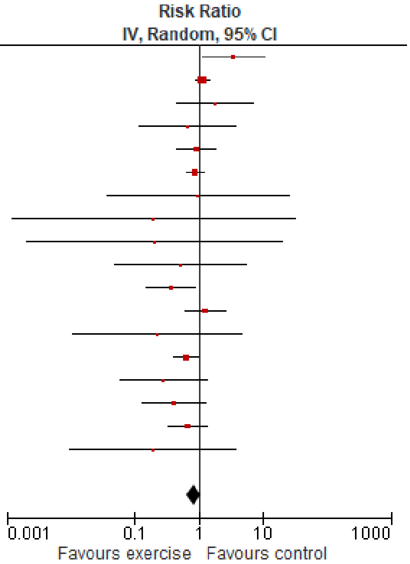
Test for subgroup differences: Chi² = 12.37, df = 7 (P = 0.09), I² = 43.4%

Footnotes
(1) LiFE (Lifestyle approach to reducing Falls through Exercise) programme - progressive balance and strength training embedded in daily life activities...
(2) Group based progressive balance training vs Control
(3) Individual Otago Exercise Programme vs Control
(4) Group based FaME plus home training based on Otago Exercise Programme vs Control
(5) Group based FaME balance and strength training plus home practice vs Individual seated gentle exercise
(6) Group based progressive strength vs Control
(7) Group based resistance training vs Control
(8) Group based Tai chi v Group based flexibility training
(9) Group based Tai Chi 1x/week vs Group based seated gentle lower limb exercise
(10) Group based Tai Chi 2x/week vs Group based seated gentle lower limb exercise
(11) Group based Tai Chi vs Control
(12) Group based balance, strength and aerobic vs Control
(13) Individual balance and strength training vs Low intensity flexibility and balance training
(14) Group based progressive balance training plus walking vs Control
(15) multimodal exercise vs stretching

Figure 6: Exercise vs control – Number of people sustaining fall related fractures

Study or Subgroup	log[Risk Ratio]	SE	Exercise Total	Control Total	Weight	Risk Ratio IV, Random, 95% CI
Bates 2022	1.2493	0.5608	290	289	4.2%	3.49 [1.16, 10.47]
Bruce 2021	0.1186	0.1281	3279	3223	19.6%	1.13 [0.88, 1.45]
Dangour 2011	0.59	0.7	325	294	2.9%	1.80 [0.46, 7.11]
Ebrahim 1997	-0.42	0.89	49	48	1.9%	0.66 [0.11, 3.76]
Giangrego 2018	-0.0942	0.3632	71	70	8.2%	0.91 [0.45, 1.85]
Gill 2016	-0.14	0.16	818	817	17.6%	0.87 [0.64, 1.19]
Karinkanta 2007 (1)	-0.0274	1.66	37	12	0.6%	0.97 [0.04, 25.18]
Karinkanta 2007 (2)	-1.64	2.6	36	12	0.2%	0.19 [0.00, 31.69]
Karinkanta 2007 (3)	-1.61	2.35	35	12	0.3%	0.20 [0.00, 20.00]
Kim 2014	-0.67	1.21	51	52	1.1%	0.51 [0.05, 5.48]
Korpelainen 2006	-1.02	0.45	84	76	6.0%	0.36 [0.15, 0.87]
Liu-Ambrose 2019	0.2231	0.372	172	172	7.9%	1.25 [0.60, 2.59]
McMurdo 1997	-1.51	1.54	44	48	0.7%	0.22 [0.01, 4.52]
Rikkonen 2023	-0.4745	0.2314	457	457	13.5%	0.62 [0.40, 0.98]
Robertson 2001a	-1.27	0.79	121	119	2.3%	0.28 [0.06, 1.32]
Sakamoto 2013	-0.91	0.58	410	455	4.0%	0.40 [0.13, 1.25]
Sherrington 2020	-0.4055	0.3563	168	168	8.4%	0.67 [0.33, 1.34]
Smulders 2010	-1.66	1.52	47	45	0.7%	0.19 [0.01, 3.74]
Total (95% CI)			**6494**	**6369**	**100.0%**	**0.83 [0.64, 1.06]**

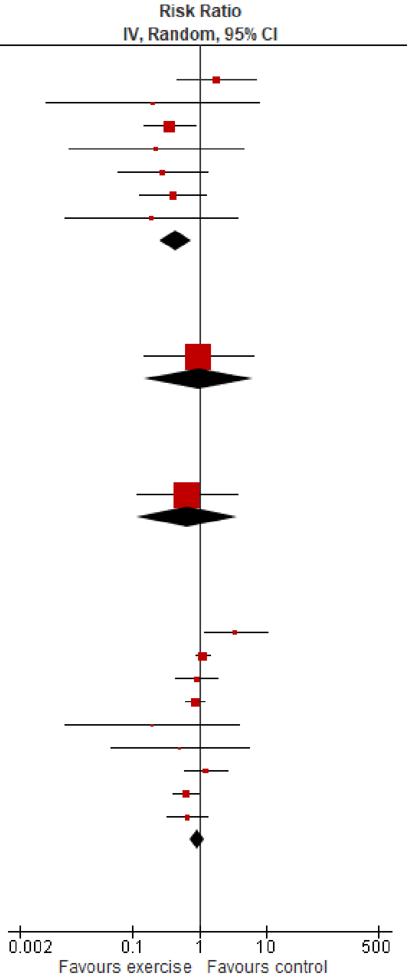
Heterogeneity: $Tau^2 = 0.07$; $Chi^2 = 25.17$, $df = 17$ ($P = 0.09$); $I^2 = 32\%$
Test for overall effect: $Z = 1.51$ ($P = 0.13$)



Footnotes
(1) Group based resistance training vs Control
(2) Combined group based balance, agility and resistance training vs Control
(3) Group based balance and agility training vs Control

Figure 7: Exercise vs control – Number of people sustaining fall related fractures sub grouped by exercise type

Study or Subgroup	log[Risk Ratio]	SE	Exercise Total	Control Total	Weight	Risk Ratio IV, Random, 95% CI
3.4.1 Balance and functional exercises vs control						
Dangour 2011	0.59	0.7	325	294	16.1%	1.80 [0.46, 7.11]
Karinkanta 2007 (1)	-1.61	1.88	35	36	2.2%	0.20 [0.01, 7.96]
Korpelainen 2006	-1.02	0.45	84	76	38.9%	0.36 [0.15, 0.87]
McMurdo 1997	-1.51	1.54	44	48	3.3%	0.22 [0.01, 4.52]
Robertson 2001a	-1.27	0.79	121	119	12.6%	0.28 [0.06, 1.32]
Sakamoto 2013	-0.91	0.58	410	455	23.4%	0.40 [0.13, 1.25]
Smulders 2010	-1.66	1.52	47	45	3.4%	0.19 [0.01, 3.74]
Subtotal (95% CI)			**1066**	**1073**	**100.0%**	**0.44 [0.25, 0.76]**
Heterogeneity: Tau² = 0.00; Chi² = 5.29, df = 6 (P = 0.51); I² = 0%						
Test for overall effect: Z = 2.91 (P = 0.004)						
3.4.2 Resistance exercise vs control						
Karinkanta 2007 (2)	-0.0321	0.971	37	36	100.0%	0.97 [0.14, 6.49]
Subtotal (95% CI)			**37**	**36**	**100.0%**	**0.97 [0.14, 6.49]**
Heterogeneity: Not applicable						
Test for overall effect: Z = 0.03 (P = 0.97)						
3.4.3 Walking programme vs control						
Ebrahim 1997	-0.42	0.89	49	48	100.0%	0.66 [0.11, 3.76]
Subtotal (95% CI)			**49**	**48**	**100.0%**	**0.66 [0.11, 3.76]**
Heterogeneity: Not applicable						
Test for overall effect: Z = 0.47 (P = 0.64)						
3.4.4 Multiple categories of exercise vs control						
Bates 2022	1.2493	0.5608	290	289	4.8%	3.49 [1.16, 10.47]
Bruce 2021	0.1186	0.1281	3279	3223	25.5%	1.13 [0.88, 1.45]
Giangrego 2018	-0.0942	0.3632	71	70	9.6%	0.91 [0.45, 1.85]
Gill 2016	-0.14	0.16	818	817	22.5%	0.87 [0.64, 1.19]
Karinkanta 2007 (3)	-1.6361	1.5319	36	36	0.7%	0.19 [0.01, 3.92]
Kim 2014	-0.67	1.21	51	52	1.2%	0.51 [0.05, 5.48]
Liu-Ambrose 2019	0.2231	0.372	172	172	9.3%	1.25 [0.60, 2.59]
Rikkonen 2023	-0.4745	0.2314	457	457	16.6%	0.62 [0.40, 0.98]
Sherrington 2020	-0.4055	0.3563	168	168	9.9%	0.67 [0.33, 1.34]
Subtotal (95% CI)			**5342**	**5284**	**100.0%**	**0.93 [0.72, 1.21]**
Heterogeneity: Tau² = 0.05; Chi² = 13.66, df = 8 (P = 0.09); I² = 41%						
Test for overall effect: Z = 0.51 (P = 0.61)						



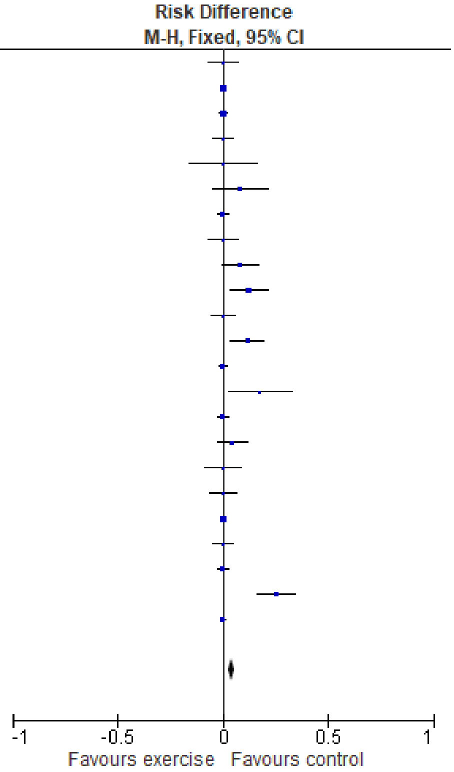
Test for subgroup differences: Chi² = 5.92, df = 3 (P = 0.12), I² = 49.3%

Footnotes
(1) Group based balance and agility training vs Control
(2) Group based resistance training vs Control
(3) Combined group based balance, agility and resitance training vs Control

Figure 8: Exercise vs control – Adverse events

Study or Subgroup	Exercise Events	Exercise Total	Control Events	Control Total	Weight	Risk Difference M-H, Fixed, 95% CI
Almeida 2013	0	28	0	26	1.4%	0.00 [-0.07, 0.07]
Altamirano 2022	0	222	0	156	9.4%	0.00 [-0.01, 0.01]
Boongrid 2017	2	218	2	219	11.3%	0.00 [-0.02, 0.02]
Carter 2002	0	40	0	40	2.1%	0.00 [-0.05, 0.05]
Costa 2022	0	10	0	12	0.6%	0.00 [-0.16, 0.16]
Giangrego 2018	18	71	12	70	3.6%	0.08 [-0.05, 0.22]
Gschwind 2015	0	71	0	65	3.5%	0.00 [-0.03, 0.03]
Hauer 2001	0	31	0	25	1.4%	0.00 [-0.07, 0.07]
Iliffe 2015 (1)	59	230	22	126	8.4%	0.08 [-0.01, 0.17]
Iliffe 2015 (2) (2)	69	227	23	126	8.3%	0.12 [0.03, 0.21]
Iwamoto 2009	0	34	0	33	1.7%	0.00 [-0.06, 0.06]
Latham 2003	18	112	5	110	5.7%	0.12 [0.04, 0.19]
Li 2018	0	95	0	93	4.8%	0.00 [-0.02, 0.02]
Liu-Ambrose 2004 (3)	7	34	1	32	1.7%	0.17 [0.03, 0.32]
Lytras 2022	0	75	0	75	3.9%	0.00 [-0.03, 0.03]
Ng 2015	2	46	0	46	2.4%	0.04 [-0.03, 0.11]
Nitz 2004	0	24	0	21	1.2%	0.00 [-0.08, 0.08]
Rubenstein 2000	0	28	0	31	1.5%	0.00 [-0.06, 0.06]
Siegrist 2016	0	222	0	156	9.4%	0.00 [-0.01, 0.01]
Skelton 2005	0	50	0	31	2.0%	0.00 [-0.05, 0.05]
Trombetti 2011	0	66	0	68	3.5%	0.00 [-0.03, 0.03]
Uusi-Rasi 2015	25	95	1	95	4.9%	0.25 [0.16, 0.34]
Wolf 2003	0	145	0	141	7.4%	0.00 [-0.01, 0.01]
Total (95% CI)		**2174**		**1797**	**100.0%**	**0.04 [0.03, 0.06]**
Total events	200		66			

Heterogeneity: Chi² = 272.13, df = 22 (P < 0.00001); I² = 92%
Test for overall effect: Z = 5.92 (P < 0.00001)

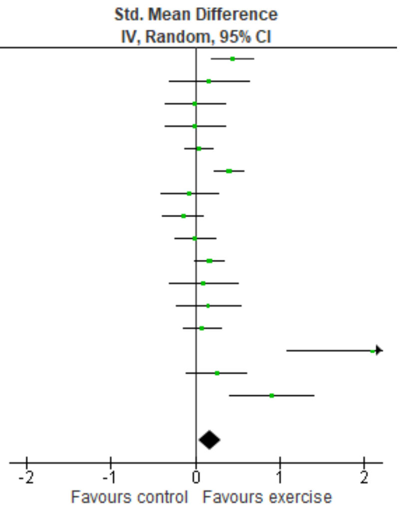


Footnotes
(1) FaME
(2) Individual Otago
(3) Agility training vs control

Figure 9: Exercise vs control – Quality of life (general)

Study or Subgroup	Exercise Mean	Exercise SD	Exercise Total	Control Mean	Control SD	Control Total	Weight	Std. Mean Difference IV, Random, 95% CI
Bernocchi 2019	63.8	22.3165	122	53.5	24.0904	123	7.3%	0.44 [0.19, 0.70]
Clegg 2014	0.51	0.34	40	0.46	0.26	30	4.3%	0.16 [-0.31, 0.63]
Clemson 2012 (1)	6.7	1.5	99	6.7	1.3	46	5.8%	0.00 [-0.35, 0.35]
Clemson 2012 (2)	6.7	1.6	96	6.7	1.3	46	5.8%	0.00 [-0.35, 0.35]
Dangour 2011	51.1	14.3	325	50.6	8.9	294	8.9%	0.04 [-0.12, 0.20]
Delbaere 2021	0.88	0.05	254	0.86	0.05	249	8.6%	0.40 [0.22, 0.58]
Gschwind 2015	0.86	0.15	71	0.87	0.13	65	6.0%	-0.07 [-0.41, 0.27]
Iliffe 2015 (3)	0.67	0.07	179	0.68	0.07	106	7.6%	-0.14 [-0.38, 0.10]
Iliffe 2015 (4)	0.68	0.07	176	0.68	0.07	106	7.5%	0.00 [-0.24, 0.24]
Oliveira 2024	84.2	14.52	257	81.65	15.31	252	8.6%	0.17 [-0.00, 0.34]
Smulders 2010	73.8	10.6	47	72.7	11	45	5.0%	0.10 [-0.31, 0.51]
Stanmore 2019	70.6	21.1	56	67.2	22.7	50	5.4%	0.15 [-0.23, 0.54]
Voukelatos 2015	0.84	0.12	144	0.83	0.13	169	7.9%	0.08 [-0.14, 0.30]
Yalfani 2022	69.62	12.53	13	38.94	15.68	12	1.4%	2.10 [1.09, 3.11]
Yang 2012	76.6	4.1	59	75.4	5.2	62	5.7%	0.25 [-0.10, 0.61]
Zhang 2022	73.8	6.7	34	65.2	11.5	34	4.0%	0.90 [0.40, 1.40]
Total (95% CI)			**1972**			**1689**	**100.0%**	**0.18 [0.05, 0.31]**

Heterogeneity: Tau² = 0.04; Chi² = 48.68, df = 15 (P < 0.0001); I² = 69%
Test for overall effect: Z = 2.69 (P = 0.007)



Footnotes
(1) LiFE (Lifestyle approach to reducing Falls through Exercise) programme - progressive balance and strength training embedded in daily life activities vs...
(2) Individual balance and strength training vs Low intensity flexibility and balance training
(3) Group based FaME plus home training based on Otago Exercise Programme vs Control
(4) Individual Otago Exercise Programme vs Control

Figure 10: Exercise vs control – Quality of life (general) sub grouped by exercise type

Study or Subgroup	Exercise Mean	Exercise SD	Exercise Total	Control Mean	Control SD	Control Total	Weight	Std. Mean Difference IV, Random, 95% CI
6.2.1 Balance and functional exercises vs control								
Clegg 2014	0.51	0.34	40	0.46	0.26	30	4.3%	0.16 [-0.31, 0.63]
Clemson 2012 (1)	6.7	1.6	96	6.7	1.3	46	5.8%	0.00 [-0.35, 0.35]
Clemson 2012 (2)	6.7	1.5	99	6.7	1.3	46	5.8%	0.00 [-0.35, 0.35]
Dangour 2011	51.1	14.3	325	50.6	8.9	294	8.9%	0.04 [-0.12, 0.20]
Delbaere 2021	0.88	0.05	254	0.86	0.05	249	8.6%	0.40 [0.22, 0.58]
Gschwind 2015	0.86	0.15	71	0.87	0.13	65	6.0%	-0.07 [-0.41, 0.27]
Iliffe 2015 (3)	0.68	0.07	176	0.68	0.07	106	7.5%	0.00 [-0.24, 0.24]
Iliffe 2015 (4)	0.67	0.07	179	0.68	0.07	106	7.6%	-0.14 [-0.38, 0.10]
Oliveira 2024	84.2	14.52	257	81.65	15.31	252	8.6%	0.17 [-0.00, 0.34]
Smulders 2010	73.8	10.6	47	72.7	11	45	5.0%	0.10 [-0.31, 0.51]
Yang 2012	76.6	4.1	59	75.4	5.2	62	5.7%	0.25 [-0.10, 0.61]
Subtotal (95% CI)			**1603**			**1301**	**74.0%**	**0.09 [-0.02, 0.20]**
Heterogeneity: Tau² = 0.01; Chi² = 19.08, df = 10 (P = 0.04); I² = 48%								
Test for overall effect: Z = 1.66 (P = 0.10)								
6.2.2 Resistance exercise vs control								
Stanmore 2019	70.6	21.1	56	67.2	22.7	50	5.4%	0.15 [-0.23, 0.54]
Zhang 2022	73.8	6.7	34	65.2	11.5	34	4.0%	0.90 [0.40, 1.40]
Subtotal (95% CI)			**90**			**84**	**9.4%**	**0.51 [-0.22, 1.24]**
Heterogeneity: Tau² = 0.23; Chi² = 5.44, df = 1 (P = 0.02); I² = 82%								
Test for overall effect: Z = 1.37 (P = 0.17)								
6.2.3 Walking programme vs control								
Voukelatos 2015	0.84	0.12	144	0.83	0.13	169	7.9%	0.08 [-0.14, 0.30]
Subtotal (95% CI)			**144**			**169**	**7.9%**	**0.08 [-0.14, 0.30]**
Heterogeneity: Not applicable								
Test for overall effect: Z = 0.70 (P = 0.48)								
6.2.4 Virtual reality vs control								
Yalfani 2022	69.62	12.53	13	38.94	15.68	12	1.4%	2.10 [1.09, 3.11]
Subtotal (95% CI)			**13**			**12**	**1.4%**	**2.10 [1.09, 3.11]**
Heterogeneity: Not applicable								
Test for overall effect: Z = 4.08 (P < 0.0001)								
6.2.6 Multiple categories vs control								
Bernocchi 2019	63.8	22.3165	122	53.5	24.0904	123	7.3%	0.44 [0.19, 0.70]
Subtotal (95% CI)			**122**			**123**	**7.3%**	**0.44 [0.19, 0.70]**
Heterogeneity: Not applicable								
Test for overall effect: Z = 3.42 (P = 0.0006)								
Total (95% CI)			**1972**			**1689**	**100.0%**	**0.18 [0.05, 0.31]**
Heterogeneity: Tau² = 0.04; Chi² = 48.68, df = 15 (P < 0.0001); I² = 69%								
Test for overall effect: Z = 2.69 (P = 0.007)								
Test for subgroup differences: Chi² = 21.76, df = 4 (P = 0.0002), I² = 81.6%								

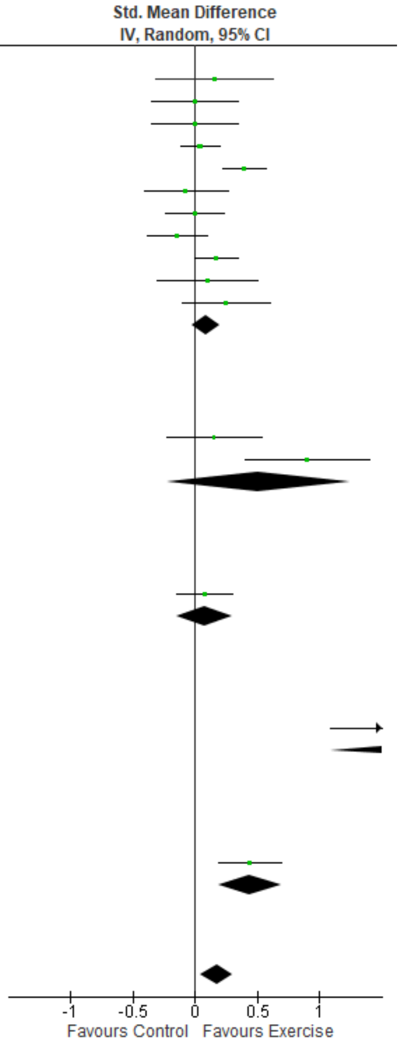


Figure 11: Exercise vs control – Quality of life (Mental component)

Study or Subgroup	Exercise Mean	Exercise SD	Exercise Total	Control Mean	Control SD	Control Total	Weight	Std. Mean Difference IV, Random, 95% CI
Bates 2022	54.4	5	227	54.2	4.8	228	10.3%	0.04 [-0.14, 0.22]
Bjerk 2020	52	1.1	77	53.1	1.3	78	9.8%	-0.91 [-1.24, -0.58]
Bruce 2021	50.3	9.1	2500	50	9	2493	10.6%	0.03 [-0.02, 0.09]
Costa 2022	63.75	12.4278	10	68.06	10.1152	12	7.0%	-0.37 [-1.22, 0.48]
Dangour 2011	49.2	6.3	325	48.3	6.3	294	10.4%	0.14 [-0.02, 0.30]
Grahn Kronhed 2009	53	8	31	47.6	11	34	9.0%	0.55 [0.05, 1.05]
Kerse 2010	55.4	0.7	94	52.7	0.01	87	8.3%	5.33 [4.70, 5.96]
Lin 2007	69.9	11.4	39	68.8	10.6	40	9.3%	0.10 [-0.34, 0.54]
Merom 2016	52.7	8.7	274	51.8	8.2	247	10.4%	0.11 [-0.07, 0.28]
Resnick 2002	47	5.2	10	46.8	3.2	7	6.4%	0.04 [-0.92, 1.01]
Sales 2017	54.5	7	27	51.6	7.9	21	8.6%	0.39 [-0.19, 0.96]
Total (95% CI)			**3614**			**3541**	**100.0%**	**0.45 [0.07, 0.84]**
Heterogeneity: Tau² = 0.37; Chi² = 312.37, df = 10 (P < 0.00001); I² = 97%								
Test for overall effect: Z = 2.30 (P = 0.02)								

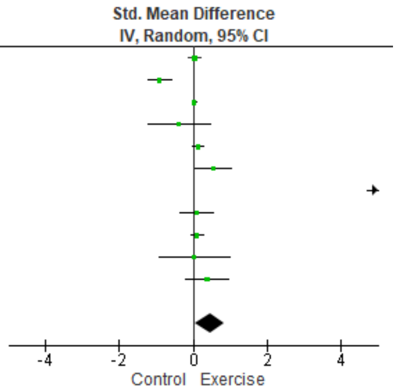


Figure 12: Exercise vs control – Quality of life (Mental component) – sub grouped by exercise type

	Exercise			Control				Std. Mean Difference
Study or Subgroup	Mean	SD	Total	Mean	SD	Total	Weight	IV, Random, 95% CI
7.2.1 Balance and functional exercises vs control								
Costa 2022	63.75	12.4278	10	68.06	10.1152	12	7.0%	-0.37 [-1.22, 0.48]
Dangour 2011	49.2	6.3	325	48.3	6.3	294	10.4%	0.14 [-0.02, 0.30]
Kerse 2010	55.4	0.7	94	52.7	0.01	87	8.2%	5.33 [4.70, 5.96]
Lin 2007	69.9	11.4	39	68.8	10.6	40	9.3%	0.10 [-0.34, 0.54]
Sales 2017	54.5	7	27	51.6	7.9	21	8.5%	0.39 [-0.19, 0.96]
Subtotal (95% CI)			**495**			**454**	**43.5%**	**1.11 [-0.46, 2.69]**
Heterogeneity: Tau² = 3.15; Chi² = 252.54, df = 4 (P < 0.00001); I² = 98%								
Test for overall effect: Z = 1.39 (P = 0.17)								
7.2.2 Multiple categories of exercise vs control								
Bates 2022	54.4	5	227	54.2	4.8	228	10.4%	0.04 [-0.14, 0.22]
Bjerk 2020	52	1.1	77	53.1	1.3	78	9.8%	-0.91 [-1.24, -0.58]
Bruce 2021	50.3	9.1	3279	50	9	3223	10.6%	0.03 [-0.02, 0.08]
Subtotal (95% CI)			**3583**			**3529**	**30.8%**	**-0.24 [-0.62, 0.15]**
Heterogeneity: Tau² = 0.10; Chi² = 30.49, df = 2 (P < 0.00001); I² = 93%								
Test for overall effect: Z = 1.22 (P = 0.22)								
7.2.3 Resistance exercise vs control								
Grahn Kronhed 2009	53	8	31	47.6	11	34	9.0%	0.55 [0.05, 1.05]
Subtotal (95% CI)			**31**			**34**	**9.0%**	**0.55 [0.05, 1.05]**
Heterogeneity: Not applicable								
Test for overall effect: Z = 2.17 (P = 0.03)								
7.2.4 3D exercise (Dance) vs control								
Merom 2016	52.7	8.7	274	51.8	8.2	247	10.4%	0.11 [-0.07, 0.28]
Subtotal (95% CI)			**274**			**247**	**10.4%**	**0.11 [-0.07, 0.28]**
Heterogeneity: Not applicable								
Test for overall effect: Z = 1.21 (P = 0.23)								
7.2.5 Walking vs control								
Resnick 2002	47	5.2	10	46.8	3.2	7	6.3%	0.04 [-0.92, 1.01]
Subtotal (95% CI)			**10**			**7**	**6.3%**	**0.04 [-0.92, 1.01]**
Heterogeneity: Not applicable								
Test for overall effect: Z = 0.09 (P = 0.93)								
Total (95% CI)			**4393**			**4271**	**100.0%**	**0.45 [0.07, 0.83]**
Heterogeneity: Tau² = 0.35; Chi² = 312.70, df = 10 (P < 0.00001); I² = 97%								
Test for overall effect: Z = 2.33 (P = 0.02)								
Test for subgroup differences: Chi² = 7.76, df = 4 (P = 0.10), I² = 48.5%								

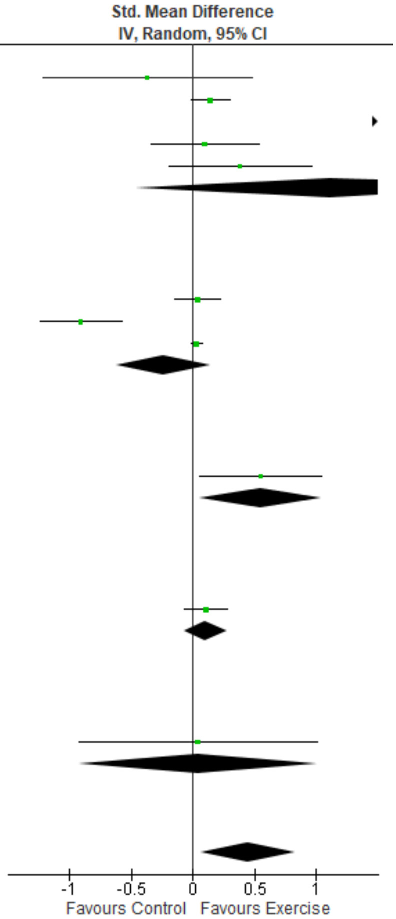


Figure 13: Exercise vs control – Quality of life (Physical component)

	Exercise			Control				Std. Mean Difference
Study or Subgroup	Mean	SD	Total	Mean	SD	Total	Weight	IV, Random, 95% CI
Bates 2022	48.5	7.6	227	47.2	8.7	228	9.3%	0.16 [-0.03, 0.34]
Bjerk 2020	41.3	1.1	77	38.4	1.3	78	7.8%	2.40 [1.98, 2.81]
Bruce 2021	50.4	10	3279	49.9	10	3223	9.7%	0.05 [0.00, 0.10]
Costa 2022	60	11.76	10	64.39	10.5	12	4.8%	-0.38 [-1.23, 0.47]
Dangour 2011	51.1	14.3	325	50.6	8.9	294	9.4%	0.04 [-0.12, 0.20]
Grahn Kronhed 2009	46.9	8.8	31	35.7	9.4	34	6.9%	1.21 [0.68, 1.75]
Kerse 2010	38.3	1.2	94	39.4	1.2	87	8.6%	-0.91 [-1.22, -0.61]
Latham 2003	35	10.6815	112	37	10.5835	110	8.9%	-0.19 [-0.45, 0.08]
Lin 2007	62.8	9.9	39	55.5	15.3	40	7.6%	0.56 [0.11, 1.01]
Merom 2016	41.8	10.3	275	42.6	9.9	247	9.3%	-0.08 [-0.25, 0.09]
Resnick 2002	33.4	4.8	10	31.2	4.9	7	4.1%	0.43 [-0.55, 1.41]
Rubenstein 2000	65	17.4	28	60.6	20.3	27	6.9%	0.23 [-0.30, 0.76]
Sales 2017	49.6	8.3	27	48.9	7.6	21	6.7%	0.09 [-0.48, 0.66]
Total (95% CI)			**4534**			**4408**	**100.0%**	**0.26 [-0.01, 0.52]**
Heterogeneity: Tau² = 0.18; Chi² = 192.37, df = 12 (P < 0.00001); I² = 94%								
Test for overall effect: Z = 1.92 (P = 0.06)								

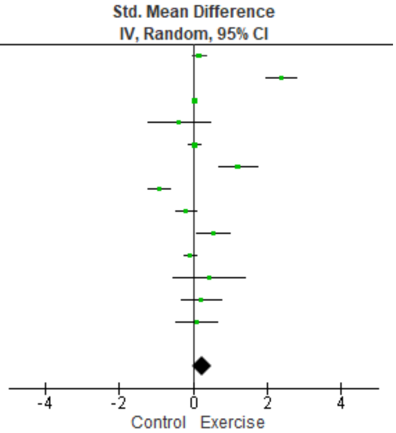


Figure 14: Exercise vs control – Quality of life (Physical component) – subgrouped by exercise type

Study or Subgroup	Exercise Mean	Exercise SD	Exercise Total	Control Mean	Control SD	Control Total	Weight	Std. Mean Difference IV, Random, 95% CI
8.2.1 Balance and functional exercises vs control								
Costa 2022	60	11.76	10	64.39	10.5	12	4.8%	-0.38 [-1.23, 0.47]
Dangour 2011	51.1	14.3	325	50.6	8.9	294	9.4%	0.04 [-0.12, 0.20]
Kerse 2010	38.3	1.2	94	39.4	1.2	87	8.6%	-0.91 [-1.22, -0.61]
Lin 2007	62.8	9.9	39	55.5	15.3	40	7.6%	0.56 [0.11, 1.01]
Sales 2017	49.6	8.3	27	48.9	7.6	21	6.7%	0.09 [-0.48, 0.66]
Subtotal (95% CI)			**495**			**454**	**37.0%**	**-0.12 [-0.64, 0.40]**
Heterogeneity: Tau² = 0.30; Chi² = 39.13, df = 4 (P < 0.00001); I² = 90%								
Test for overall effect: Z = 0.45 (P = 0.66)								
8.2.2 Multiple categories of exercise vs control								
Bates 2022	48.5	7.6	227	47.2	8.7	228	9.3%	0.16 [-0.03, 0.34]
Bjerk 2020	41.3	1.1	77	38.4	1.3	78	7.8%	2.40 [1.98, 2.81]
Bruce 2021	50.4	10	3279	49.9	10	3223	9.7%	0.05 [0.00, 0.10]
Rubenstein 2000	65	17.4	28	60.6	20.3	27	6.9%	0.23 [-0.30, 0.76]
Subtotal (95% CI)			**3611**			**3556**	**33.8%**	**0.69 [0.02, 1.35]**
Heterogeneity: Tau² = 0.43; Chi² = 122.02, df = 3 (P < 0.00001); I² = 98%								
Test for overall effect: Z = 2.03 (P = 0.04)								
8.2.3 Resistance exercise vs control								
Grahn Kronhed 2009	46.9	8.8	31	35.7	9.4	34	6.9%	1.21 [0.68, 1.75]
Latham 2003	35	10.6815	112	37	10.5835	110	8.9%	-0.19 [-0.45, 0.08]
Subtotal (95% CI)			**143**			**144**	**15.8%**	**0.49 [-0.88, 1.87]**
Heterogeneity: Tau² = 0.94; Chi² = 21.37, df = 1 (P < 0.00001); I² = 95%								
Test for overall effect: Z = 0.70 (P = 0.48)								
8.2.4 Walking programme vs control								
Resnick 2002	33.4	4.8	10	31.2	4.9	7	4.1%	0.43 [-0.55, 1.41]
Subtotal (95% CI)			**10**			**7**	**4.1%**	**0.43 [-0.55, 1.41]**
Heterogeneity: Not applicable								
Test for overall effect: Z = 0.86 (P = 0.39)								
8.2.5 3D exercise (Dance) vs control								
Merom 2016	41.8	10.3	275	42.6	9.9	247	9.3%	-0.08 [-0.25, 0.09]
Subtotal (95% CI)			**275**			**247**	**9.3%**	**-0.08 [-0.25, 0.09]**
Heterogeneity: Not applicable								
Test for overall effect: Z = 0.90 (P = 0.37)								
Total (95% CI)			**4534**			**4408**	**100.0%**	**0.26 [-0.01, 0.52]**
Heterogeneity: Tau² = 0.18; Chi² = 192.37, df = 12 (P < 0.00001); I² = 94%								
Test for overall effect: Z = 1.92 (P = 0.06)								
Test for subgroup differences: Chi² = 6.32, df = 4 (P = 0.18), I² = 36.7%								

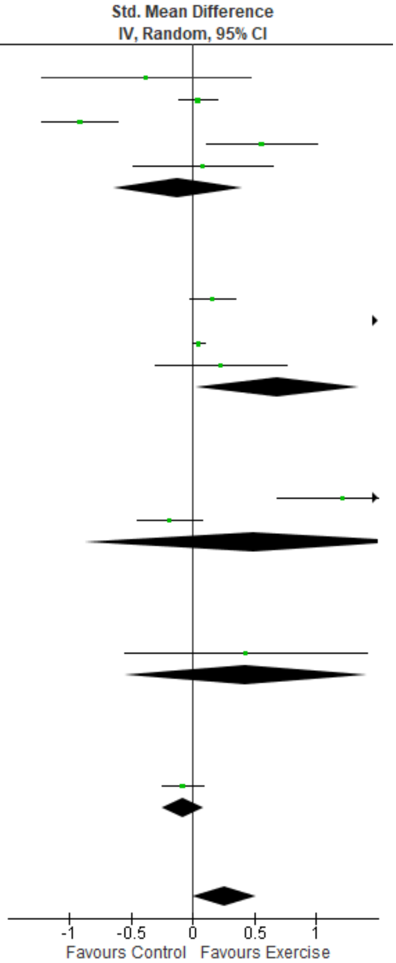
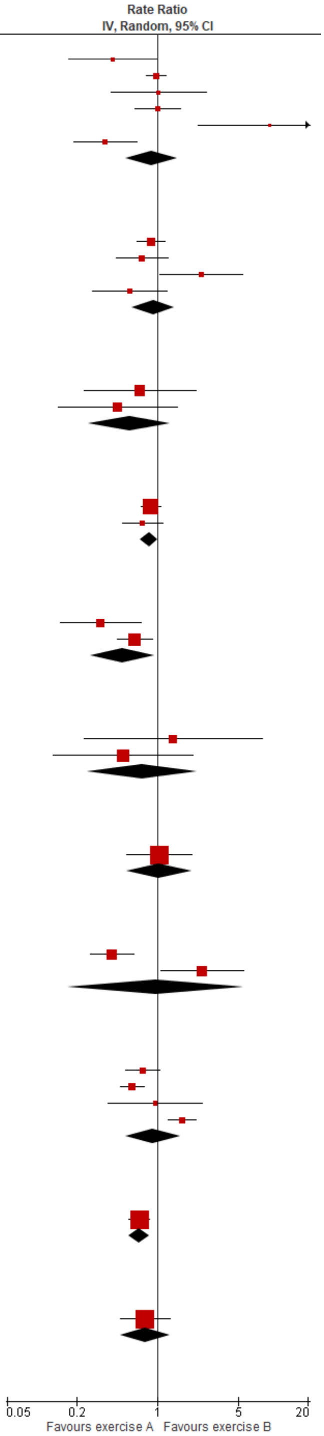


Figure 15: Exercise vs exercise – Rate of falls

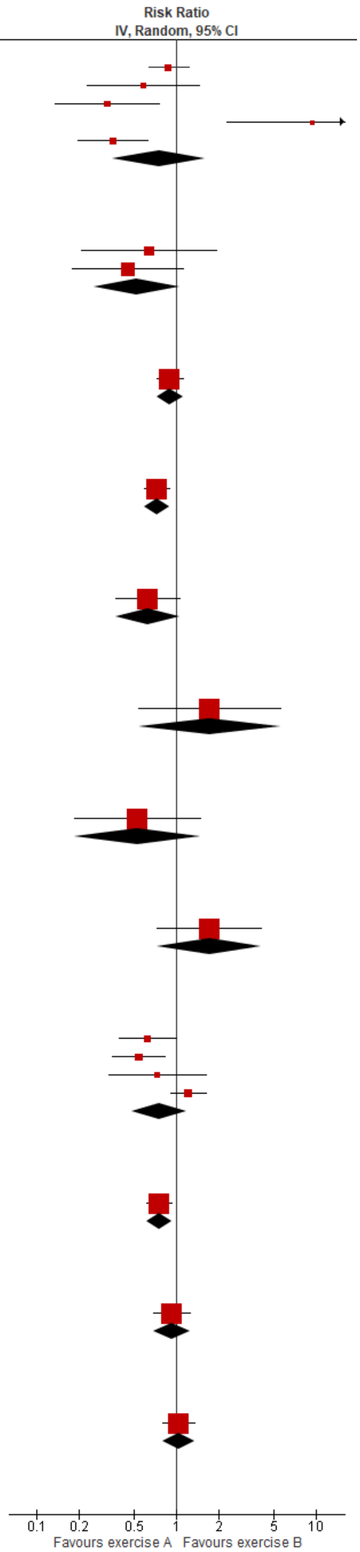
Study or Subgroup	log[Rate Ratio]	SE	Exercise A Total	Exercise B Total	Weight	Rate Ratio IV, Random, 95% CI
11.1.1 Balance and functional exercises vs balance and functional exercises						
Hirase 2015 (1)	-0.89	0.45	29	29	14.5%	0.41 [0.17, 0.99]
Iliffe 2015 (2)	-0.03	0.1	230	227	24.2%	0.97 [0.80, 1.18]
Liston 2014 (3)	0.02	0.49	7	8	13.4%	1.02 [0.39, 2.67]
Steadman 2003 (4)	0	0.23	69	64	21.0%	1.00 [0.64, 1.57]
Yamada 2012 (5)	2.24	0.73	73	72	8.6%	9.39 [2.25, 39.28]
Yamada 2013 (6)	-1.05	0.32	112	118	18.3%	0.35 [0.19, 0.66]
Subtotal (95% CI)			**520**	**518**	**100.0%**	**0.88 [0.52, 1.47]**
Heterogeneity: Tau² = 0.28; Chi² = 22.91, df = 5 (P = 0.0004); I² = 78%						
Test for overall effect: Z = 0.51 (P = 0.61)						
11.1.2 Balance and functional exercises vs resistance exercises						
Davis 2011 (7)	-0.13	0.14	52	49	37.5%	0.88 [0.67, 1.16]
Davis 2011 (8)	-0.31	0.26	54	49	27.1%	0.73 [0.44, 1.22]
Karinkanta 2007 (9)	0.87	0.42	35	37	16.6%	2.39 [1.05, 5.44]
Liu-Ambrose 2004 (10)	-0.55	0.38	34	32	18.8%	0.58 [0.27, 1.22]
Subtotal (95% CI)			**175**	**167**	**100.0%**	**0.91 [0.60, 1.40]**
Heterogeneity: Tau² = 0.11; Chi² = 7.37, df = 3 (P = 0.06); I² = 59%						
Test for overall effect: Z = 0.42 (P = 0.67)						
11.1.3 Balance and functional exercises vs walking						
Shigematsu 2008 (11)	-0.36	0.57	32	36	53.4%	0.70 [0.23, 2.13]
Yamada 2010 (12)	-0.8	0.61	29	29	46.6%	0.45 [0.14, 1.49]
Subtotal (95% CI)			**61**	**65**	**100.0%**	**0.57 [0.25, 1.29]**
Heterogeneity: Tau² = 0.00; Chi² = 0.28, df = 1 (P = 0.60); I² = 0%						
Test for overall effect: Z = 1.36 (P = 0.17)						
11.1.4 Balance and functional exercises vs multiple categories of exercise						
Clemson 2012 (13)	-0.14	0.1	107	105	81.6%	0.87 [0.71, 1.06]
Hager 2024	-0.3011	0.2103	156	145	18.4%	0.74 [0.49, 1.12]
Subtotal (95% CI)			**263**	**250**	**100.0%**	**0.84 [0.71, 1.01]**
Heterogeneity: Tau² = 0.00; Chi² = 0.48, df = 1 (P = 0.49); I² = 0%						
Test for overall effect: Z = 1.88 (P = 0.06)						
11.1.5 3D (Tai Chi) vs balance and functional exercises						
Hwang 2016 (14)	-1.14	0.41	167	167	35.3%	0.32 [0.14, 0.71]
Wolf 1996 (15)	-0.46	0.18	72	64	64.7%	0.63 [0.44, 0.90]
Subtotal (95% CI)			**239**	**231**	**100.0%**	**0.50 [0.26, 0.94]**
Heterogeneity: Tau² = 0.13; Chi² = 2.31, df = 1 (P = 0.13); I² = 57%						
Test for overall effect: Z = 2.15 (P = 0.03)						
11.1.6 3D (Tai Chi) vs 3D (Tai Chi)						
Wu 2010 (16)	0.31	0.91	22	20	37.8%	1.36 [0.23, 8.11]
Wu 2010 (17)	-0.69	0.71	22	22	62.2%	0.50 [0.12, 2.02]
Subtotal (95% CI)			**44**	**42**	**100.0%**	**0.73 [0.24, 2.19]**
Heterogeneity: Tau² = 0.00; Chi² = 0.75, df = 1 (P = 0.39); I² = 0%						
Test for overall effect: Z = 0.56 (P = 0.58)						
11.1.7 Multiple categories of exercise vs balance and functional exercises						
Karinkanta 2007 (18)	0.03	0.33	36	35	100.0%	1.03 [0.54, 1.97]
Subtotal (95% CI)			**36**	**35**	**100.0%**	**1.03 [0.54, 1.97]**
Heterogeneity: Not applicable						
Test for overall effect: Z = 0.09 (P = 0.93)						
11.1.8 Multiple categories of exercise vs resistance exercises						
Ansai 2015 (19)	-0.91	0.22	22	22	52.0%	0.40 [0.26, 0.62]
Karinkanta 2007 (20)	0.89	0.42	36	37	48.0%	2.44 [1.07, 5.55]
Subtotal (95% CI)			**58**	**59**	**100.0%**	**0.96 [0.16, 5.57]**
Heterogeneity: Tau² = 1.51; Chi² = 14.41, df = 1 (P = 0.0001); I² = 93%						
Test for overall effect: Z = 0.05 (P = 0.96)						
11.1.9 Multiple categories of exercise vs multiple categories of exercise						
Freiberger 2007 (21)	-0.3	0.17	65	62	27.2%	0.74 [0.53, 1.03]
Kemmler 2010 (22)	-0.51	0.12	115	112	28.6%	0.60 [0.47, 0.76]
Kwok 2016 (23)	-0.05	0.48	40	40	16.1%	0.95 [0.37, 2.44]
LaStayo 2017 (24)	0.49	0.14	54	58	28.1%	1.63 [1.24, 2.15]
Subtotal (95% CI)			**274**	**272**	**100.0%**	**0.91 [0.52, 1.58]**
Heterogeneity: Tau² = 0.26; Chi² = 30.67, df = 3 (P < 0.00001); I² = 90%						
Test for overall effect: Z = 0.35 (P = 0.73)						
11.1.10 Tai chi vs multimodal exercises						
Li 2018 (25)	-0.3651	0.1057	224	223	100.0%	0.69 [0.56, 0.85]
Subtotal (95% CI)			**224**	**223**	**100.0%**	**0.69 [0.56, 0.85]**
Heterogeneity: Not applicable						
Test for overall effect: Z = 3.45 (P = 0.0006)						
11.1.11 Perturbation exercise vs balance and functional exercise						
Lurie 2020 (26)	-0.2485	0.2585	187	190	100.0%	0.78 [0.47, 1.29]
Subtotal (95% CI)			**187**	**190**	**100.0%**	**0.78 [0.47, 1.29]**
Heterogeneity: Not applicable						
Test for overall effect: Z = 0.96 (P = 0.34)						



Footnotes
(1) Group based: balance training on foam rubber vs on stable surface
(2) Group based FaME + home training based on Otago Exercise Programme (OEP) vs OEP
(3) Group based: modified Otago Exercise Programme (OEP) + individual, partially supervised multisensory balance training vs modified OEP + individual, partially...
(4) Standard, individualised physiotherapy focused on functional training + balance training vs Standard, individualised physiotherapy focused on functional training
(5) Group based balance, strength, flexibility and gait training involving simple obstacle course vs Group based balance, strength, flexibility and gait training involving...
(6) Group based balance, strength, flexibility and gait training including stepping mat vs Group based balance, strength, flexibility and gait training plus indoor walking
(7) Group based: progressive high intensity resistance training twice weekly vs balance and tone
(8) Group based: progressive high intensity resistance training once weekly vs balance and tone
(9) Group based: balance and agility training vs resistance training
(10) Supervised agility training vs Supervised high-intensity resistance training
(11) Group based: stepping training on felt mat vs walking
(12) Group based: trail walking training vs indoor walking
(13) LiFE (Lifestyle approach to reducing Falls through Exercise) programme - progressive balance and strength training embedded in daily life activities vs...
(14) Individually supervised Tai Chi vs individually supervised balance and strength training
(15) Group based Tai Chi vs individual computerised balance training on force platform
(16) Individual supervised Tai Chi delivered via videoconferencing vs Group based Tai Chi
(17) Individual supervised Tai Chi delivered via videoconferencing vs individual Tai Chi with DVD instruction
(18) Combined group based balance, agility and resistance training vs group based balance and agility training
(19) Group based: balance, strength and aerobic vs progressive strength training
(20) Combined group based balance, agility and resistance training vs group based resistance training
(21) Group based: psychomotor programme vs balance, strength, flexibility, endurance training
(22) Group based: balance, gait, flexibility and strength training + home practice vs low intensity, low frequency balance and endurance training
(23) Group based balance, strength and aerobic training + home practice vs balance, strength and aerobic training using the Nintendo WiiActive
(24) Resisted lower limb exercise using recumbent stepper-ergometer vs resisted lower limb exercise in standing and leg press
(25) A: Tai chi, B: multimodal exercise
(26) A: pertubation, B: Standard balance training

Figure 16: Exercise vs exercise – Number of fallers

Study or Subgroup	log[Risk Ratio]	SE	Exercise A Total	Exercise B Total	Weight	Risk Ratio IV, Random, 95% CI
11.2.1 Balance and functional exercises vs balance and functional exercises						
Iliffe 2015 (1)	-0.13	0.17	230	227	24.9%	0.88 [0.63, 1.23]
Lurie 2013 (2)	-0.55	0.47	26	33	18.9%	0.58 [0.23, 1.45]
Verrusio 2017 (3)	-1.14	0.44	73	74	19.6%	0.32 [0.14, 0.76]
Yamada 2012 (4)	2.24	0.72	73	72	13.8%	9.39 [2.29, 38.52]
Yamada 2013 (5)	-1.05	0.29	112	118	22.8%	0.35 [0.20, 0.62]
Subtotal (95% CI)			**514**	**524**	**100.0%**	**0.75 [0.35, 1.60]**
Heterogeneity: Tau² = 0.58; Chi² = 23.84, df = 4 (P < 0.0001); I² = 83%						
Test for overall effect: Z = 0.75 (P = 0.46)						
11.2.2 Balance and functional exercises vs walking						
Shigematsu 2008 (6)	-0.45	0.57	32	36	40.5%	0.64 [0.21, 1.95]
Yamada 2010 (7)	-0.8	0.47	29	29	59.5%	0.45 [0.18, 1.13]
Subtotal (95% CI)			**61**	**65**	**100.0%**	**0.52 [0.25, 1.05]**
Heterogeneity: Tau² = 0.00; Chi² = 0.22, df = 1 (P = 0.64); I² = 0%						
Test for overall effect: Z = 1.82 (P = 0.07)						
11.2.3 Balance and functional exercises vs multiple categories of exercise						
Clemson 2012 (8)	-0.11	0.11	99	96	100.0%	0.90 [0.72, 1.11]
Subtotal (95% CI)			**99**	**96**	**100.0%**	**0.90 [0.72, 1.11]**
Heterogeneity: Not applicable						
Test for overall effect: Z = 1.00 (P = 0.32)						
11.2.4 3D (Tai Chi) vs balance and functional exercises						
Hwang 2016 (9)	-0.32	0.11	167	167	100.0%	0.73 [0.59, 0.90]
Subtotal (95% CI)			**167**	**167**	**100.0%**	**0.73 [0.59, 0.90]**
Heterogeneity: Not applicable						
Test for overall effect: Z = 2.91 (P = 0.004)						
11.2.5 3D (Tai Chi) vs resistance exercises						
Woo 2007 (10)	-0.47	0.27	58	59	100.0%	0.63 [0.37, 1.06]
Subtotal (95% CI)			**58**	**59**	**100.0%**	**0.63 [0.37, 1.06]**
Heterogeneity: Not applicable						
Test for overall effect: Z = 1.74 (P = 0.08)						
11.2.6 Multiple categories of exercise vs balance and functional exercises						
Halvarsson 2016 (11)	0.55	0.6	18	25	100.0%	1.73 [0.53, 5.62]
Subtotal (95% CI)			**18**	**25**	**100.0%**	**1.73 [0.53, 5.62]**
Heterogeneity: Not applicable						
Test for overall effect: Z = 0.92 (P = 0.36)						
11.2.7 Multiple categories of exercise vs resistance exercises						
Ansai 2015 (12)	-0.65	0.53	22	22	100.0%	0.52 [0.18, 1.48]
Subtotal (95% CI)			**22**	**22**	**100.0%**	**0.52 [0.18, 1.48]**
Heterogeneity: Not applicable						
Test for overall effect: Z = 1.23 (P = 0.22)						
11.2.8 Multiple categories of exercise vs resistance exercises (after hospital stays)						
Vogler 2009 (13)	0.54	0.44	57	57	100.0%	1.72 [0.72, 4.06]
Subtotal (95% CI)			**57**	**57**	**100.0%**	**1.72 [0.72, 4.06]**
Heterogeneity: Not applicable						
Test for overall effect: Z = 1.23 (P = 0.22)						
11.2.9 Multiple categories of exercise vs multiple categories of exercise						
Freiberger 2007 (14)	-0.47	0.24	65	62	25.6%	0.63 [0.39, 1.00]
Kemmler 2010 (15)	-0.62	0.22	115	112	26.8%	0.54 [0.35, 0.83]
Kwok 2016 (16)	-0.32	0.41	40	40	16.7%	0.73 [0.33, 1.62]
LaStayo 2017 (17)	0.19	0.15	54	58	30.8%	1.21 [0.90, 1.62]
Subtotal (95% CI)			**274**	**272**	**100.0%**	**0.75 [0.48, 1.19]**
Heterogeneity: Tau² = 0.15; Chi² = 11.64, df = 3 (P = 0.009); I² = 74%						
Test for overall effect: Z = 1.22 (P = 0.22)						
11.2.10 Tai Ji Chuan (Thai chi) vs Multimodal exercise						
Li 2018	-0.2803	0.1084	224	223	100.0%	0.76 [0.61, 0.93]
Subtotal (95% CI)			**224**	**223**	**100.0%**	**0.76 [0.61, 0.93]**
Heterogeneity: Not applicable						
Test for overall effect: Z = 2.59 (P = 0.010)						
11.2.11 Perturbation exercise vs balance and functional exercise						
Lurie 2020	-0.08	0.1554	253	253	100.0%	0.92 [0.68, 1.25]
Subtotal (95% CI)			**253**	**253**	**100.0%**	**0.92 [0.68, 1.25]**
Heterogeneity: Not applicable						
Test for overall effect: Z = 0.51 (P = 0.61)						
11.2.12 Individual multimodal exercise vs group multimodal exercises						
Jansen 2023	0.0296	0.1354	156	153	100.0%	1.03 [0.79, 1.34]
Subtotal (95% CI)			**156**	**153**	**100.0%**	**1.03 [0.79, 1.34]**
Heterogeneity: Not applicable						
Test for overall effect: Z = 0.22 (P = 0.83)						



Footnotes
(1) Group based FaME + home training based on Otago Exercise Programme (OEP) vs OEP
(2) Standard Physical Therapy programme + surface perturbation treadmill training vs standard physical therapy programme
(3) Individual, supervised balance and gait training using exoskeleton human body posturizer vs individual, supervised balance and gait training
(4) Group based: balance, strength, flexibility and gait training involving simple obstacle course vs balance, strength, flexibility and gait training involving complex...
(5) Group based: balance, strength, flexibility and gait training including stepping mat vs balance, strength, flexibility and gait training + indoor walking
(6) Group based: stepping training on felt mat vs walking
(7) Group based: trail walking training vs indoor walking
(8) LiFE (Lifestyle approach to reducing Falls through Exercise) programme - progressive balance and strength training embedded in daily life activities vs...
(9) Individually supervised Tai Chi vs individually supervised balance and strength training
(10) Group based: Tai Chi vs resistance training
(11) Group based: progressive balance training + walking vs progressive balance training
(12) Group based: balance, strength and aerobic vs progressive strength training
(13) Home based: strength training with weightbearing, functional tasks vs seated lower limb strength exercises
(14) Group based: psychomotor programme vs balance, strength, flexibility, endurance training
(15) Group based: balance, gait, flexibility and strength training + home practice vs low intensity, low frequency balance and endurance training
(16) Group based balance, strength and aerobic training + home practice vs balance, strength and aerobic training using the Nintendo WiiActive
(17) Resisted lower limb exercise using recumbent stepper-ergometer vs resisted lower limb exercise in standing and leg press

Figure 17: Exercise vs exercise – Number of falls

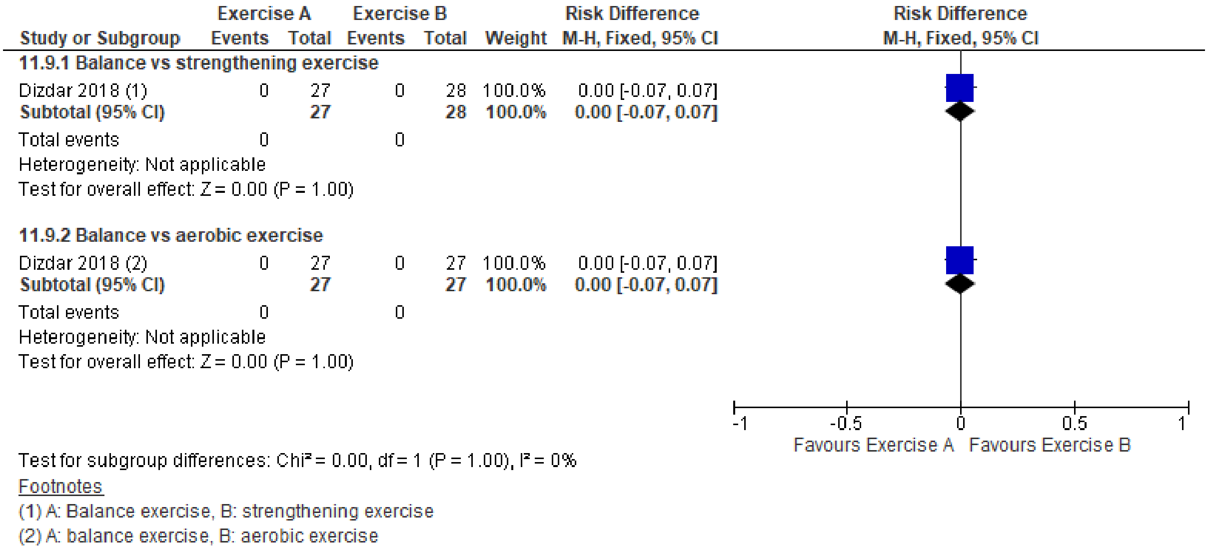


Figure 18: Exercise vs exercise – Number of people experiencing fall related fractures

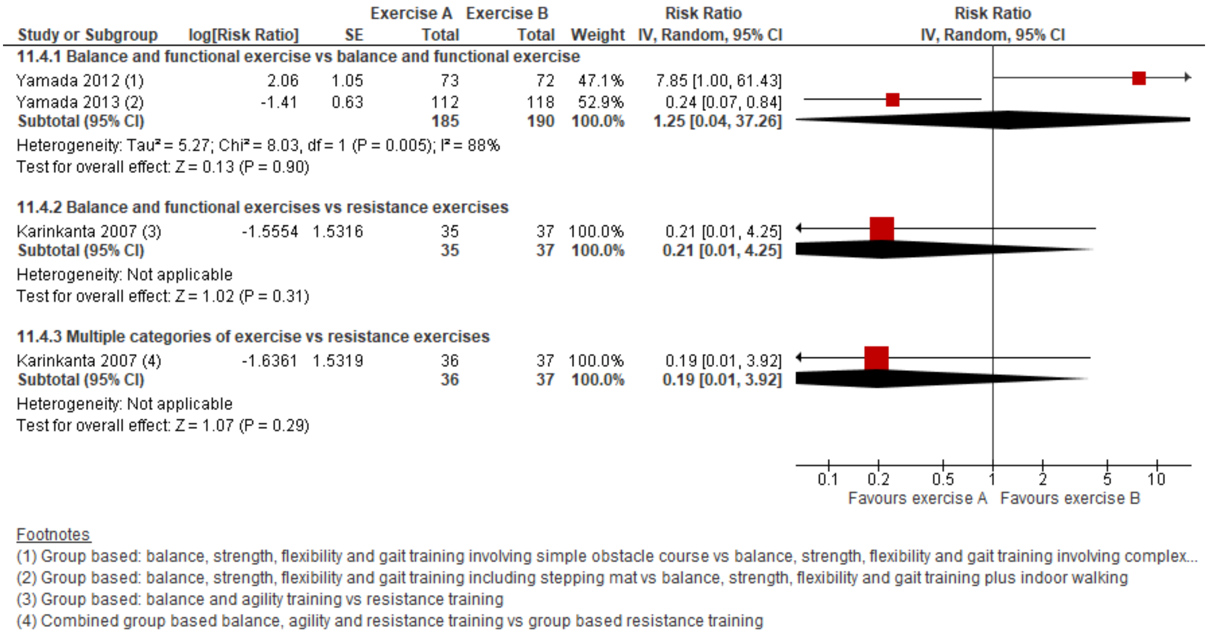


Figure 19: Exercise vs exercise – Quality of life (Balance and functional exercise vs balance and functional exercise)

Study or Subgroup	Balance and functional exercise Mean	SD	Total	Balance and functional exercise Mean	SD	Total	Weight	Std. Mean Difference IV, Random, 95% CI
Steadman 2003	64.4	19.9	69	64.5	17.4	64	100.0%	-0.01 [-0.35, 0.33]
Total (95% CI)			**69**			**64**	**100.0%**	**-0.01 [-0.35, 0.33]**

Heterogeneity: Not applicable
Test for overall effect: Z = 0.03 (P = 0.98)

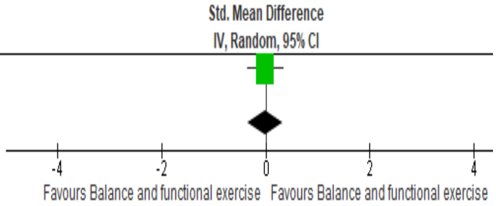


Figure 20: Exercise vs exercise – Quality of life (general) – Balance and functional exercise versus strengthening exercise

Study or Subgroup	Balance and functional exercise Mean	SD	Total	Strengthening exercise Mean	SD	Total	Weight	Std. Mean Difference IV, Random, 95% CI
Dizdar 2018	32.5	13	25	26.7	14.1	25	100.0%	0.42 [-0.14, 0.98]
Total (95% CI)			**25**			**25**	**100.0%**	**0.42 [-0.14, 0.98]**

Heterogeneity: Not applicable
Test for overall effect: Z = 1.47 (P = 0.14)

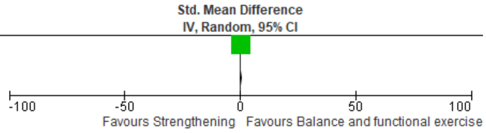


Figure 21: Exercise vs exercise – Quality of life (general) strengthening exercise versus aerobic exercise

Study or Subgroup	Strengthening exercise Mean	SD	Total	Aerobic exercise Mean	SD	Total	Weight	Std. Mean Difference IV, Random, 95% CI
Dizdar 2018	26.7	14.1	25	32.6	15.2	25	100.0%	-0.40 [-0.96, 0.16]
Total (95% CI)			**25**			**25**	**100.0%**	**-0.40 [-0.96, 0.16]**

Heterogeneity: Not applicable
Test for overall effect: Z = 1.39 (P = 0.17)

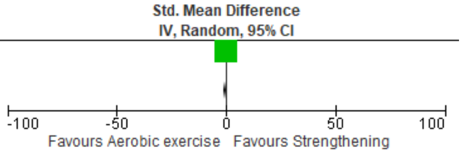


Figure 22: Exercise vs exercise – Quality of life (general) Balance and functioning exercise versus aerobic exercise

Study or Subgroup	Balance and functional exercise Mean	SD	Total	Aerobic Mean	SD	Total	Weight	Std. Mean Difference IV, Random, 95% CI
Dizdar 2018	32.5	13	25	32.6	15.2	25	100.0%	-0.01 [-0.56, 0.55]
Total (95% CI)			**25**			**25**	**100.0%**	**-0.01 [-0.56, 0.55]**

Heterogeneity: Not applicable
Test for overall effect: Z = 0.02 (P = 0.98)

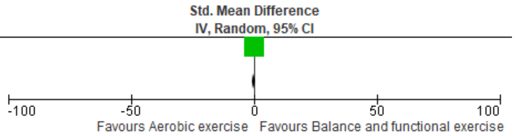
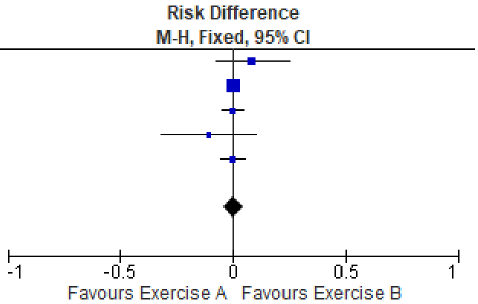


Figure 23: Exercise vs exercise – Adverse events

Study or Subgroup	Exercise A Events	Total	Exercise B Events	Total	Weight	Risk Difference M-H, Fixed, 95% CI
Davis 2011 (1)	14	52	9	49	18.6%	0.09 [-0.08, 0.25]
Kemmler 2010 (2)	0	115	0	112	41.9%	0.00 [-0.02, 0.02]
Kwok 2016 (3)	0	40	0	40	14.8%	0.00 [-0.05, 0.05]
Liu-Ambrose 2004 (4)	7	34	10	32	12.2%	-0.11 [-0.32, 0.10]
Shigematsu 2008	0	32	0	36	12.5%	0.00 [-0.06, 0.06]
Total (95% CI)		**273**		**269**	**100.0%**	**0.00 [-0.04, 0.04]**
Total events	21		19			

Heterogeneity: Chi² = 2.18, df = 4 (P = 0.70); I² = 0%
Test for overall effect: Z = 0.14 (P = 0.89)



Footnotes
(1) A: balance and strength exercise, B: resistance exercise
(2) Exercise B is a low intensity version of exercise A (multicomponent exercise)
(3) Balance and strengthening A: group based, B: using gaming console
(4) A: agility training, B: resistance training

E.2 Multifactorial and multicomponent interventions in the community setting

Multifactorial intervention versus usual care or attention control

Figure 24: Multifactorial intervention versus usual care or attention control – Rate of falls

Study or Subgroup	log[Rate Ratio]	SE	Multifactorial Total	Control Total	Weight	Rate Ratio IV, Random, 95% CI
Barker, 2019	-0.4308	0.2108	217	213	2.9%	0.65 [0.43, 0.98]
Beling 2009	-1.7	1.12	11	8	0.2%	0.18 [0.02, 1.64]
Bruce 2021	0.1222	0.0727	2497	2493	4.6%	1.13 [0.98, 1.30]
Daly 2019	0.077	0.2212	81	81	2.8%	1.08 [0.70, 1.67]
Davison 2005	-0.45	0.06	144	149	4.7%	0.64 [0.57, 0.72]
Elley 2008	-0.04	0.08	155	157	4.5%	0.96 [0.82, 1.12]
Fairhall 2014	0.11	0.19	107	109	3.1%	1.12 [0.77, 1.62]
Ferrer 2014	-0.16	0.26	142	131	2.4%	0.85 [0.51, 1.42]
Gallagher 1996	-0.21	0.15	50	50	3.6%	0.81 [0.60, 1.09]
Ganz 2022	-0.0305	0.0215	2802	2649	4.9%	0.97 [0.93, 1.01]
Hogan 2001	-0.23	0.09	75	77	4.4%	0.79 [0.67, 0.95]
Lightbody 2002	-0.16	0.11	155	159	4.2%	0.85 [0.69, 1.06]
Logan 2010	-0.8	0.07	98	99	4.6%	0.45 [0.39, 0.52]
Lord 2005	0.04	0.11	192	197	4.2%	1.04 [0.84, 1.29]
Luck 2013	-1.14	0.2	118	112	3.0%	0.32 [0.22, 0.47]
Markle-Reid 2010	0.09	0.18	49	43	3.3%	1.09 [0.77, 1.56]
Möller 2014	0.03	0.15	56	50	3.6%	1.03 [0.77, 1.38]
Palvanen 2014	-0.32	0.05	661	653	4.8%	0.73 [0.66, 0.80]
Pardessus 2002	-0.22	0.3	30	30	2.0%	0.80 [0.45, 1.44]
Russell 2010	-0.44	0.04	344	354	4.9%	0.64 [0.60, 0.70]
Stathi 2022	-0.207	0.08	410	367	4.5%	0.81 [0.70, 0.95]
Tan, 2018	0.1484	0.1586	134	134	3.5%	1.16 [0.85, 1.58]
Taylor 2021	-0.2485	0.16	153	156	3.5%	0.78 [0.57, 1.07]
Tinetti 1994	-0.57	0.14	147	144	3.8%	0.57 [0.43, 0.74]
Ueda 2022	-1.1394	1.7683	27	26	0.1%	0.32 [0.01, 10.24]
Vind 2009	0.02	0.07	196	196	4.6%	1.02 [0.89, 1.17]
Williamson 2022a	-0.2282	0.165	292	143	3.5%	0.80 [0.58, 1.10]
Zijlstra 2009	-0.15	0.14	196	209	3.8%	0.86 [0.65, 1.13]
Total (95% CI)			**9539**	**9189**	**100.0%**	**0.81 [0.73, 0.90]**

Heterogeneity: Tau² = 0.06; Chi² = 276.92, df = 27 (P < 0.00001); I² = 90%
Test for overall effect: Z = 3.84 (P = 0.0001)

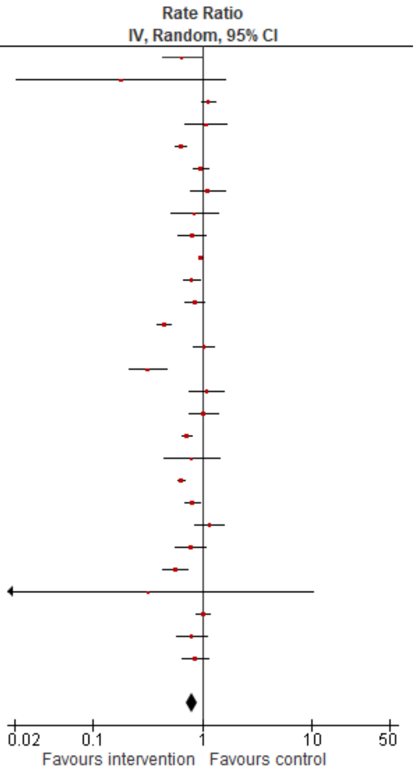
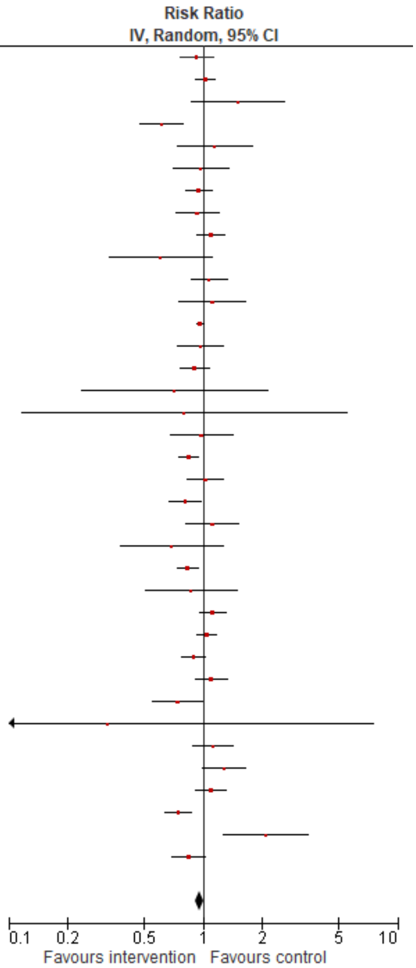


Figure 25: Multifactorial intervention versus usual care or attention control – Number of people sustaining one or more falls

Study or Subgroup	log[Risk Ratio]	SE	Multifactorial Total	Control Total	Weight	Risk Ratio IV, Random, 95% CI
Barker, 2019	-0.0769	0.1007	217	213	3.3%	0.93 [0.76, 1.13]
Bruce 2021	0.0308	0.0594	2497	2493	5.0%	1.03 [0.92, 1.16]
Ciaschini 2009	0.41	0.28	101	100	0.7%	1.51 [0.87, 2.61]
Close 1999	-0.49	0.13	184	213	2.5%	0.61 [0.47, 0.79]
Coleman 1999	0.14	0.23	79	63	1.0%	1.15 [0.73, 1.81]
Daly 2019	-0.0256	0.1689	77	71	1.7%	0.97 [0.70, 1.36]
Davison 2005	-0.05	0.08	144	149	4.1%	0.95 [0.81, 1.11]
De Vries 2010	-0.07	0.13	106	111	2.5%	0.93 [0.72, 1.20]
Elley 2008	0.09	0.08	155	157	4.1%	1.09 [0.94, 1.28]
Fabacher 1994	-0.5	0.31	100	95	0.6%	0.61 [0.33, 1.11]
Fairhall 2014	0.07	0.11	119	119	3.0%	1.07 [0.86, 1.33]
Ferrer 2014	0.11	0.2	142	131	1.3%	1.12 [0.75, 1.65]
Ganz 2022	-0.0369	0.0192	2802	2649	6.6%	0.96 [0.93, 1.00]
Hendriks 2008	-0.03	0.14	124	134	2.2%	0.97 [0.74, 1.28]
Hogan 2001	-0.1	0.09	75	77	3.7%	0.90 [0.76, 1.08]
Huang 2005	-0.34	0.56	63	63	0.2%	0.71 [0.24, 2.13]
Kingston 2001	-0.22	0.98	51	41	0.1%	0.80 [0.12, 5.48]
Lightbody 2002	-0.02	0.19	155	159	1.4%	0.98 [0.68, 1.42]
Logan 2010	-0.17	0.06	102	102	5.0%	0.84 [0.75, 0.95]
Lord 2005	0.03	0.11	202	201	3.0%	1.03 [0.83, 1.28]
Marrocco 2023	-0.2126	0.0955	875	882	3.5%	0.81 [0.67, 0.97]
Möller 2014	0.11	0.16	80	73	1.9%	1.12 [0.82, 1.53]
Newbury 2001	-0.37	0.31	45	44	0.6%	0.69 [0.38, 1.27]
Palvanen 2014	-0.18	0.06	661	653	5.0%	0.84 [0.74, 0.94]
Pardessus 2002	-0.14	0.28	30	30	0.7%	0.87 [0.50, 1.50]
Russell 2010	0.11	0.08	320	330	4.1%	1.12 [0.95, 1.31]
Spice 2009	0.04	0.06	106	80	5.0%	1.04 [0.93, 1.17]
Spice 2009	-0.11	0.07	164	80	4.5%	0.90 [0.78, 1.03]
Taylor 2021	0.0968	0.0958	153	156	3.5%	1.10 [0.91, 1.33]
Tinetti 1994	-0.3	0.15	147	144	2.0%	0.74 [0.55, 0.99]
Ueda 2022	-1.135	1.6106	27	26	0.0%	0.32 [0.01, 7.55]
Van Haastregt 2000	0.12	0.12	120	115	2.7%	1.13 [0.89, 1.43]
Vetter 1992	0.25	0.13	240	210	2.5%	1.28 [1.00, 1.66]
Vind 2009	0.09	0.09	196	196	3.7%	1.09 [0.92, 1.31]
Wagner 1994 (1)	-0.29	0.08	635	607	4.1%	0.75 [0.64, 0.88]
Whitehead 2003	0.74	0.26	58	65	0.8%	2.10 [1.26, 3.49]
Zijlstra 2009	-0.17	0.1	188	203	3.3%	0.84 [0.69, 1.03]
Total (95% CI)			**11540**	**11235**	**100.0%**	**0.96 [0.91, 1.01]**

Heterogeneity: Tau² = 0.01; Chi² = 80.98, df = 36 (P < 0.0001); I² = 56%
Test for overall effect: Z = 1.64 (P = 0.10)



Footnotes
(1) Multifactorial arm vs control

Figure 26: Multifactorial intervention vs. usual care or attention control – Number of people sustaining one or more fall-related fractures

Study or Subgroup	log[Risk Ratio]	SE	Multifactorial Total	Control Total	Weight	Risk Ratio IV, Random, 95% CI
Barker, 2019	-0.8515	0.3663	217	213	4.3%	0.43 [0.21, 0.87]
Bhasin 2020	-0.1544	0.0981	2802	2649	59.7%	0.86 [0.71, 1.04]
Bruce 2021	-0.1775	0.2644	2497	2493	8.2%	0.84 [0.50, 1.41]
Ciaschini 2009	-1.8	1.07	101	100	0.5%	0.17 [0.02, 1.35]
Davison 2005	-0.64	0.49	159	154	2.4%	0.53 [0.20, 1.38]
De Vries 2010	0.05	0.62	106	111	1.5%	1.05 [0.31, 3.54]
Fairhall 2014	0.08	0.38	119	119	4.0%	1.08 [0.51, 2.28]
Hogan 2001	-0.48	0.71	75	77	1.1%	0.62 [0.15, 2.49]
Logan 2010	-0.69	0.69	102	102	1.2%	0.50 [0.13, 1.94]
Russell 2010	-0.6	0.43	320	330	3.1%	0.55 [0.24, 1.27]
Spice 2009	-0.31	0.65	114	67	1.4%	0.73 [0.21, 2.62]
Spice 2009	-0.75	0.65	177	67	1.4%	0.47 [0.13, 1.69]
Taylor 2021	0.1248	0.4452	153	156	2.9%	1.13 [0.47, 2.71]
Vetter 1992	0	0.35	240	210	4.7%	1.00 [0.50, 1.99]
Williamson 2022a	-0.0779	0.3994	292	143	3.6%	0.93 [0.42, 2.02]
Total (95% CI)			**7474**	**6991**	**100.0%**	**0.81 [0.70, 0.94]**

Heterogeneity: Tau² = 0.00; Chi² = 10.34, df = 14 (P = 0.74); I² = 0%
Test for overall effect: Z = 2.77 (P = 0.006)

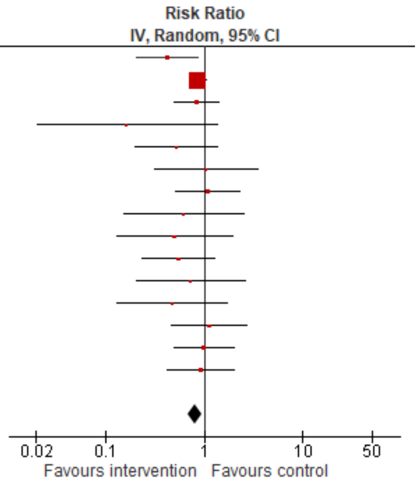


Figure 27: Multifactorial intervention vs. usual care or attention control – Health-related quality of life: endpoint score (SF-36; 0-100 0 is the worst and 100 is the best)

Study or Subgroup	Multifactorial Mean	SD	Total	Control Mean	SD	Total	Weight	Std. Mean Difference IV, Random, 95% CI
Close 1999	18.6	2.4	184	17.3	3.7	213	13.3%	0.41 [0.21, 0.61]
Fairhall 2014	57.5	20.8	107	57.7	19.7	108	11.4%	-0.01 [-0.28, 0.26]
Gallagher 1996	36.8	5	50	36.3	5	50	8.2%	0.10 [-0.29, 0.49]
Hendriks 2008	0.7	0.25	124	0.71	0.28	134	12.0%	-0.04 [-0.28, 0.21]
Huang 2005	60.77	10.5	63	51.25	11.63	59	8.7%	0.86 [0.48, 1.23]
Jitapunkul 1998	17.3	3.6	57	17.1	2.7	59	8.9%	0.06 [-0.30, 0.43]
Lightbody 2002	18.5	2.37	155	17.8	3.6	159	12.7%	0.23 [0.01, 0.45]
Logan 2010	14.33	4.69	82	13.57	4.79	75	10.1%	0.16 [-0.15, 0.47]
Rubenstein 2007	36	12.3	334	35.5	11.4	360	14.7%	0.04 [-0.11, 0.19]
Total (95% CI)			**1156**			**1217**	**100.0%**	**0.19 [0.03, 0.35]**

Heterogeneity: Tau² = 0.04; Chi² = 26.69, df = 8 (P = 0.0008); I² = 70%
Test for overall effect: Z = 2.35 (P = 0.02)

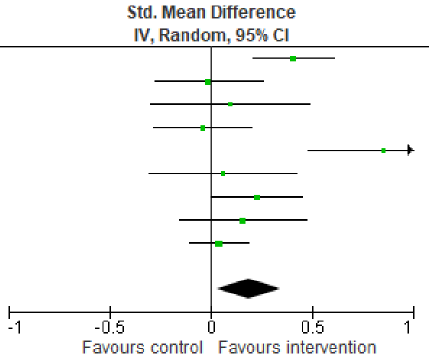


Figure 28: Multifactorial intervention vs. usual care or attention control – Health-related quality of life SF-36 and SF-12 (mental): endpoint score (0-100; 0 is the worst and 100 is the best)

Study or Subgroup	Multifactorial Mean	SD	Total	Control Mean	SD	Total	Weight	Std. Mean Difference IV, Random, 95% CI
Bruce 2021	49.9	9.5	3301	50	9	3223	35.1%	-0.01 [-0.06, 0.04]
Huang 2005	62.16	19.66	63	56.34	15.14	59	12.7%	0.33 [-0.03, 0.69]
Markle-Reid 2010	73.07	15.33	49	74	14.5	43	10.5%	-0.06 [-0.47, 0.35]
Shyu 2010	64.52	19.03	80	55.81	18.7	82	15.0%	0.46 [0.15, 0.77]
Stathi 2022	54.73	7.64	294	54.33	9.18	334	26.7%	0.05 [-0.11, 0.20]
Total (95% CI)			**3787**			**3741**	**100.0%**	**0.11 [-0.05, 0.27]**

Heterogeneity: Tau² = 0.02; Chi² = 12.05, df = 4 (P = 0.02); I² = 67%
Test for overall effect: Z = 1.40 (P = 0.16)

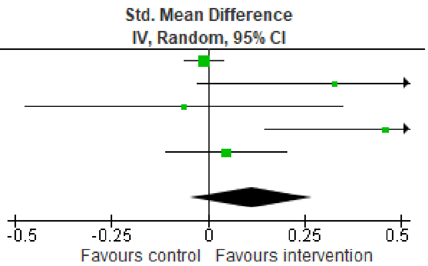


Figure 29: Multifactorial intervention vs. usual care or attention control – Health-related quality of life SF-36 and SF-12 (physical): endpoint score (01-100; 0 is the worst and 100 is the best)

	Multifactorial			Control				Std. Mean Difference
Study or Subgroup	Mean	SD	Total	Mean	SD	Total	Weight	IV, Random, 95% CI
Bruce 2021	49.8	10.3	3301	49.9	10	3223	26.6%	-0.01 [-0.06, 0.04]
Huang 2005	23.65	18.86	63	13.72	19.62	59	16.5%	0.51 [0.15, 0.87]
Markle-Reid 2010	54.76	17.45	49	55.51	20.43	43	14.8%	-0.04 [-0.45, 0.37]
Shyu 2010	62.19	28.08	80	43.5	28.47	82	18.1%	0.66 [0.34, 0.97]
Stathi 2022	29.38	9.39	294	30.84	10.04	334	24.0%	-0.15 [-0.31, 0.01]
Total (95% CI)			**3787**			**3741**	**100.0%**	**0.16 [-0.08, 0.40]**

Heterogeneity: Tau² = 0.05; Chi² = 28.05, df = 4 (P < 0.0001); I² = 86%
Test for overall effect: Z = 1.32 (P = 0.19)

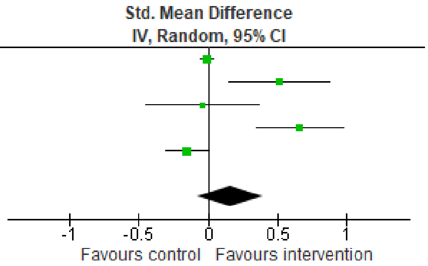


Figure 30: Multifactorial intervention vs. usual care- Health-related quality of life (EQ-5D) 0-1, 0 is the worst and 1 is the best

	Multifactorial			Control				Std. Mean Difference
Study or Subgroup	Mean	SD	Total	Mean	SD	Total	Weight	IV, Random, 95% CI
Ganz 2022	0.819	0.202	2802	0.815	0.204	2649	94.6%	0.02 [-0.03, 0.07]
Taylor 2021	0.78	0.2504	153	0.77	0.2529	156	5.4%	0.04 [-0.18, 0.26]
Total (95% CI)			**2955**			**2805**	**100.0%**	**0.02 [-0.03, 0.07]**

Heterogeneity: Tau² = 0.00; Chi² = 0.03, df = 1 (P = 0.86); I² = 0%
Test for overall effect: Z = 0.79 (P = 0.43)

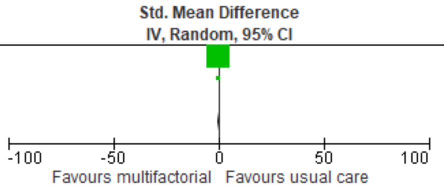


Figure 31: Multifactorial intervention vs. control – Subgroup analysis- intensity by intervention: Rate of falls

Study or Subgroup	log[Rate Ratio]	SE	Multifactorial Total	Control Total	Weight	Rate Ratio IV, Random, 95% CI
5.1.1 Assessment and active intervention						
Beling 2009	-1.7	1.12	11	8	0.2%	0.18 [0.02, 1.64]
Bruce 2021	0.1222	0.0732	2497	2493	4.6%	1.13 [0.98, 1.30]
Daly 2019	0.077	0.2212	81	81	2.8%	1.08 [0.70, 1.67]
Davison 2005	-0.45	0.06	144	149	4.7%	0.64 [0.57, 0.72]
Fairhall 2014	0.11	0.19	107	109	3.1%	1.12 [0.77, 1.62]
Logan 2010	-0.8	0.07	98	99	4.6%	0.45 [0.39, 0.52]
Lord 2005	0.04	0.11	192	197	4.2%	1.04 [0.84, 1.29]
Luck 2013	-1.14	0.2	118	112	3.0%	0.32 [0.22, 0.47]
Markle-Reid 2010	0.09	0.18	49	43	3.3%	1.09 [0.77, 1.56]
Möller 2014	0.03	0.15	56	50	3.6%	1.03 [0.77, 1.38]
Stathi 2022	-0.207	0.08	410	367	4.5%	0.81 [0.70, 0.95]
Tan, 2018	0.1441	0.1588	134	134	3.5%	1.15 [0.85, 1.58]
Taylor 2021	-0.2485	0.16	153	156	3.5%	0.78 [0.57, 1.07]
Tinetti 1994	-0.57	0.14	147	144	3.8%	0.57 [0.43, 0.74]
Vind 2009	0.02	0.07	196	196	4.6%	1.02 [0.89, 1.17]
Williamson 2022a	-0.2282	0.165	292	143	3.5%	0.80 [0.58, 1.10]
Zijlstra 2009	-0.15	0.14	196	209	3.8%	0.86 [0.65, 1.13]
Subtotal (95% CI)			**4881**	**4690**	**61.3%**	**0.81 [0.68, 0.97]**
Heterogeneity: Tau² = 0.11; Chi² = 166.98, df = 16 (P < 0.00001); I² = 90%						
Test for overall effect: Z = 2.28 (P = 0.02)						
5.1.2 Assessment and referral or provision of information						
Barker, 2019	-0.4308	0.2108	217	213	2.9%	0.65 [0.43, 0.98]
Elley 2008	-0.04	0.08	155	157	4.5%	0.96 [0.82, 1.12]
Ferrer 2014	-0.16	0.26	142	131	2.4%	0.85 [0.51, 1.42]
Gallagher 1996	-0.21	0.15	50	50	3.6%	0.81 [0.60, 1.09]
Ganz 2022	-0.0305	0.0215	2802	2649	4.9%	0.97 [0.93, 1.01]
Hogan 2001	-0.23	0.09	75	77	4.4%	0.79 [0.67, 0.95]
Lightbody 2002	-0.16	0.11	155	159	4.2%	0.85 [0.69, 1.06]
Palvanen 2014	-0.32	0.05	661	653	4.8%	0.73 [0.66, 0.80]
Pardessus 2002	-0.22	0.3	30	30	2.0%	0.80 [0.45, 1.44]
Russell 2010	-0.44	0.04	344	354	4.9%	0.64 [0.60, 0.70]
Ueda 2022	-1.1394	1.7683	27	26	0.1%	0.32 [0.01, 10.24]
Subtotal (95% CI)			**4658**	**4499**	**38.7%**	**0.80 [0.69, 0.93]**
Heterogeneity: Tau² = 0.04; Chi² = 100.00, df = 10 (P < 0.00001); I² = 90%						
Test for overall effect: Z = 2.93 (P = 0.003)						
Total (95% CI)			**9539**	**9189**	**100.0%**	**0.81 [0.73, 0.90]**
Heterogeneity: Tau² = 0.06; Chi² = 276.57, df = 27 (P < 0.00001); I² = 90%						
Test for overall effect: Z = 3.84 (P = 0.0001)						
Test for subgroup differences: Chi² = 0.01, df = 1 (P = 0.91), I² = 0%						

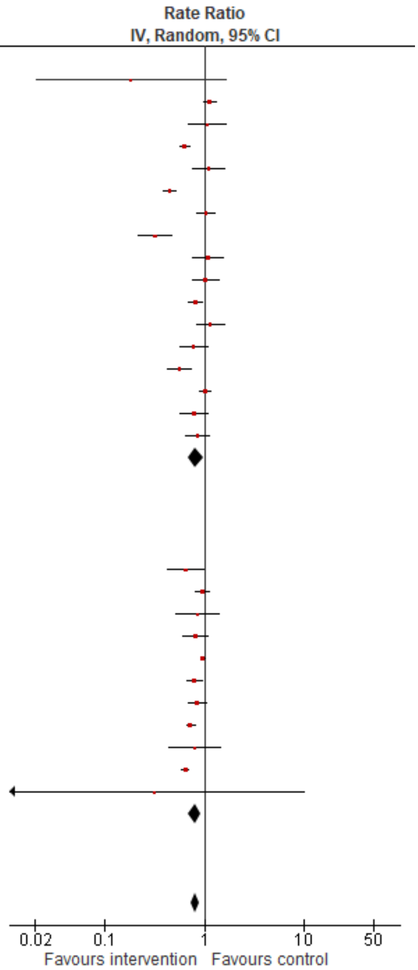
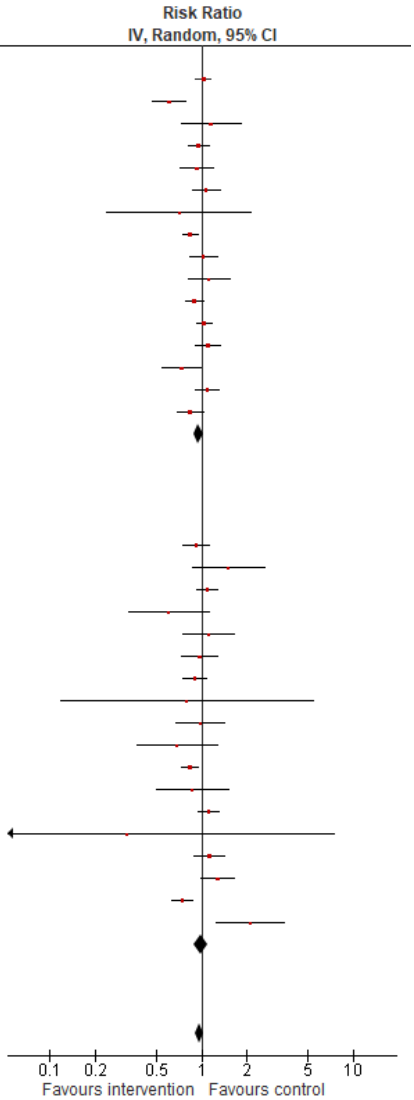


Figure 32: Multifactorial intervention vs. control- Subgroup analysis by intensity of intervention- Number of people sustaining one or more falls

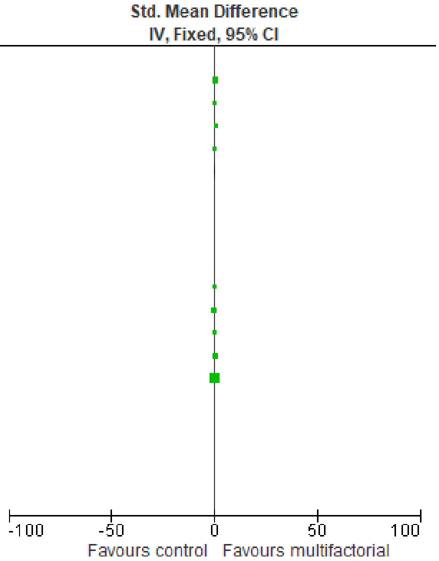
Study or Subgroup	log[Risk Ratio]	SE	Multifactorial Total	Control Total	Weight	Risk Ratio IV, Random, 95% CI
5.2.1 Assessment and active intervention						
Bruce 2021	0.0308	0.0594	2497	2493	5.1%	1.03 [0.92, 1.16]
Close 1999	-0.49	0.13	184	213	3.0%	0.61 [0.47, 0.79]
Coleman 1999	0.14	0.23	79	63	1.4%	1.15 [0.73, 1.81]
Davison 2005	-0.05	0.08	144	149	4.5%	0.95 [0.81, 1.11]
De Vries 2010	-0.07	0.13	106	111	3.0%	0.93 [0.72, 1.20]
Fairhall 2014	0.07	0.11	119	119	3.5%	1.07 [0.86, 1.33]
Huang 2005	-0.34	0.56	63	63	0.3%	0.71 [0.24, 2.13]
Logan 2010	-0.17	0.06	102	102	5.1%	0.84 [0.75, 0.95]
Lord 2005	0.03	0.11	202	201	3.5%	1.03 [0.83, 1.28]
Möller 2014	0.11	0.16	80	73	2.3%	1.12 [0.82, 1.53]
Spice 2009	-0.11	0.07	164	80	4.8%	0.90 [0.78, 1.03]
Spice 2009	0.04	0.06	106	80	5.1%	1.04 [0.93, 1.17]
Taylor 2021	0.0968	0.0958	153	156	3.9%	1.10 [0.91, 1.33]
Tinetti 1994	-0.3	0.15	147	144	2.5%	0.74 [0.55, 0.99]
Vind 2009	0.09	0.09	196	196	4.1%	1.09 [0.92, 1.31]
Zijlstra 2009	-0.17	0.1	188	203	3.8%	0.84 [0.69, 1.03]
Subtotal (95% CI)			**4530**	**4446**	**56.1%**	**0.95 [0.88, 1.02]**
Heterogeneity: Tau² = 0.01; Chi² = 32.91, df = 15 (P = 0.005); I² = 54%						
Test for overall effect: Z = 1.36 (P = 0.17)						
5.2.2 Assessment and referral or provision of information						
Barker, 2019	-0.0769	0.1007	217	213	3.8%	0.93 [0.76, 1.13]
Ciaschini 2009	0.41	0.28	101	100	1.0%	1.51 [0.87, 2.61]
Elley 2008	0.09	0.08	155	157	4.5%	1.09 [0.94, 1.28]
Fabacher 1994	-0.5	0.31	100	95	0.9%	0.61 [0.33, 1.11]
Ferrer 2014	0.11	0.2	142	131	1.7%	1.12 [0.75, 1.65]
Hendriks 2008	-0.03	0.14	124	134	2.7%	0.97 [0.74, 1.28]
Hogan 2001	-0.1	0.09	75	77	4.1%	0.90 [0.76, 1.08]
Kingston 2001	-0.22	0.98	51	41	0.1%	0.80 [0.12, 5.48]
Lightbody 2002	-0.02	0.19	155	159	1.9%	0.98 [0.68, 1.42]
Newbury 2001	-0.37	0.31	45	44	0.9%	0.69 [0.38, 1.27]
Palvanen 2014	-0.18	0.06	661	653	5.1%	0.84 [0.74, 0.94]
Pardessus 2002	-0.14	0.28	30	30	1.0%	0.87 [0.50, 1.50]
Russell 2010	0.11	0.08	320	330	4.5%	1.12 [0.95, 1.31]
Ueda 2022	-1.135	1.6106	27	26	0.0%	0.32 [0.01, 7.55]
Van Haastregt 2000	0.12	0.12	120	115	3.2%	1.13 [0.89, 1.43]
Vetter 1992	0.25	0.13	240	210	3.0%	1.28 [1.00, 1.66]
Wagner 1994 (1)	-0.29	0.08	635	607	4.5%	0.75 [0.64, 0.88]
Whitehead 2003	0.74	0.26	58	65	1.1%	2.10 [1.26, 3.49]
Subtotal (95% CI)			**3256**	**3187**	**43.9%**	**0.99 [0.89, 1.11]**
Heterogeneity: Tau² = 0.02; Chi² = 44.80, df = 17 (P = 0.0003); I² = 62%						
Test for overall effect: Z = 0.10 (P = 0.92)						
Total (95% CI)			**7786**	**7633**	**100.0%**	**0.97 [0.91, 1.03]**
Heterogeneity: Tau² = 0.01; Chi² = 77.71, df = 33 (P < 0.0001); I² = 58%						
Test for overall effect: Z = 1.10 (P = 0.27)						
Test for subgroup differences: Chi² = 0.46, df = 1 (P = 0.50), I² = 0%						



Footnotes
(1) Multifactorial arm vs control

Figure 33: Multifactorial intervention vs. control – Subgroup analysis by intensity of intervention- Health-related quality of life (SF-36)

Study or Subgroup	Multifactorial Mean	Multifactorial SD	Multifactorial Total	Control Mean	Control SD	Control Total	Weight	Std. Mean Difference IV, Fixed, 95% CI
5.4.1 Assessment and active intervention								
Close 1999	18.6	2.4	184	17.3	3.7	213	16.5%	0.41 [0.21, 0.61]
Fairhall 2014	57.5	20.8	107	57.7	19.7	108	9.2%	-0.01 [-0.28, 0.26]
Huang 2005	60.77	10.5	63	51.25	11.63	59	4.7%	0.86 [0.48, 1.23]
Logan 2010	14.33	4.69	82	13.57	4.79	75	6.7%	0.16 [-0.15, 0.47]
Subtotal (95% CI)			**436**			**455**	**37.0%**	**0.32 [0.19, 0.45]**
Heterogeneity: Chi² = 15.61, df = 3 (P = 0.001); I² = 81%								
Test for overall effect: Z = 4.69 (P < 0.00001)								
5.4.2 Assessment and referral or provision of information								
Gallagher 1996	36.8	5	50	36.3	5	50	4.3%	0.10 [-0.29, 0.49]
Hendriks 2008	0.7	0.25	124	0.71	0.28	134	11.0%	-0.04 [-0.28, 0.21]
Jitapunkul 1998	17.3	3.6	57	17.1	2.7	59	4.9%	0.06 [-0.30, 0.43]
Lightbody 2002	18.5	2.37	155	17.8	3.6	159	13.3%	0.23 [0.01, 0.45]
Rubenstein 2007	36	12.3	334	35.5	11.4	360	29.5%	0.04 [-0.11, 0.19]
Subtotal (95% CI)			**720**			**762**	**63.0%**	**0.07 [-0.03, 0.18]**
Heterogeneity: Chi² = 2.86, df = 4 (P = 0.58); I² = 0%								
Test for overall effect: Z = 1.40 (P = 0.16)								
Total (95% CI)			**1156**			**1217**	**100.0%**	**0.16 [0.08, 0.24]**
Heterogeneity: Chi² = 26.69, df = 8 (P = 0.0008); I² = 70%								
Test for overall effect: Z = 3.97 (P < 0.0001)								
Test for subgroup differences: Chi² = 8.22, df = 1 (P = 0.004), I² = 87.8%								



Multifactorial intervention vs. exercise

Figure 34: Multifactorial intervention vs. exercise – Rate of falls

Study or Subgroup	log[Rate Ratio]	SE	Multifactorial Total	Exercise Total	Weight	Rate Ratio IV, Random, 95% CI
Bruce 2021	0.0198	0.0395	2497	2500	76.5%	1.02 [0.94, 1.10]
Ueda 2017	-2.04	1.5	25	26	23.5%	0.13 [0.01, 2.46]
Total (95% CI)			**2522**	**2526**	**100.0%**	**0.63 [0.11, 3.48]**
Heterogeneity: Tau² = 1.00; Chi² = 1.88, df = 1 (P = 0.17); I² = 47%						
Test for overall effect: Z = 0.53 (P = 0.59)						

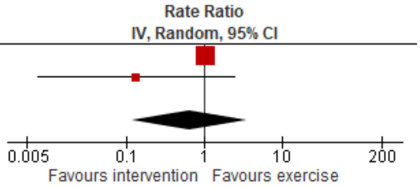


Figure 35: Multifactorial intervention vs. exercise – Number of people sustaining one or more falls

Study or Subgroup	log[Risk Ratio]	SE	Multifactorial Total	Exercise Total	Weight	Risk Ratio IV, Random, 95% CI
Bruce 2021	0.0447	0.0596	2497	2500	99.9%	1.05 [0.93, 1.18]
Ueda 2017	-1.35	1.56	25	26	0.1%	0.26 [0.01, 5.52]
Total (95% CI)			**2522**	**2526**	**100.0%**	**1.04 [0.93, 1.17]**
Heterogeneity: Tau² = 0.00; Chi² = 0.80, df = 1 (P = 0.37); I² = 0%						
Test for overall effect: Z = 0.72 (P = 0.47)						

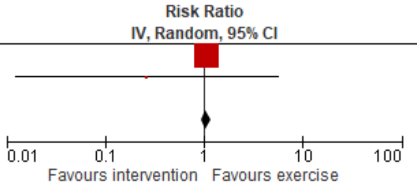


Figure 36: Multifactorial intervention vs. exercise – Number of people sustaining one or more fall-related fracture

Study or Subgroup	log[Risk Ratio]	SE	Weight	Risk Ratio IV, Fixed, 95% CI
Bruce 2021	-0.1747	0.2644	100.0%	0.84 [0.50, 1.41]
Total (95% CI)			**100.0%**	**0.84 [0.50, 1.41]**
Heterogeneity: Not applicable				
Test for overall effect: Z = 0.66 (P = 0.51)				

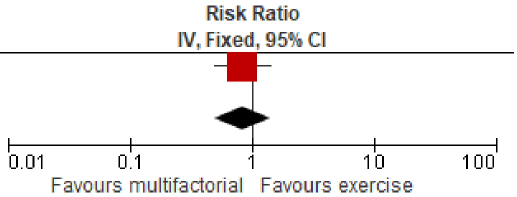


Figure 37: Multifactorial intervention vs. usual care or attention control – Health-related quality of life SF-12 (mental): endpoint score (01-100; 0 is the worst and 100 is the best)

	Multifactorial			Control			Std. Mean Difference
Study or Subgroup	Mean	SD	Total	Mean	SD	Total	IV, Fixed, 95% CI
Bruce 2021	49.8	10.3	3301	50.4	10	3279	-0.06 [-0.11, -0.01]

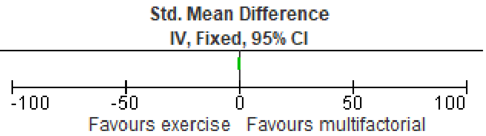
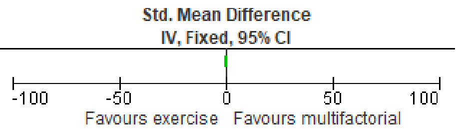


Figure 38: Multifactorial intervention vs. usual care or attention control – Health-related quality of life SF-12 (physical): endpoint score (01-100; 0 is the worst and 100 is the best)

	Multifactorial			Control				Std. Mean Difference
Study or Subgroup	Mean	SD	Total	Mean	SD	Total	Weight	IV, Fixed, 95% CI
Bruce 2021	49.9	9.5	3301	50.3	9.1	3279		-0.04 [-0.09, 0.01]



Multicomponent intervention vs. control or attention control

Figure 39: Multicomponent intervention vs. control or attention control – Rate of falls

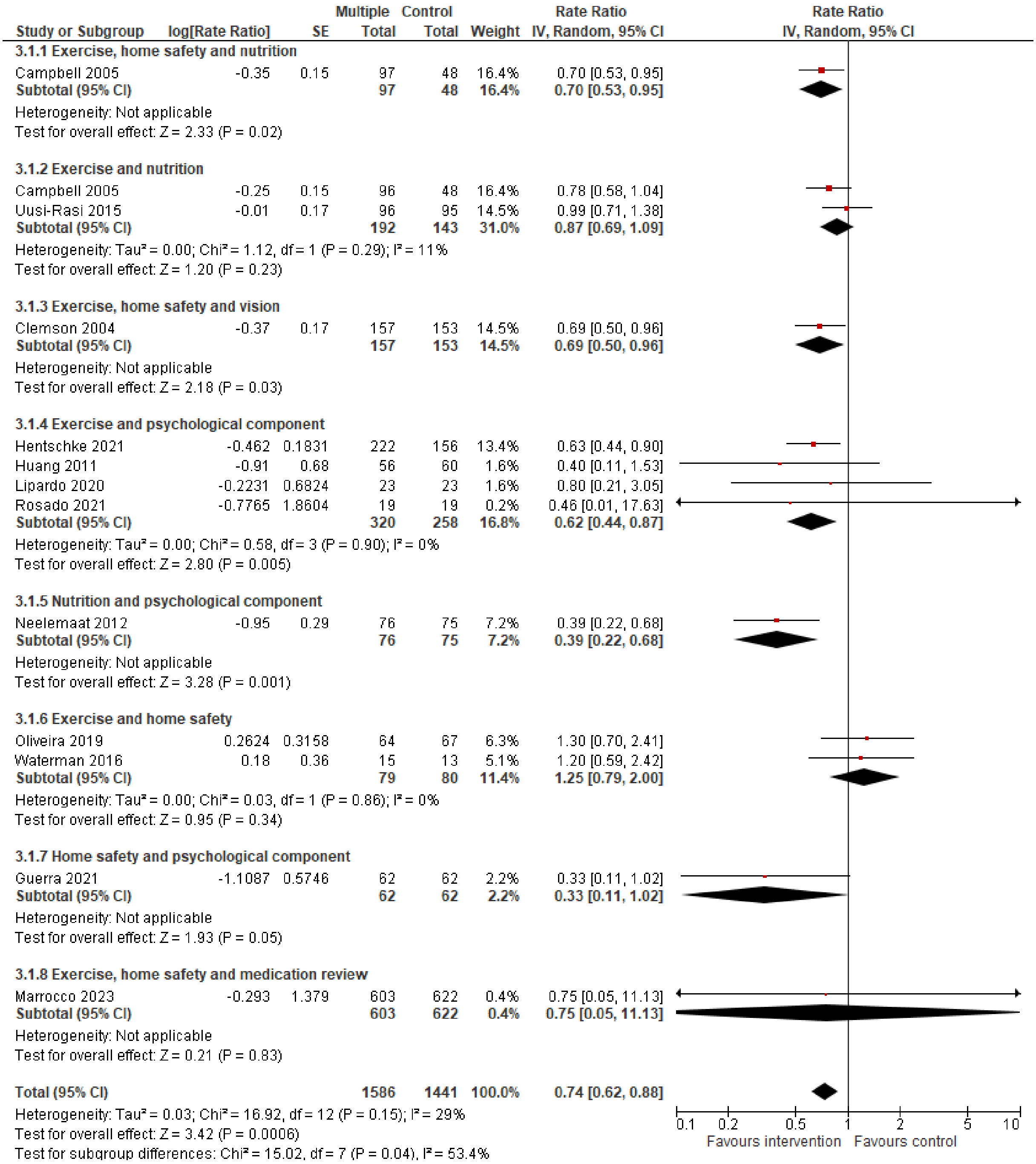


Figure 40: Multicomponent intervention vs. control or attention control – Number of people sustaining one or more falls

Study or Subgroup	log[Risk Ratio]	SE	Multiple Total	Control Total	Weight	Risk Ratio IV, Random, 95% CI
3.2.1 Exercise, home safety and nutrition						
Campbell 2005	-0.26	0.15	97	48	7.3%	0.77 [0.57, 1.03]
Subtotal (95% CI)			**97**	**48**	**7.3%**	**0.77 [0.57, 1.03]**
Heterogeneity: Not applicable						
Test for overall effect: Z = 1.73 (P = 0.08)						
3.2.2 Exercise and nutrition						
Campbell 2005	-0.25	0.15	98	48	7.3%	0.78 [0.58, 1.04]
Subtotal (95% CI)			**98**	**48**	**7.3%**	**0.78 [0.58, 1.04]**
Heterogeneity: Not applicable						
Test for overall effect: Z = 1.67 (P = 0.10)						
3.2.3 Exercise, home safety and vision						
Clemson 2004	-0.11	0.1	157	153	9.3%	0.90 [0.74, 1.09]
Day 2002	-0.3	0.15	135	34	7.3%	0.74 [0.55, 0.99]
Subtotal (95% CI)			**292**	**187**	**16.6%**	**0.84 [0.71, 1.00]**
Heterogeneity: Tau² = 0.00; Chi² = 1.11, df = 1 (P = 0.29); I² = 10%						
Test for overall effect: Z = 1.93 (P = 0.05)						
3.2.4 Exercise and vision						
Day 2002	-0.29	0.15	136	34	7.3%	0.75 [0.56, 1.00]
Subtotal (95% CI)			**136**	**34**	**7.3%**	**0.75 [0.56, 1.00]**
Heterogeneity: Not applicable						
Test for overall effect: Z = 1.93 (P = 0.05)						
3.2.5 Exercise and home safety						
Day 2002	-0.19	0.15	135	34	7.3%	0.83 [0.62, 1.11]
Waterman 2016	-0.03	0.3	15	13	3.3%	0.97 [0.54, 1.75]
Wesson 2013	-0.69	0.75	11	11	0.7%	0.50 [0.12, 2.18]
Subtotal (95% CI)			**161**	**58**	**11.3%**	**0.84 [0.65, 1.09]**
Heterogeneity: Tau² = 0.00; Chi² = 0.72, df = 2 (P = 0.70); I² = 0%						
Test for overall effect: Z = 1.32 (P = 0.19)						
3.2.6 Home safety and vision						
Day 2002	-0.13	0.15	137	34	7.3%	0.88 [0.65, 1.18]
Subtotal (95% CI)			**137**	**34**	**7.3%**	**0.88 [0.65, 1.18]**
Heterogeneity: Not applicable						
Test for overall effect: Z = 0.87 (P = 0.39)						
3.2.7 Exercise and psychological component						
Arkkukangas, 2019b	0.4862	0.2209	58	56	5.0%	1.63 [1.05, 2.51]
Faes 2011	0.33	0.38	18	15	2.3%	1.39 [0.66, 2.93]
Hentschke 2021	-0.5691	0.1061	212	144	9.1%	0.57 [0.46, 0.70]
Huang 2011	-0.91	0.65	56	60	0.9%	0.40 [0.11, 1.44]
Subtotal (95% CI)			**344**	**275**	**17.3%**	**0.90 [0.44, 1.83]**
Heterogeneity: Tau² = 0.41; Chi² = 22.53, df = 3 (P < 0.0001); I² = 87%						
Test for overall effect: Z = 0.29 (P = 0.77)						
3.2.8 Education and exercise						
Huang 2010	0.53	1.2	56	47	0.3%	1.70 [0.16, 17.85]
Olsen 2014	0.05	0.35	47	42	2.7%	1.05 [0.53, 2.09]
Subtotal (95% CI)			**103**	**89**	**2.9%**	**1.09 [0.57, 2.11]**
Heterogeneity: Tau² = 0.00; Chi² = 0.15, df = 1 (P = 0.70); I² = 0%						
Test for overall effect: Z = 0.26 (P = 0.79)						
3.2.9 Nutrition and psychological component						
Neelemaat 2012	-0.88	0.35	105	105	2.7%	0.41 [0.21, 0.82]
Subtotal (95% CI)			**105**	**105**	**2.7%**	**0.41 [0.21, 0.82]**
Heterogeneity: Not applicable						
Test for overall effect: Z = 2.51 (P = 0.01)						
3.2.10 Exercise, nutrition and psychological component						
Ng 2015	-0.9	0.81	49	50	0.6%	0.41 [0.08, 1.99]
Subtotal (95% CI)			**49**	**50**	**0.6%**	**0.41 [0.08, 1.99]**
Heterogeneity: Not applicable						
Test for overall effect: Z = 1.11 (P = 0.27)						
3.2.11 Education and psychological component						
Tannenbaum 2019	0.0595	0.0906	461	448	9.7%	1.06 [0.89, 1.27]
Subtotal (95% CI)			**461**	**448**	**9.7%**	**1.06 [0.89, 1.27]**
Heterogeneity: Not applicable						
Test for overall effect: Z = 0.66 (P = 0.51)						
3.2.12 Exercise, home safety and medication review						
Marrocco 2023	-0.2126	0.0955	603	622	9.5%	0.81 [0.67, 0.97]
Subtotal (95% CI)			**603**	**622**	**9.5%**	**0.81 [0.67, 0.97]**
Heterogeneity: Not applicable						
Test for overall effect: Z = 2.23 (P = 0.03)						
Total (95% CI)			**2586**	**1998**	**100.0%**	**0.83 [0.73, 0.94]**
Heterogeneity: Tau² = 0.03; Chi² = 41.24, df = 18 (P = 0.001); I² = 56%						
Test for overall effect: Z = 2.92 (P = 0.004)						
Test for subgroup differences: Chi² = 13.43, df = 11 (P = 0.27), I² = 18.1%						

Risk Ratio
IV, Random, 95% CI

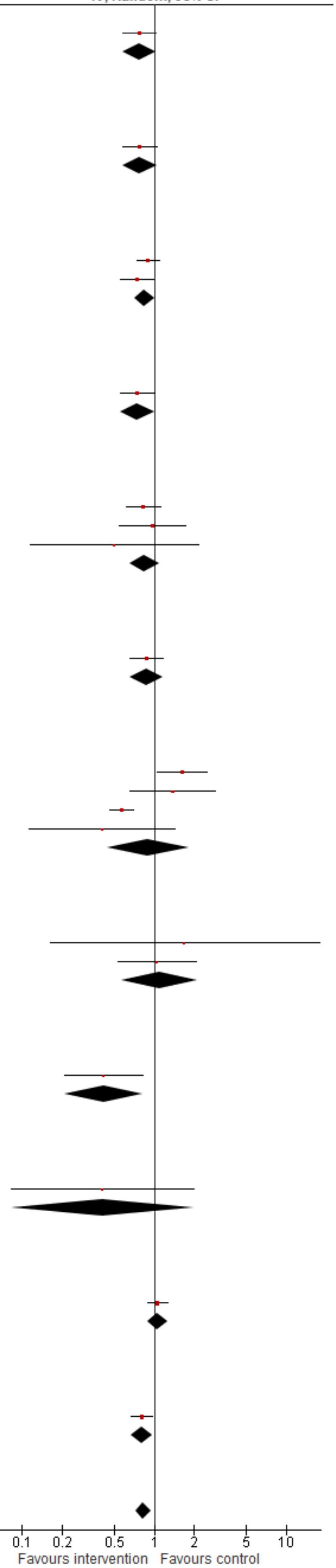


Figure 41: Multicomponent intervention vs. control or attention control – Number of people sustaining one or more fall-related fractures

Study or Subgroup	log[Risk Ratio]	SE	Multiple Total	Control Total	Weight	Risk Ratio IV, Random, 95% CI
3.4.1 Nutrition and psychological component						
Neelemaat 2012	-0.69	1.73	105	105	4.3%	0.50 [0.02, 14.89]
Subtotal (95% CI)			**105**	**105**	**4.3%**	**0.50 [0.02, 14.89]**
Heterogeneity: Not applicable						
Test for overall effect: Z = 0.40 (P = 0.69)						
3.4.2 Exercise and home safety						
Wesson 2013	-0.69	1.68	11	11	4.6%	0.50 [0.02, 13.50]
Subtotal (95% CI)			**11**	**11**	**4.6%**	**0.50 [0.02, 13.50]**
Heterogeneity: Not applicable						
Test for overall effect: Z = 0.41 (P = 0.68)						
3.4.3 Exercise, medication review and home safety						
Marrocco 2023	0.8409	0.3758	603	622	91.1%	2.32 [1.11, 4.84]
Subtotal (95% CI)			**603**	**622**	**91.1%**	**2.32 [1.11, 4.84]**
Heterogeneity: Not applicable						
Test for overall effect: Z = 2.24 (P = 0.03)						
Total (95% CI)			**719**	**738**	**100.0%**	**2.02 [1.00, 4.09]**

Heterogeneity: Tau² = 0.00; Chi² = 1.47, df = 2 (P = 0.48); I² = 0%
Test for overall effect: Z = 1.97 (P = 0.05)
Test for subgroup differences: Chi² = 1.47, df = 2 (P = 0.48), I² = 0%

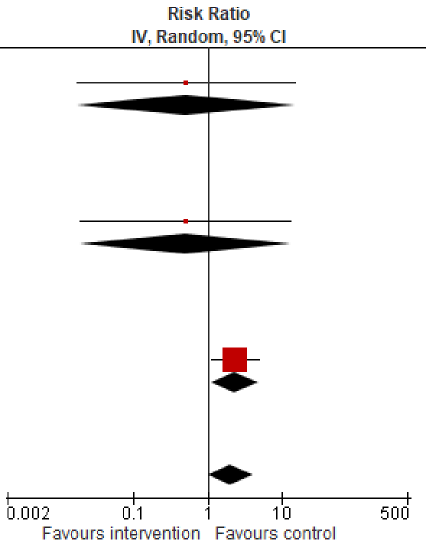


Figure 42: Multicomponent intervention vs. control or attention control – Health-related quality of life: endpoint score (SF-36 0-100;EQ5D 0.2-1; I-QOL 0-100, higher is better))

Study or Subgroup	Multiple Mean	Multiple SD	Multiple Total	Control Mean	Control SD	Control Total	Weight	Std. Mean Difference IV, Random, 95% CI
3.7.1 Exercise and nutrition								
Serra-Prat 2017	7.2	1.5	61	7.1	1.5	72	17.2%	0.07 [-0.27, 0.41]
Subtotal (95% CI)			**61**			**72**	**17.2%**	**0.07 [-0.27, 0.41]**
Heterogeneity: Not applicable								
Test for overall effect: Z = 0.38 (P = 0.70)								
3.7.2 Exercise and psychological component								
Hagovska 2016	9.52	1.06	40	7.71	1.55	38	15.3%	1.36 [0.86, 1.85]
Huang 2011	59.7	5.87	56	52.27	6.93	60	16.6%	1.15 [0.75, 1.54]
Subtotal (95% CI)			**96**			**98**	**31.9%**	**1.23 [0.92, 1.54]**
Heterogeneity: Tau² = 0.00; Chi² = 0.42, df = 1 (P = 0.51); I² = 0%								
Test for overall effect: Z = 7.81 (P < 0.00001)								
3.7.3 Exercise, nutrition and psychological component								
Mendoza-Ruvalcaba 2015	26.67	1.99	31	25.19	3	33	15.2%	0.57 [0.07, 1.07]
Subtotal (95% CI)			**31**			**33**	**15.2%**	**0.57 [0.07, 1.07]**
Heterogeneity: Not applicable								
Test for overall effect: Z = 2.23 (P = 0.03)								
3.7.4 Exercise and home safety								
Oliveira 2019	0.8	0.1	46	0.8	0.1	52	16.6%	0.00 [-0.40, 0.40]
Subtotal (95% CI)			**46**			**52**	**16.6%**	**0.00 [-0.40, 0.40]**
Heterogeneity: Not applicable								
Test for overall effect: Z = 0.00 (P = 1.00)								
3.7.5 Education and psychological component								
Tannenbaum 2019	6.7	12.0185	461	5.4	11.8469	448	19.1%	0.11 [-0.02, 0.24]
Subtotal (95% CI)			**461**			**448**	**19.1%**	**0.11 [-0.02, 0.24]**
Heterogeneity: Not applicable								
Test for overall effect: Z = 1.64 (P = 0.10)								
Total (95% CI)			**695**			**703**	**100.0%**	**0.52 [0.10, 0.94]**

Heterogeneity: Tau² = 0.24; Chi² = 47.82, df = 5 (P < 0.00001); I² = 90%
Test for overall effect: Z = 2.41 (P = 0.02)
Test for subgroup differences: Chi² = 47.39, df = 4 (P < 0.00001), I² = 91.6%

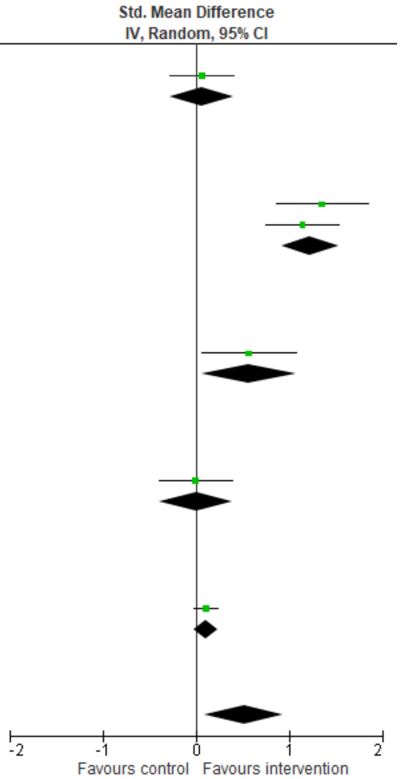


Figure 43: Multicomponent intervention vs. control or attention control – Health-related quality of life (mental): endpoint score

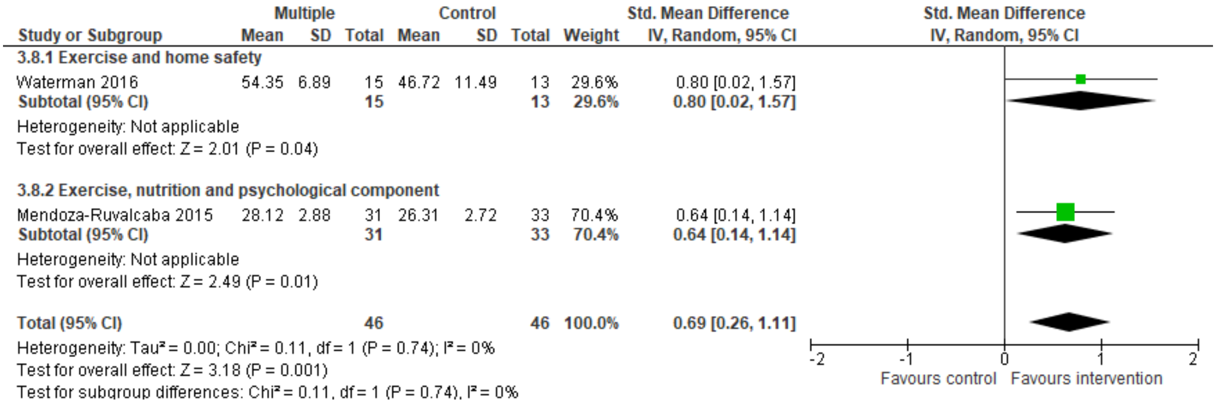
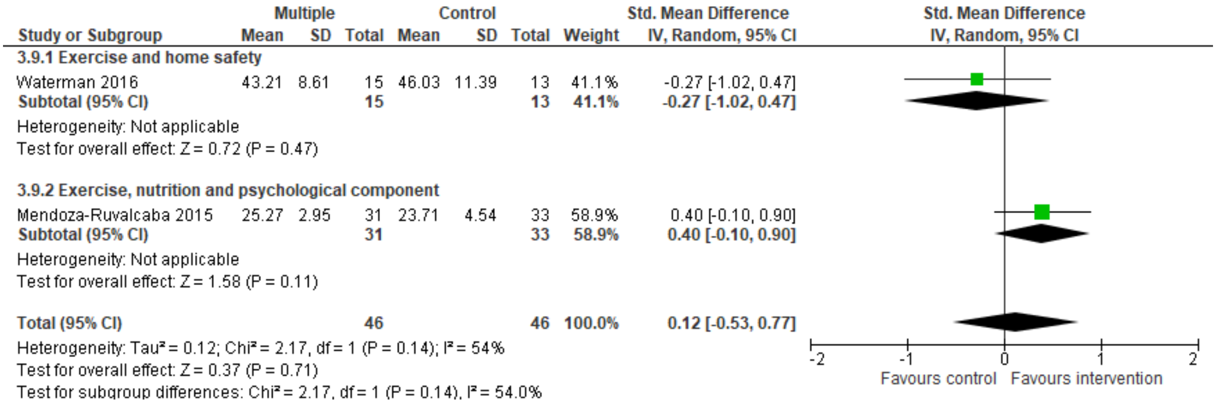


Figure 44: Multicomponent intervention vs. control or attention control – Health-related quality of life (physical): endpoint score



Multicomponent intervention vs. exercise

Figure 45: Multicomponent intervention vs. exercise – Rate of falls

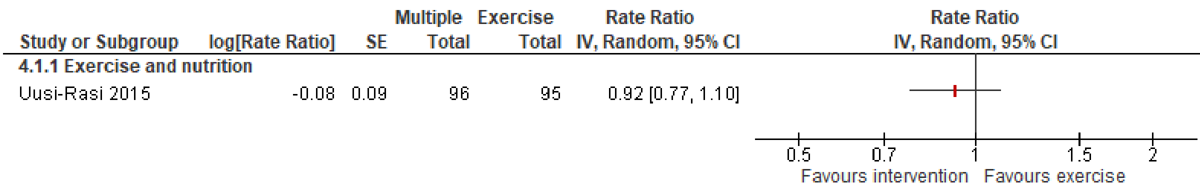


Figure 46: Multicomponent intervention vs. exercise – Number of people sustaining one or more falls

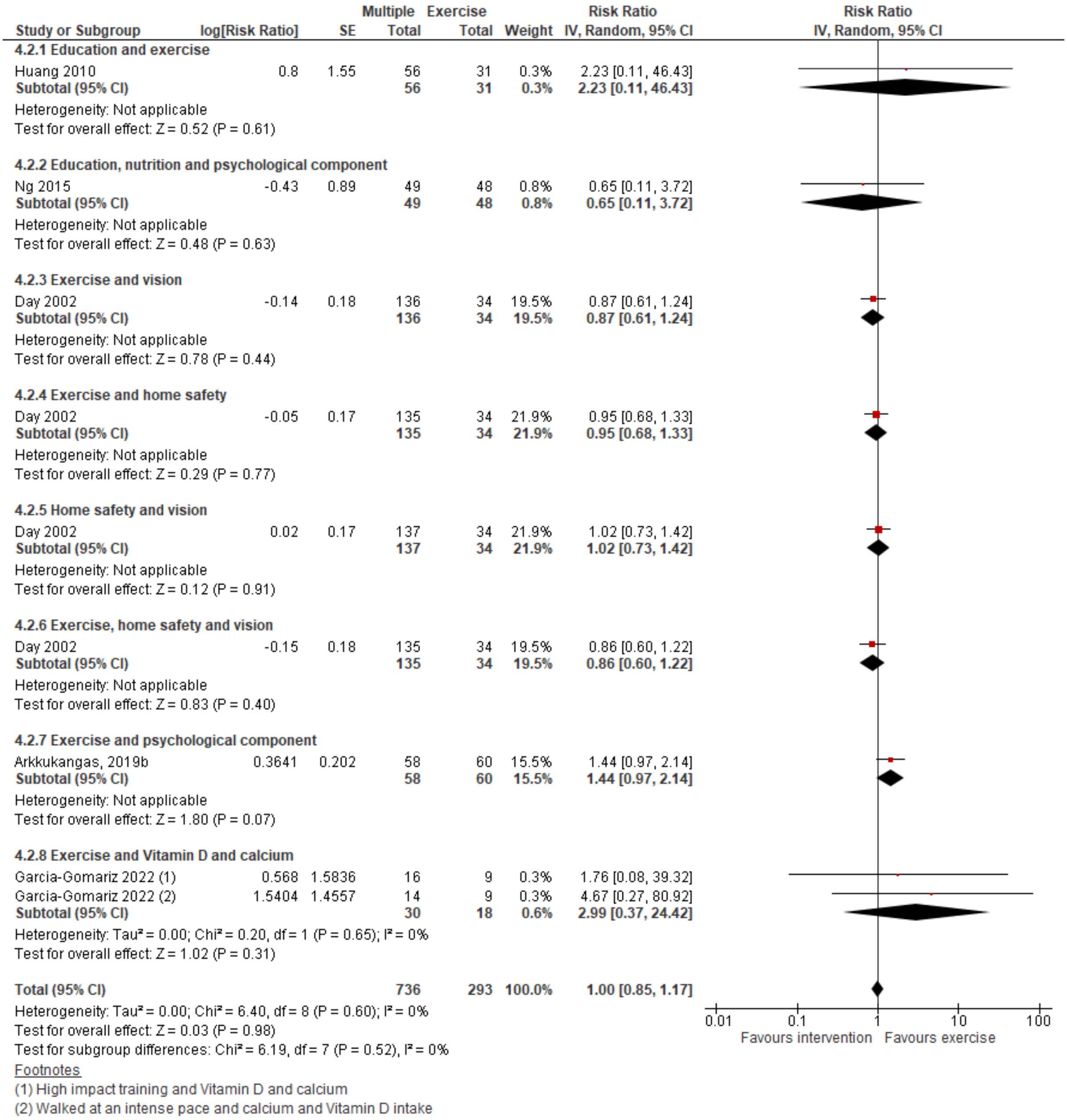
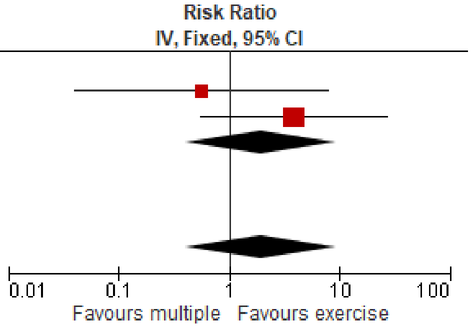


Figure 47: Multicomponent intervention vs. exercise – Number of people sustaining one or more fall-related fractures

Study or Subgroup	log[Risk Ratio]	SE	Weight	Risk Ratio IV, Fixed, 95% CI
4.4.1 Exercise and Vitamin D and calcium				
Garcia-Gomariz 2022 (1)	-0.5754	1.3514	35.0%	0.56 [0.04, 7.95]
Garcia-Gomariz 2022 (2)	1.3499	0.992	65.0%	3.86 [0.55, 26.96]
Subtotal (95% CI)			**100.0%**	**1.97 [0.41, 9.42]**
Heterogeneity: Chi² = 1.32, df = 1 (P = 0.25); I² = 24%				
Test for overall effect: Z = 0.85 (P = 0.40)				
Total (95% CI)			**100.0%**	**1.97 [0.41, 9.42]**
Heterogeneity: Chi² = 1.32, df = 1 (P = 0.25); I² = 24%				
Test for overall effect: Z = 0.85 (P = 0.40)				
Test for subgroup differences: Not applicable				



Footnotes
(1) High impact training and Vitamin D and calcium
(2) Walked at an intense pace and calcium and Vitamin D intake

E.3 Environmental interventions

See Clemson 2023[41] Cochrane review for forest plots.

Appendix F GRADEpro tables

F.1 Exercise

Table 31: Clinical evidence profile: Exercise vs control – Rate of falls

Certainty assessment							№ of patients		Effect		Certainty	Importance
№ of studies	Study design	Risk of bias	Inconsistency	Indirectness	Imprecision	Other considerations	Exercise	control (rate of falls)	Relative (95% CI)	Absolute (95% CI)		
Rate of falls - overall analysis												
80[a]	randomised trials	very serious[b]	serious[c]	not serious	serious[d]	none	12833	11679	**Rate ratio 0.74** (0.69 to 0.80)	-	⨁◯◯◯ Very low	CRITICAL
Rate of falls - subgrouped by exercise type - Balance and functional exercises vs control												
43	randomised trials	very serious[b]	not serious	not serious	serious[d]	none	5047	4571	**Rate ratio 0.76** (0.70 to 0.82)	-	⨁◯◯◯ Very low	CRITICAL
Rate of falls - subgrouped by exercise type - Resistance exercise vs control												
7	randomised trials	very serious[b]	serious[c]	not serious	serious[e]	none	247	238	**Rate ratio 0.78** (0.42 to 1.48)	-	⨁◯◯◯ Very low	CRITICAL
Rate of falls - subgrouped by exercise type - 3D exercise (Tai Chi) vs control												
10	randomised trials	very serious[b]	serious[c]	not serious	serious[d]	none	1754	1500	**Rate ratio 0.74** (0.56 to 0.97)	-	⨁◯◯◯ Very low	CRITICAL

Certainty assessment							№ of patients		Effect		Certainty	Importance
№ of studies	Study design	Risk of bias	Inconsistency	Indirectness	Imprecision	Other considerations	Exercise	control (rate of falls)	Relative (95% CI)	Absolute (95% CI)		
Rate of falls - subgrouped by exercise type - 3D exercise (Ditangquan) vs control												
1	randomised trials	very serious[b]	not serious	not serious	serious[d]	none	35	36	**Rate ratio 0.12** (0.02 to 0.90)	-	⨁◯◯◯ Very low	CRITICAL
Rate of falls - subgrouped by exercise type - 3D exercise (dance) vs control												
1	randomised trials	serious[f]	serious[c]	not serious	serious[d]	none	275	247	**Rate ratio 1.34** (0.98 to 1.83)	-	⨁◯◯◯ Very low	CRITICAL
Rate of falls - subgrouped by exercise type - Walking programme vs control												
3	randomised trials	very serious[b]	serious[c]	not serious	very serious[e]	none	236	257	**Rate ratio 0.92** (0.52 to 1.65)	-	⨁◯◯◯ Very low	CRITICAL
Rate of falls - subgrouped by exercise type - Multiple categories of exercise vs control												
24[a]	randomised trials	very serious[b]	very serious[g]	not serious	serious[d]	none	5050	4901	**Rate ratio 0.71** (0.61 to 0.83)	-	⨁◯◯◯ Very low	CRITICAL

a. Rate ratio calculated from number of falls for Lytras, 2022

b. Downgraded by 2 increments due to high risk of bias in studies (lack of blinding participants, lack of blinding of outcome assessments and selective reporting)

c. Downgraded by 1 increment for unexplained heterogeneity

d. Downgraded by 1 increment as confidence interval crosses 1 MID (0.8 and 1.25 for dichotomous outcomes)

e. Downgraded by 2 increments as confidence interval crosses 2 MIDs (0.8 and 1.25 for dichotomous outcomes)

f. Downgraded by 1 increment due to high risk of bias in study (lack of blinding of outcome assessments)

g. Downgraded by 2 increments for serious unexplained heterogeneity

Table 32: Clinical evidence profile: Exercise vs control - Number of fallers

Certainty assessment							№ of patients		Effect		Certainty	Importance
№ of studies	Study design	Risk of bias	Inconsistency	Indirectness	Imprecision	Other considerations	Exercise	control (number of fallers)	Relative (95% CI)	Absolute (95% CI)		
Number of fallers - overall analysis												
81	randomised trials	very serious[a]	not serious	not serious	not serious	none	12611	11454	**RR 0.86** (0.83 to 0.90)	-	⨁⨁◯◯ Low	CRITICAL
Number of fallers - subgrouped by exercise type - Balance and functional exercises vs control												
41	randomised trials	very serious[a]	not serious	not serious	not serious	none	5336	4924	**RR 0.86** (0.82 to 0.91)	-	⨁⨁◯◯ Low	CRITICAL
Number of fallers - subgrouped by exercise type - Resistance exercise vs control												
4	randomised trials	very serious[a]	not serious	not serious	serious[b]	none	164	157	**RR 0.84** (0.65 to 1.08)	-	⨁◯◯◯ Very low	CRITICAL
Number of fallers - subgrouped by exercise type - 3D exercise (Tai Chi) vs control												
9	randomised trials	very serious[a]	not serious	not serious	serious[b]	none	1674	1450	**RR 0.78** (0.68 to 0.88)	-	⨁◯◯◯ Very low	CRITICAL
Number of fallers - subgrouped by exercise type - 3D exercise (dance) vs control												
1	randomised trials	serious[c]	not serious	not serious	serious[b]	none	275	247	**RR 1.35** (0.83 to 2.20)	-	⨁⨁◯◯ Low	CRITICAL
Number of fallers - subgrouped by exercise type - Multiple categories of exercise vs control												
25	randomised trials	very serious[a]	not serious	not serious	serious[b]	none	4713	4520	**RR 0.87** (0.78 to 0.98)	-	⨁◯◯◯ Very low	CRITICAL

Certainty assessment							№ of patients		Effect		Certainty	Importance
№ of studies	Study design	Risk of bias	Inconsistency	Indirectness	Imprecision	Other considerations	Exercise	control (number of fallers)	Relative (95% CI)	Absolute (95% CI)		
Number of fallers - subgrouped by exercise type - Walking programme vs control												
5	randomised trials	very serious[a]	not serious	not serious	serious[b]	none	542	562	**RR 0.91** (0.80 to 1.04)	-	⊕◯◯◯ Very low	CRITICAL
Number of fallers - subgrouped by exercise type - Step and slip exercises vs control												
2	randomised trials	very serious[d]	not serious	not serious	serious[b]	none	95	89	**RR 1.1** (0.8 to 1.5)	-	⊕◯◯◯ Very low	CRITICAL
Number of fallers - subgrouped by exercise type - 3D exercise (ditangguan) vs control												
1	randomised trials	serious[c]	not serious	not serious	serious[b]	none	35	35	**RR 0.13** (0.02 to 0.95)	-	⊕⊕◯◯ Low	

a. Downgraded by 2 increments due to high risk of bias in studies (lack of blinding participants, lack of blinding of outcome assessments and selective reporting)

b. Downgraded by 1 increment as confidence interval crosses 1 MID (0.8 and 1.25 for dichotomous outcomes)

c. Downgraded by 1 increment due to high risk of bias in studies (lack of blinding of outcome assessments)

d. Downgraded by 2 increments due to high risk of bias in studies (lack of blinding participants, lack of information regarding randomisation)

Table 33: Clinical evidence profile: Exercise vs control - Number of people experiencing fall-related fractures

Certainty assessment							№ of patients		Effect		Certainty	Importance
№ of studies	Study design	Risk of bias	Inconsistency	Indirectness	Imprecision	Other considerations	Exercise	control (number of people with fractures)	Relative (95% CI)	Absolute (95% CI)		
Number of people who experienced one or more fall-related fractures- overall analysis												
16	randomised trials	very serious[a]	not serious	not serious	serious[b]	none	6494	6369	**RR 0.83** (0.64 to 1.06)	-	⨁◯◯◯ Very low	CRITICAL
Number of people who experienced one or more fall-related fractures - subgrouped by exercise type - Balance and functional exercises vs control												
7	randomised trials	very serious[a]	not serious	not serious	very serious[c]	none	-/1066	-/1073	**RR 0.44** (0.25 to 0.76)	-	⨁◯◯◯ Very low	CRITICAL
Number of people who experienced one or more fall-related fractures - subgrouped by exercise type - Resistance exercise vs control												
1	randomised trials	very serious[d]	not serious	not serious	very serious[c]	none	37	36	**RR 0.97** (0.14 to 6.49)	-	⨁◯◯◯ Very low	CRITICAL
Number of people who experienced one or more fall-related fractures - subgrouped by exercise type - Walking programme vs control												
1	randomised trials	very serious[a]	not serious	not serious	very serious[c]	none	49	48	**RR 0.66** (0.11 to 3.76)	-	⨁◯◯◯ Very low	CRITICAL
Number of people who experienced one or more fall-related fractures - subgrouped by exercise type - Multiple categories of exercise vs control												
9	randomised trials	very serious[a]	not serious	not serious	serious[b]	none	5284	5284	**RR 0.93** (0.72 to 1.21)	-	⨁◯◯◯ Very low	CRITICAL

a. Downgraded by 2 increments due to high risk of bias in studies (lack of blinding participants, lack of blinding of outcome assessments and selective reporting)

b. Downgraded by 1 increment as confidence interval crosses 1 MID (0.8 and 1.25 for dichotomous outcomes)

c. Downgraded by 2 increments as confidence interval crosses 2 MIDs (0.8 and 1.25 for dichotomous outcomes)

d. Downgraded by 2 increments due to high risk of bias in studies (lack of blinding participants, selective reporting and reporting bias)

Table 34: Clinical evidence profile: Exercise vs control - Adverse events

Certainty assessment							№ of patients		Effect		Certainty	Importance
№ of studies	Study design	Risk of bias	Inconsistency	Indirectness	Imprecision	Other considerations	Exercise	control (Adverse events)	Relative (95% CI)	Absolute (95% CI)		
Number of people sustaining adverse events												
23	randomised trials	very serious[a]	not serious	not serious	not serious	none	200/2174 (9.2%)	66/1797 (3.7%)	**RD 0.04** (0.03 to 0.06)	**40 fewer per 1,000** (from 30 fewer to 60 more)	⨁⨁◯◯ Low	CRITICAL

a. Downgraded by 2 increments due to high risk of bias in studies (lack of blinding participants, lack of information regarding adherence)

b. Downgraded by 2 increments as confidence interval crosses 2 MIDs (0.8 and 1.25 for dichotomous outcomes)

Table 35: Clinical evidence profile: Exercise vs control - Quality of life (general) – better values are higher

Certainty assessment							№ of patients		Effect		Certainty	Importance
№ of studies	Study design	Risk of bias	Inconsistency	Indirectness	Imprecision	Other considerations	Exercise	control (health-related quality of life)	Relative (95% CI)	Absolute (95% CI)		
Health-related quality of life- overall analysis												

Certainty assessment							№ of patients		Effect		Certainty	Importance
№ of studies	Study design	Risk of bias	Inconsistency	Indirectness	Imprecision	Other considerations	Exercise	control (health-related quality of life)	Relative (95% CI)	Absolute (95% CI)		
14	randomised trials	very serious[a]	serious[b]	not serious	serious[c]	none	1647	1395	-	SMD **0.19 SD higher** (0.05 higher to 0.34 higher)	⊕◯◯◯ Very low	CRITICAL
Health-related quality of life - subgrouped by exercise type - Balance and functional exercises vs control												
9	randomised trials	very serious[a]	not serious	not serious	not serious	none	1092	800	-	SMD **0.09 SD higher** (0.02 lower to 0.2 higher)	⊕⊕◯◯ Low	CRITICAL
Health-related quality of life - subgrouped by exercise type - Resistance exercise vs control												
2	randomised trials	very serious[a]	not serious	not serious	not serious	none	90	84	-	SMD **0.51 SD higher** (0.22 lower to 1.24 higher)	⊕⊕◯◯ Low	CRITICAL
Health-related quality of life - subgrouped by exercise type - Walking programme vs control												
1	randomised trials	very serious[a]	not serious	not serious	not serious	none	144	169	-	SMD **0.08 higher** (0.14 lower to 0.3 higher)	⊕⊕◯◯ Low	CRITICAL
Health-related quality of life - subgrouped by exercise type - Virtual reality vs control												
1	randomised trials	very serious[a]	not serious	not serious	very serious[e]	none	13	12	-	SMD **2.1 higher** (1.09 higher to 3.11 higher)	⊕◯◯◯ Very low	CRITICAL
Health-related quality of life - subgrouped by exercise type - Multiple categories vs control												

Certainty assessment							№ of patients		Effect		Certainty	Importance
№ of studies	Study design	Risk of bias	Inconsistency	Indirectness	Imprecision	Other considerations	Exercise	control (health-related quality of life)	Relative (95% CI)	Absolute (95% CI)		
1	randomised trials	serious[a]	not serious	not serious	serious[c]	none	122	123	-	SMD **0.44 higher** (0.19 higher to 0.7 higher)	⊕⊕◯◯ Low	

a. Downgraded by 2 increments due to high risk of bias in studies (lack of blinding participants, lack of blinding of outcome assessments and selective reporting)

b. Downgraded by 1 increment for unexplained heterogeneity

c. Downgraded for 1 increment as confidence intervals cross 1 MID (0.5 lower and 0.5 higher for SMD)

d. Downgraded by 2 increments for serious unexplained heterogeneity

e. Downgraded by 2 increments as confidence interval crosses 2 MIDs (0.5 lower and 0.5 higher for SMDs)

Table 36: Clinical evidence profile: Exercise vs control - Quality of life (Mental component) better values are higher

Certainty assessment							№ of patients		Effect		Certainty	Importance
№ of studies	Study design	Risk of bias	Inconsistency	Indirectness	Imprecision	Other considerations	Exercise	control (health-related quality of life - Mental component)	Relative (95% CI)	Absolute (95% CI)		
Health-related quality of life mental component - overall analysis												
11	randomised trials	very serious[a]	very serious[b]	not serious	serious[c]	none	3614	3541	-	SMD **0.45 SD higher** (0.07 higher to 0.84 higher)	⊕◯◯◯ Very low	CRITICAL
Health-related quality of life mental component - subgrouped by exercise type - Balance and functional exercises vs control												

Certainty assessment							№ of patients		Effect		Certainty	Importance
№ of studies	Study design	Risk of bias	Inconsistency	Indirectness	Imprecision	Other considerations	Exercise	control (health-related quality of life - Mental component)	Relative (95% CI)	Absolute (95% CI)		
5	randomised trials	very serious[a]	very serious[b]	not serious	very serious[d]	none	495	454	-	SMD **1.11 SD higher** (0.46 lower to 2.69 higher)	⨁◯◯◯ Very low	CRITICAL
Health-related quality of life mental component - subgrouped by exercise type - Multiple categories of exercise vs control												
3	randomised trials	very serious[e]	very serious[b]	not serious	very serious[d]	none	3583	3529	-	SMD **0.24 SD lower** (0.62 lower to 0.15 higher)	⨁◯◯◯ Very low	CRITICAL
Health-related quality of life mental component - subgrouped by exercise type - Resistance exercise vs control												
1	randomised trials	very serious[e]	not serious	not serious	serious[c]	none	31	34	-	SMD **0.55 higher** (0.05 higher to 1.05 higher)	⨁◯◯◯ Very low	CRITICAL
Health-related quality of life mental component - subgrouped by exercise type - 3D exercise (Dance) vs control												
1	randomised trials	very serious[e]	not serious	not serious	not serious	none	274	247	-	SMD **0.11 higher** (0.07 lower to 0.28 higher)	⨁⨁◯◯ Low	CRITICAL
Health-related quality of life mental component - subgrouped by exercise type - Walking vs control												
1	randomised trials	very serious[e]	not serious	not serious	very serious[d]	none	10	7	-	SMD **0.04 higher** (0.92 lower to 1.01 higher)	⨁◯◯◯ Very low	

a. Downgraded by 2 increments due to high risk of bias in studies (lack of blinding participants, lack of blinding of outcome assessments and selective reporting)

b. Downgraded by 2 increments for serious unexplained heterogeneity

c. Downgraded by 1 increment as confidence interval crosses 1 MID (0.5 lower and 0.5 higher for SMDs)

d. Downgraded by 2 increments as confidence interval crosses 2 MIDs (0.5 lower and 0.5 higher for SMDs)

e. Downgraded by 2 increments due to high risk of bias in studies (lack of blinding participants, lack of blinding of outcome assessments and high risk of bias in reported outcomes)

Table 37: Clinical evidence profile: Exercise vs control - Quality of life (Physical component) better values are higher

Certainty assessment							№ of patients		Effect		Certainty	Importance
№ of studies	Study design	Risk of bias	Inconsistency	Indirectness	Imprecision	Other considerations	Exercise	control (health-related quality of life physical component)	Relative (95% CI)	Absolute (95% CI)		
Health-related quality of life physical component - overall analysis												
13	randomised trials	very serious[a]	very serious[b]	not serious	serious[c]	none	4534	4408	-	SMD **0.26 SD higher** (0.01 lower to 0.52 higher)	⨁◯◯◯ Very low	CRITICAL
Health-related quality of life physical component - subgrouped by exercise type - Balance and functional exercises vs control												
5	randomised trials	very serious[a]	very serious[b]	not serious	serious[c]	none	495	454	-	SMD **0.12 SD lower** (0.64 lower to 0.4 higher)	⨁◯◯◯ Very low	CRITICAL
Health-related quality of life physical component - subgrouped by exercise type - Multiple categories of exercise vs control												
4	randomised trials	very serious[a]	very serious[b]	not serious	very serious[d]	none	3611	3556	-	SMD **0.69 SD higher** (0.02 higher to 1.35 higher)	⨁◯◯◯ Very low	CRITICAL
Health-related quality of life physical component - subgrouped by exercise type - Resistance exercise vs control												
2	randomised trials	very serious[a]	very serious[b]	not serious	very serious[d]	none	143	144	-	SMD **0.49 higher** (0.88 lower to 1.87 higher)	⨁◯◯◯ Very low	CRITICAL

Certainty assessment							№ of patients		Effect		Certainty	Importance
№ of studies	Study design	Risk of bias	Inconsistency	Indirectness	Imprecision	Other considerations	Exercise	control (health-related quality of life physical component)	Relative (95% CI)	Absolute (95% CI)		
Health-related quality of life physical component - subgrouped by exercise type - Walking programme vs control												
1	randomised trials	very serious[a]	not serious	not serious	very serious[d]	none	10	7	-	SMD **0.43 higher** (0.55 lower to 1.41 higher)	⊕◯◯◯ Very low	CRITICAL
Health-related quality of life physical component - subgrouped by exercise type - 3D exercise (Dance) vs control												
1	randomised trials	very serious[a]	not serious	not serious	not serious	none	275	247	-	SMD **0.08 lower** (0.25 lower to 0.09 higher)	⊕⊕◯◯ Low	CRITICAL

a. Downgraded by 2 increments due to high risk of bias in studies (lack of blinding participants, lack of blinding of outcome assessments and high risk of bias in reported outcomes)

b. Downgraded by 2 increments for serious unexplained heterogeneity

c. Downgraded by 1 increment as confidence interval crosses 1 MID (0.5 lower and 0.5 higher for SMDs)

d. Downgraded by 2 increments as confidence interval crosses 2 MIDs (0.5 lower and 0.5 higher for SMDs)

Table 38: Clinical evidence profile: Exercise vs exercise

Certainty assessment							№ of patients		Effect		Certainty	Importance
№ of studies	Study design	Risk of bias	Inconsistency	Indirectness	Imprecision	Other considerations	Exercise	exercise	Relative (95% CI)	Absolute (95% CI)		
Rate of falls, different types of exercise compared - Balance and functional exercises vs balance and functional exercises												
6	randomised trials	very serious[a]	serious[b]	not serious	very serious[c]	none	520	518	Rate ratio 0.88 (0.52 to 1.47)	-	⊕◯◯◯ Very low	CRITICAL

Certainty assessment							№ of patients		Effect		Certainty	Importance
№ of studies	Study design	Risk of bias	Inconsistency	Indirectness	Imprecision	Other considerations	Exercise	exercise	Relative (95% CI)	Absolute (95% CI)		
Rate of falls, different types of exercise compared - Balance and functional exercises vs resistance exercises												
3	randomised trials	very serious[d]	not serious	not serious	very serious[c]	none	175	167	Rate ratio 0.91 (0.60 to 1.40)	-	⊕◯◯◯ Very low	CRITICAL
Rate of falls, different types of exercise compared - Balance and functional exercises vs walking												
2	randomised trials	very serious[e]	not serious	not serious	very serious[c]	none	61	65	Rate ratio 0.57 (0.25 to 1.29)	-	⊕◯◯◯ Very low	CRITICAL
Rate of falls, different types of exercise compared - Balance and functional exercises vs multiple categories of exercise												
2	randomised trials	serious[f]	not serious	not serious	serious[g]	none	263	250	Rate ratio 0.84 (0.71 to 1.01)	-	⊕⊕◯◯ Low	CRITICAL
Rate of falls, different types of exercise compared - 3D (Tai Chi) vs balance and functional exercises												
2	randomised trials	very serious[a]	not serious	not serious	serious[g]	none	239	231	Rate ratio 0.50 (0.26 to 0.94)	-	⊕◯◯◯ Very low	CRITICAL
Rate of falls, different types of exercise compared - 3D (Tai Chi) vs 3D (Tai Chi)												
1	randomised trials	very serious[a]	not serious	not serious	very serious[c]	none	44	42	Rate ratio 0.73 (0.24 to 2.19)	-	⊕◯◯◯ Very low	CRITICAL
Rate of falls, different types of exercise compared - Multiple categories of exercise vs balance and functional exercises												
1	randomised trials	very serious[a]	not serious	not serious	very serious[c]	none	36	35	Rate ratio 1.03 (0.54 to 1.97)	-	⊕◯◯◯ Very low	CRITICAL

Certainty assessment							№ of patients		Effect		Certainty	Importance
№ of studies	Study design	Risk of bias	Inconsistency	Indirectness	Imprecision	Other considerations	Exercise	exercise	Relative (95% CI)	Absolute (95% CI)		
Rate of falls, different types of exercise compared - Multiple categories of exercise vs resistance exercises												
2	randomised trials	very serious[a]	very serious[h]	not serious	very serious[c]	none	58	59	Rate ratio 0.96 (0.16 to 5.57)	-	⊕◯◯◯ Very low	CRITICAL
Rate of falls, different types of exercise compared - Multiple categories of exercise vs multiple categories of exercise												
4	randomised trials	very serious[a]	very serious[h]	not serious	very serious[c]	none	274	272	Rate ratio 0.91 (0.52 to 1.58)	-	⊕◯◯◯ Very low	CRITICAL
Rate of falls, different types of exercise compared - Tai chi vs multimodal exercises												
1	randomised trials	serious[i]	not serious	not serious	not serious	none	224	223	**Rate ratio 0.69** (0.56 to 0.85)	-	⊕⊕⊕◯ Moderate	CRITICAL
Rate of falls, different types of exercise compared - Perturbation exercise vs balance and functional exercise												
1	randomised trials	serious[i]	not serious	not serious	serious[g]	none	187	190	**Rate ratio 0.78** (0.47 to 1.29)	-	⊕⊕◯◯ Low	CRITICAL
Number of fallers, different types of exercise compared - Balance and functional exercises vs balance and functional exercises												
5	randomised trials	very serious[a]	very serious[h]	not serious	very serious[c]	none	514	524	RR 0.75 (0.35 to 1.60)	-	⊕◯◯◯ Very low	CRITICAL
Number of fallers, different types of exercise compared - Balance and functional exercises vs walking												
2	randomised trials	very serious[a]	not serious	not serious	serious[g]	none	61	65	RR 0.52 (0.25 to 1.05)	-	⊕◯◯◯ Very low	CRITICAL

Certainty assessment							№ of patients		Effect		Certainty	Importance
№ of studies	Study design	Risk of bias	Inconsistency	Indirectness	Imprecision	Other considerations	Exercise	exercise	Relative (95% CI)	Absolute (95% CI)		
Number of fallers, different types of exercise compared - Balance and functional exercises vs multiple categories of exercise												
1	randomised trials	serious[f]	not serious	not serious	serious[g]	none	99	96	RR 0.90 (0.72 to 1.11)	-	⨁⨁◯◯ Low	CRITICAL
Number of fallers, different types of exercise compared - 3D (Tai Chi) vs balance and functional exercises												
1	randomised trials	serious[f]	not serious	not serious	serious[g]	none	167	167	RR 0.73 (0.59 to 0.90)	-	⨁⨁◯◯ Low	CRITICAL
Number of fallers, different types of exercise compared - 3D (Tai Chi) vs resistance exercises												
1	randomised trials	very serious[a]	not serious	not serious	serious[g]	none	58	59	RR 0.63 (0.37 to 1.06)	-	⨁◯◯◯ Very low	CRITICAL
Number of fallers, different types of exercise compared - Multiple categories of exercise vs balance and functional exercises												
1	randomised trials	very serious[a]	not serious	not serious	very serious[c]	none	18	25	RR 1.73 (0.53 to 5.62)	-	⨁◯◯◯ Very low	CRITICAL
Number of fallers, different types of exercise compared - Multiple categories of exercise vs resistance exercises												
1	randomised trials	very serious[a]	not serious	not serious	very serious[c]	none	22	22	RR 0.52 (0.18 to 1.48)	-	⨁◯◯◯ Very low	CRITICAL
Number of fallers, different types of exercise compared - Multiple categories of exercise vs resistance exercises (after hospital stays)												
1	randomised trials	very serious[a]	not serious	not serious	very serious[c]	none	57	57	RR 1.72 (0.72 to 4.06)	-	⨁◯◯◯ Very low	CRITICAL

Certainty assessment							№ of patients		Effect		Certainty	Importance
№ of studies	Study design	Risk of bias	Inconsistency	Indirectness	Imprecision	Other considerations	Exercise	exercise	Relative (95% CI)	Absolute (95% CI)		
Number of fallers, different types of exercise compared - Multiple categories of exercise vs multiple categories of exercise												
4	randomised trials	very serious[a]	serious[b]	not serious	serious[g]	none	274	272	RR 0.75 (0.48 to 1.19)	-	⊕◯◯◯ Very low	CRITICAL
Number of fallers, different types of exercise compared - Tai Ji Chuan vs Multimodal exercise												
1	randomised trials	Serious[i]	not serious	not serious	serious[g]	none	224	223	RR 0.76 (0.61 to 0.93)	-	⊕⊕◯◯ Low	CRITICAL
Number of fallers, different types of exercise compared – Perturbation exercise vs balance and functional exercise												
1	randomised trials	very serious[h]	not serious	not serious	serious[c]	None	253	253	RR 0.92 (0.68 to 1.25)	-	⊕◯◯◯ Very low	CRITICAL
Number of fallers, different types of exercise compared - Individual multimodal exercise vs group multimodal exercises												
1	randomised trials	serious[i]	not serious	not serious	serious[g]	none	156	153	**RR 1.03** (0.79 to 1.34)	-	⊕⊕◯◯ Low	CRITICAL
Falls - Balance vs strengthening exercise												
1	randomised trials	very serious[j]	not serious	not serious	not serious	none	0/27 (0.0%)	0/28 (0.0%)	not estimable	**0 fewer per 1,000** (from 70 fewer to 70 more)	⊕⊕◯◯ Low	CRITICAL
Falls - Balance vs aerobic exercise												
1	randomised trials	very serious[j]	not serious	not serious	not serious	none	0/27 (0.0%)	0/27 (0.0%)	not estimable	**0 fewer per 1,000** (from 70 fewer to 70 more)	⊕⊕◯◯ Low	CRITICAL

Certainty assessment							№ of patients		Effect		Certainty	Importance
№ of studies	Study design	Risk of bias	Inconsistency	Indirectness	Imprecision	Other considerations	Exercise	exercise	Relative (95% CI)	Absolute (95% CI)		
Number of people who experienced one or more fall-related fractures, different types of exercise compared - Balance and functional exercise vs balance and functional exercise												
2	randomised trials	serious[i]	very serious[h]	not serious	very serious[c]	none	185	190	RR 1.25 (0.04 to 37.26)	-	⨁◯◯◯ Very low	CRITICAL
Number of people who experienced one or more fall-related fractures, different types of exercise compared - Balance and functional exercises vs resistance exercises												
1	randomised trials	very serious[a]	not serious	not serious	very serious[c]	none	35	37	RR 0.21 (0.01 to 4.25)	-	⨁◯◯◯ Very low	CRITICAL
Number of people who experienced one or more fall-related fractures, different types of exercise compared - Multiple categories of exercise vs resistance exercises												
1	randomised trials	very serious[a]	not serious	not serious	very serious[c]	none	36	37	RR 0.19 (0.01 to 3.92)	-	⨁◯◯◯ Very low	CRITICAL
Quality of life (general) - Balance and functional exercise vs balance and functional exercise- better values are higher												
1	randomised trials	very serious[a]	not serious	not serious	not serious	none	69	64	-	SMD **0.01 lower** (0.35 lower to 0.33 higher)	⨁⨁◯◯ Low	CRITICAL
Quality of life (general) - Balance and functional exercise vs resistance exercise - better values are higher												
1	randomised trials	very serious	not serious	not serious	Serious[j,m]	none	25	25	-	SMD **0.42 higher** (0.14 lower to 0.98 higher)	⨁◯◯◯ Very low	CRITICAL
Quality of life (general) - Resistance exercise vs aerobic exercise - better values are higher												
1	randomised trials	very serious[k]	not serious	not serious	Serious[j,n]	none	25	25	-	SMD **0.4 lower** (0.96 lower to 0.16 higher)	⨁◯◯◯ Very low	CRITICAL

Certainty assessment							№ of patients		Effect		Certainty	Importance
№ of studies	Study design	Risk of bias	Inconsistency	Indirectness	Imprecision	Other considerations	Exercise	exercise	Relative (95% CI)	Absolute (95% CI)		
Quality of life (general) - Balance and functional exercise vs aerobic												
1	randomised trials	very serious[j]	not serious	not serious	serious[n]	none	25	25	-	SMD **0.01 lower** (0.56 lower to 0.55 higher)	⨁◯◯◯ Very low	CRITICAL
Adverse events												
5	randomised trials	very serious[a]	not serious	not serious	not serious	none	21/273 (7.7%)	19/269 (7.1%)	not estimable	**0 fewer per 1,000** (from 40 fewer to 40 more)	⨁⨁◯◯ Low	CRITICAL

a. Downgraded by 2 increments due to high risk of bias in studies (lack of blinding participants, lack of blinding of outcome assessments and selective reporting)

b. Downgraded by 1 increment for unexplained heterogeneity

c. Downgraded by 2 increments as confidence interval crosses 2 MIDs (0.8 and 1.25 for dichotomous outcomes)

d. Downgraded by 2 increments due to high risk of bias in studies (lack of blinding participants and selective reporting)

e. Downgraded by 2 increments due to high risk of bias in studies (lack of blinding participants, lack of blinding of outcome assessments)

f. Downgraded by 1 increment due to high risk of bias in study (lack of blinding of outcome assessments)

g. Downgraded by 1 increment as confidence interval crosses 1 MID (0.8 and 1.25 for dichotomous outcomes)

h. Downgraded by 2 increments for serious unexplained heterogeneity

i. Downgraded by 1 increment due to high risk of bias in studies (lack of blinding participants,)

j. Downgraded by 2 increments due to high risk of bias in studies (lack of blinding participants, lack of pre-specified plan)

k. Downgraded by 1 increment as confidence interval crosses 1 MID (0.5 lower and 0.5 higher for SMDs)

l. Downgraded by 2 increments as confidence interval crosses 2 MIDs (0.5 lower and 0.5 higher for SMDs)

m. Downgraded by 1 increment as 1 confidence interval crosses 1 MID (7.05)

n. Downgraded by 1 increment as 1 confidence interval crosses 1 MID (7.6)

F.2 Multifactorial

Table 39: Clinical evidence profile: Multifactorial intervention vs. control

Certainty assessment							№ of patients		Effect		Certainty	Importance
№ of studies	Study design	Risk of bias	Inconsistency	Indirectness	Imprecision	Other considerations	Multifactorial intervention	usual care or attention control	Relative (95% CI)	Absolute (95% CI)		
Rate of falls (falls per person years)												
28	randomised trials	very serious[a]	very serious[b]	not serious	serious[c]	none	9539	9189	**Rate ratio 0.81** (0.73 to 0.90)	-	⊕◯◯◯ Very low	CRITICAL
Number of people sustaining one or more falls												
376	randomised trials	very serious[d]	serious[e]	not serious	not serious	none	11540	11235	**RR 0.96** (0.91 to 1.01)	-	⊕◯◯◯ Very low	CRITICAL
Number of people sustaining one or more fall-related fractures												
14	randomised trials	serious[e]	not serious	not serious	serious[c]	none	7474	6991	**RR 0.81** (0.70 to 0.94)	-	⊕⊕◯◯ Low	CRITICAL
Health-related quality of life: endpoint score												
9	randomised trials	serious[f]	serious[g]	not serious	not serious	none	1156	1217	-	SMD **0.15 higher** (0.03 higher to 0.26 higher)	⊕⊕◯◯ Low	CRITICAL
Health-related quality of life (mental): endpoint score												

Certainty assessment							№ of patients		Effect		Certainty	Importance
№ of studies	Study design	Risk of bias	Inconsistency	Indirectness	Imprecision	Other considerations	Multifactorial intervention	usual care or attention control	Relative (95% CI)	Absolute (95% CI)		
5	randomised trials	serious[h]	serious[g]	not serious	serious[c]	none	3787	3741	-	SMD **0.11 higher** (0.05 lower to 0.27 higher)	⊕⊕◯◯ Low	CRITICAL
Health-related quality of life (physical): endpoint score												
5	randomised trials	serious[h]	very serious[b]	not serious	serious[c]	none	3787	3741	-	SMD **0.16 higher** (0.08 lower to 0.40 higher)	⊕◯◯◯ Very low	CRITICAL
Adverse events												
1	randomised trials	serious[h]	not serious	not serious	not serious	none	1374/5604 (24.5%)	1328/5298 (25.1%)	**RR 1.01** (0.85 to 1.20)	**3 more per 1,000** (from 38 fewer to 50 more)	⊕⊕⊕◯ Moderate	CRITICAL
Adverse events - Death												
1	randomised trials	serious[h]	not serious	not serious	not serious	none	235/2802 (8.4%)	220/2649 (8.3%)	**RR 1.01** (0.85 to 1.20)	**1 more per 1,000** (from 12 fewer to 17 more)	⊕⊕⊕◯ Moderate	CRITICAL
Adverse events - Hospitalisation												
1	randomised trials	serious[h]	not serious	not serious	not serious	none	1139/2802 (40.6%)	1108/2649 (41.8%)	**RR 0.97** (0.91 to 1.04)	**13 fewer per 1,000** (from 38 fewer to 17 more)	⊕⊕⊕◯ Moderate	CRITICAL
Health-related quality of life (EQ-5D) (follow-up: 12 months)												
2	randomised trials	serious[h]	not serious	not serious	not serious	none	2955	2805	-	SMD **0.02 SD higher** (0.03 lower to 0.07 higher)	⊕⊕◯◯ Low	CRITICAL

Certainty assessment							№ of patients		Effect		Certainty	Importance
№ of studies	Study design	Risk of bias	Inconsistency	Indirectness	Imprecision	Other considerations	Multifactorial intervention	usual care or attention control	Relative (95% CI)	Absolute (95% CI)		
~~Health-related quality of life (mental): endpoint score(S F-12, 0-100)~~												

CI: confidence interval; **RR:** risk ratio; **SMD:** standardised mean difference

a. Downgraded by 2 increments for risk of bias due to incomplete outcome data, participants and people delivering the intervention were aware of the assigned intervention, blinding of outcome assessment, method of ascertaining falls, selective reporting, and unclear allocation concealment.

b. Downgraded by 2 increments due to very serious heterogeneity unexplained by subgroup analysis

c. Downgraded by 1 increment if the confidence interval crossed one MID or by 2 increments if the confidence interval crossed both MIDs. The MIDs were 0.8 to 1.25 for dichotomous outcomes or 0.5 x median baseline SD (or 0.5 x SMD where no baseline values given) for continuous outcomes.

d. Downgraded by 2 increments for risk of bias due to incomplete outcome data, outcome assessment was not blinded, incorrect analysis for cluster randomisation, participants and people delivering the intervention were aware of the assigned intervention, and unclear allocation concealment.

e. Downgraded by 1 increment for risk of bias due to participants and people delivering the intervention were aware of the assigned intervention, blinding of outcome assessment, and incomplete outcome data.

f. Downgraded by 1 increment for risk of bias due to participants being aware of their assigned intervention, method of ascertaining falls, blinding of outcome assessment, and incomplete outcome data.

g. Downgraded by 1 increment due to serious heterogeneity unexplained by subgroup analysis

h. Downgraded by 1 increment for risk of bias due to participants and people delivering the intervention were aware of the assigned intervention, selective reporting, and incomplete outcome data.

i. Downgraded by 1 increment for risk of bias due to personnel not being blinded.

Table 40: Clinical evidence profile: Multifactorial interventions vs. control- Subgroup analysis by intensity of interventions

Certainty assessment							№ of patients		Effect		Certainty	Importance
№ of studies	Study design	Risk of bias	Inconsistency	Indirectness	Imprecision	Other considerations	Multifactorial intervention	usual care	Relative (95% CI)	Absolute (95% CI)		
Rate of falls (falls per person years) - Assessment and active intervention												
16	randomised trials	serious[a]	serious[b]	not serious	serious[c]	none	4747	4556	**Rate ratio 0.81** (0.68 to 0.97)	-	⨁◯◯◯ Very low	

Certainty assessment							№ of patients		Effect		Certainty	Importance
№ of studies	Study design	Risk of bias	Inconsistency	Indirectness	Imprecision	Other considerations	Multifactorial intervention	usual care	Relative (95% CI)	Absolute (95% CI)		
Rate of falls (falls per person years) - Assessment and referral or provision of information												
11	randomised trials	serious[d]	serious[b]	not serious	serious[c]	none	4658	4499	**Rate ratio 0.80** (0.69 to 0.93)	-	⊕◯◯◯ Very low	
Number of people sustaining one or more falls - Assessment and active intervention												
15	randomised trials	serious[e]	not serious	not serious	serious[c]	none	4530	4446	**RR 0.95** (0.88 to 1.02)	**1 fewer per 1,000** (from 1 fewer to 1 fewer)	⊕⊕◯◯ Low	
Number of people sustaining one or more falls - Assessment and referral or provision of information												
18	randomised trials	serious[f]	not serious	not serious	serious[c]	none	3256	3187	**RR 0.99** (0.89 to 1.11)	**1 fewer per 1,000** (from 1 fewer to 1 fewer)	⊕⊕◯◯ Low	
Health-related quality of life: endpoint score (SF-36) - Assessment and active intervention												
4	randomised trials	serious[g]	serious[b]	not serious	serious[c]	none	436	455	-	SMD **0.32 higher** (0.19 higher to 0.45 higher)	⊕◯◯◯ Very low	
Health-related quality of life: endpoint score (SF-36) - Assessment and referral or provision of information												
5	randomised trials	serious[h]	serious[b]	not serious	serious[c]	none	720	762	-	SMD **0.07 higher** (0.03 lower to 0.18 higher)	⊕◯◯◯ Very low	

a. Downgraded by 1 increment for risk of bias due to missing outcome data, participants and people delivering the intervention were aware of the assigned intervention, and outcome assessment was not blind

b. Downgraded by 1 increment for inconsistency due to a high I2 value.

c. Downgraded by 1 increment if the confidence interval crossed one MID or by 2 increments if the confidence interval crossed both MIDs. The MIDs were 0.8 to 1.25 for dichotomous outcomes or 0.5 x median baseline SD (or 0.5 x SMD where no baseline values given) for continuous outcomes.

d. Downgraded by 1 increment for risk of bias due to unclear outcome assessment, unclear allocation concealment, unclear selective reporting, method of ascertaining falls, and participants and people delivering the intervention were aware of the assigned intervention

e. Downgraded by 1 increment for risk of bias due to incomplete outcome data, selective reporting, and participants and people delivering the intervention were aware of the assigned intervention.

f. Downgraded by 1 increment for risk of bias due to outcome assessment was not blinded, incomplete outcome data, and method of ascertaining falls.

g. Downgraded by 1increment for risk of bias due to issues regarding blinding of the outcome assessment, missing outcome data, and unclear method of ascertaining falls

h. Downgraded by 1 increment for risk of bias due to missing outcome data, method of ascertaining falls, and unclear allocation concealment

Table 41: Clinical evidence profile: Multifactorial intervention vs. exercise

Certainty assessment							№ of patients		Effect		Certainty	Importance
№ of studies	Study design	Risk of bias	Inconsistency	Indirectness	Imprecision	Other considerations	Multifactorial intervention	exercise	Relative (95% CI)	Absolute (95% CI)		
Number of fallers												
2	randomised trials	serious[a]	not serious	not serious	not serious	none	2522	2526	**RR 1.04** (0.93 to 1.17)	**1 fewer per 1,000** (from 1 fewer to 1 fewer)	⨁⨁⨁◯ Moderate	
Number of people sustaining a fall-related fracture												
1	randomised trials	serious[b]	not serious	not serious	very serious[c]	none	2497	2500	**RR 0.84** (0.50 to 1.41)	**1 fewer per 1,000** (from 1 fewer to 1 fewer)	⨁◯◯◯ Very low	
Rate of falls												
2	randomised trials	serious[a]	not serious	not serious	very serious[c]	none	2522	2526	**Rate ratio 0.63** (0.11 to 3.48)	-	⨁◯◯◯ Very low	

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Health-related quality of life (mental): endpoint score(S F-12, 0-100)

1	randomised trials	Serious[b]	not serious	not serious	serious[c]	none	3301	3279	-	SMD 0.06 lower (0.11 lower to 0.01 lower	⨁⨁◯◯ Low	

Certainty assessment							№ of patients		Effect		Certainty	Importance
№ of studies	Study design	Risk of bias	Inconsistency	Indirectness	Imprecision	Other considerations	Multifactorial intervention	exercise	Relative (95% CI)	Absolute (95% CI)		
Health-related quality of life (physical): endpoint score(SF-12, 0-100)												
1	randomised trials	Serious[b]	not serious	not serious	serious[c]	none	3301	3279	-	SMD 0.04 lower (0.09 lower to 0.01 higher)	⊕⊕◯◯ Low	

CI: confidence interval; **RR:** risk ratio

a. Downgraded by 1 increment due to personnel not being blinded, unclear allocation concealment, unclear blinding of outcome assessment, and unclear blinding of participants.

b. Downgraded by 1 increment for risk of bias due to personnel not being blinded.

c. Downgraded by 1 increment if the confidence interval crossed one MID or by 2 increments if the confidence interval crossed both MIDs. The MIDs were 0.8 to 1.25 for dichotomous outcomes or 0.5 x median baseline SD (or 0.5 x SMD where no baseline values given) for continuous outcomes.

Table 42: Clinical evidence profile: Multicomponent interventions vs. control

Certainty assessment							№ of patients		Effect		Certainty	Importance
№ of studies	Study design	Risk of bias	Inconsistency	Indirectness	Imprecision	Other considerations	Multiple intervention	usual care or attention control	Relative (95% CI)	Absolute (95% CI)		
Rate of falls (falls per person years)												
13	randomised trials	very serious[a]	very serious[b]	not serious	very serious[c]	none	1586	1441	**Rate ratio 0.74** (0.62 to 0.88)	-	⊕◯◯◯ Very low	CRITICAL
Rate of falls (falls per person years) - Exercise, home safety and nutrition												

Certainty assessment							№ of patients		Effect		Certainty	Importance
№ of studies	Study design	Risk of bias	Inconsistency	Indirectness	Imprecision	Other considerations	Multiple intervention	usual care or attention control	Relative (95% CI)	Absolute (95% CI)		
1	randomised trials	serious[d]	not serious	not serious	serious[c]	none	97	48	**Rate ratio 0.70** (0.53 to 0.95)	-	⊕⊕◯◯ Low	CRITICAL
Rate of falls (falls per person years) - Exercise and nutrition												
2	randomised trials	serious[e]	not serious	not serious	serious[c]	none	192	143	**Rate ratio 0.87** (0.69 to 1.09)	-	⊕⊕◯◯ Low	CRITICAL
Rate of falls (falls per person years) - Exercise, home safety and vision												
1	randomised trials	serious[e]	not serious	not serious	serious[c]	none	157	153	**Rate ratio 0.69** (0.50 to 0.96)	-	⊕⊕◯◯ Low	CRITICAL
Rate of falls (falls per person years) - Exercise and psychological component												
4	randomised trials	serious[f]	serious[g]	not serious	very serious[c]	none	320	258	**Rate ratio 0.62** (0.44 to 0.87)	-	⊕◯◯◯ Very low	CRITICAL
Rate of falls (falls per person years) - Nutrition and psychological component												
1	randomised trials	serious[h]	not serious	not serious	not serious	none	76	75	**Rate ratio 0.39** (0.22 to 0.68)	-	⊕⊕⊕◯ Moderate	CRITICAL
Rate of falls (falls per person years) - Exercise and home safety												
2	randomised trials	serious[i]	serious[g]	not serious	very serious[c]	none	79	80	**Rate ratio 1.25** (0.79 to 2.0)	-	⊕◯◯◯ Very low	CRITICAL
Rate of falls (falls per person years) - Home safety and psychological component												
1	randomised trials	serious[j]	not serious	not serious	serious[c]	none	62	62	**Rate ratio 0.33** (0.11 to 1.02)	-	⊕⊕◯◯ Low	CRITICAL

Certainty assessment							№ of patients		Effect		Certainty	Importance
№ of studies	Study design	Risk of bias	Inconsistency	Indirectness	Imprecision	Other considerations	Multiple intervention	usual care or attention control	Relative (95% CI)	Absolute (95% CI)		
Rate of falls (falls per person years) - Exercise, home safety and medication review												
1	randomised trials	serious[f]	not serious	not serious	very serious[c]	none	603	622	**Rate ratio 0.75** (0.05 to 11.13)	-	⊕◯◯◯ Very low	CRITICAL
Number of people sustaining one or more falls												
15	randomised trials	very serious[k]	serious[g]	not serious	serious[c]	none	2586	1998	**RR 0.83** (0.73 to 0.94)	-	⊕◯◯◯ Very low	CRITICAL
Number of people sustaining one or more falls - Exercise, home safety and nutrition												
1	randomised trials	serious[d]	not serious	not serious	serious[c]	none	97	48	**RR 0.77** (0.57 to 1.03)	-	⊕⊕◯◯ Low	CRITICAL
Number of people sustaining one or more falls - Exercise and nutrition												
1	randomised trials	serious[d]	not serious	not serious	serious[c]	none	98	48	**RR 0.78** (0.58 to 1.04)	-	⊕⊕◯◯ Low	CRITICAL
Number of people sustaining one or more falls - Exercise, home safety and vision												
2	randomised trials	serious[e]	not serious	not serious	serious[c]	none	292	187	**RR 0.84** (0.71 to 1.00)	-	⊕⊕◯◯ Low	CRITICAL
Number of people sustaining one or more falls - Exercise and vision												
1	randomised trials	serious[d]	not serious	not serious	serious[c]	none	136	34	**RR 0.75** (0.56 to 1.00)	-	⊕⊕◯◯ Low	CRITICAL
Number of people sustaining one or more falls - Exercise and home safety												

Certainty assessment							№ of patients		Effect		Certainty	Importance
№ of studies	Study design	Risk of bias	Inconsistency	Indirectness	Imprecision	Other considerations	Multiple intervention	usual care or attention control	Relative (95% CI)	Absolute (95% CI)		
3	randomised trials	serious[l]	not serious	not serious	serious[c]	none	161	58	**RR 0.84** (0.65 to 1.09)	-	⊕⊕◯◯ Low	CRITICAL
Number of people sustaining one or more falls - Home safety and vision												
1	randomised trials	serious[d]	not serious	not serious	serious[c]	none	137	34	**RR 0.88** (0.65 to 1.18)	-	⊕⊕◯◯ Low	CRITICAL
Number of people sustaining one or more falls - Exercise and psychological component												
4	randomised trials	serious[m]	very serious[b]	not serious	very serious[c]	none	344	275	**RR 0.90** (0.44 to 1.83)	-	⊕◯◯◯ Very low	CRITICAL
Number of people sustaining one or more falls - Education and exercise												
2	randomised trials	very serious[n]	not serious	not serious	very serious[c]	none	103	89	**RR 1.09** (0.57 to 2.11)	-	⊕◯◯◯ Very low	CRITICAL
Number of people sustaining one or more falls - Nutrition and psychological component												
1	randomised trials	serious[h]	not serious	not serious	serious[c]	none	105	105	**RR 0.41** (0.21 to 0.82)	-	⊕⊕◯◯ Low	CRITICAL
Number of people sustaining one or more falls - Exercise, nutrition and psychological component												
1	randomised trials	serious[o]	not serious	not serious	very serious[c]	none	49	50	**RR 0.41** (0.08 to 1.99)	-	⊕◯◯◯ Very low	CRITICAL
Number of people sustaining one or more falls - Education and psychological component												
1	randomised trials	serious[p]	not serious	not serious	very serious[c]	none	461	448	**RR 1.06** (0.89 to 1.27)	-	⊕◯◯◯ Very low	CRITICAL

Certainty assessment							№ of patients		Effect		Certainty	Importance
№ of studies	Study design	Risk of bias	Inconsistency	Indirectness	Imprecision	Other considerations	Multiple intervention	usual care or attention control	Relative (95% CI)	Absolute (95% CI)		
Number of people sustaining one or more falls - Exercise, home safety and medication review												
1	randomised trials	serious[t]	not serious	not serious	very serious[c]	none	603	622	**RR 0.81** (0.67 to 0.97)	-	⨁◯◯◯ Very low	CRITICAL
Number of people sustaining one or more fall-related fractures												
3	randomised trials	very serious[q,t]	not serious	not serious	very serious[c]	none	719	738	**RR 2.02** (1.00 to 4.09)	-	⨁◯◯◯ Very low	CRITICAL
Number of people sustaining one or more fall-related fractures - Nutrition and psychological component												
1	randomised trials	serious[h]	not serious	not serious	very serious[c]	none	105	105	**RR 0.50** (0.02 to 14.89)	-	⨁◯◯◯ Very low	CRITICAL
Number of people sustaining one or more fall-related fractures - Exercise and home safety												
1	randomised trials	serious[r]	not serious	not serious	very serious[c]	none	11	11	**RR 0.50** (0.02 to 13.50)	-	⨁◯◯◯ Very low	CRITICAL
Number of people sustaining one or more fall-related fractures – Exercise, home safety and medication review												
1	randomised trials	serious[t]	not serious	not serious	very serious[c]	none	603	622	**RR 2.32** (1.11 to 4.84)	-	⨁◯◯◯ Very low	CRITICAL
Health-related quality of life: endpoint score												
6	randomised trials	serious[p]	serious[b]	not serious	serious[c]	none	695	703	-	SMD **0.52 higher** (0.1 higher to 0.94 higher)	⨁◯◯◯ Very low	CRITICAL

Certainty assessment							№ of patients		Effect		Certainty	Importance
№ of studies	Study design	Risk of bias	Inconsistency	Indirectness	Imprecision	Other considerations	Multiple intervention	usual care or attention control	Relative (95% CI)	Absolute (95% CI)		
Health-related quality of life: endpoint score - Exercise and nutrition												
1	randomised trials	serious[p]	not serious	not serious	serious[c]	none	61	72	-	SMD **0.07 higher** (0.27 lower to 0.41 higher)	⨁⨁◯◯ Low	CRITICAL
Health-related quality of life: endpoint score - Exercise and psychological component												
2	randomised trials	serious[p]	not serious	not serious	serious[c]	none	96	98	-	SMD **1.23 higher** (0.92 higher to 1.54 higher)	⨁⨁◯◯ Low	CRITICAL
Health-related quality of life: endpoint score - Exercise, nutrition and psychological component												
1	randomised trials	serious[p]	not serious	not serious	serious[c]	none	31	33	-	SMD **0.57 higher** (0.07 higher to 1.07 higher)	⨁⨁◯◯ Low	CRITICAL
Health-related quality of life: endpoint score - Exercise and home safety												
1	randomised trials	serious[p]	not serious	not serious	not serious	none	46	52	-	SMD **0** (0.4 lower to 0.4 higher)	⨁⨁⨁◯ Moderate	CRITICAL
Health-related quality of life: endpoint score - Education and psychological component												
1	randomised trials	serious[d]	not serious	not serious	not serious	none	461	448	-	SMD **0.11 higher** (0.02 lower to 0.24 higher)	⨁⨁⨁◯ Moderate	CRITICAL
Health-related quality of life (mental): endpoint score												
2	randomised trials	serious[p]	not serious	not serious	serious[c]	none	46	46	-	SMD **0.69 higher** (0.26 higher to 1.11 higher)	⨁⨁◯◯ Low	CRITICAL
Health-related quality of life (mental): endpoint score - Exercise and home safety												

Certainty assessment							№ of patients		Effect		Certainty	Importance
№ of studies	Study design	Risk of bias	Inconsistency	Indirectness	Imprecision	Other considerations	Multiple intervention	usual care or attention control	Relative (95% CI)	Absolute (95% CI)		
1	randomised trials	serious[d]	not serious	not serious	serious[c]	none	15	13	-	SMD **0.8 higher** (0.02 higher to 1.57 higher)	⊕⊕◯◯ Low	CRITICAL
Health-related quality of life (mental): endpoint score - Exercise, nutrition and psychological component												
1	randomised trials	serious[p]	not serious	not serious	serious[c]	none	31	33	-	SMD **0.64 higher** (0.14 higher to 1.14 higher)	⊕⊕◯◯ Low	CRITICAL
Health-related quality of life (physical): endpoint score												
2	randomised trials	serious[p]	not serious	not serious	serious[c]	none	46	46	-	SMD **0.12 higher** (0.53 lower to 0.77 higher)	⊕⊕◯◯ Low	CRITICAL
Health-related quality of life (physical): endpoint score - Exercise and home safety												
1	randomised trials	serious[d]	not serious	not serious	serious[c]	none	15	13	-	SMD **0.27 lower** (1.02 lower to 0.47 higher)	⊕⊕◯◯ Low	CRITICAL
Health-related quality of life (physical): endpoint score - Exercise, nutrition and psychological component												
1	randomised trials	serious[p]	not serious	not serious	serious[c]	none	31	33	-	SMD **0.4 higher** (0.1 lower to 0.9 higher)	⊕⊕◯◯ Low	CRITICAL

a. Downgraded by 2 increments for risk of bias due to participants and people delivering the intervention being aware of the assigned intervention, unclear randomisation process, unclear allocation concealment, limited information regarding outcome assessment, and incomplete outcome data.

b. Downgraded by 2 increment for very serious inconsistency unexplained by subgroup analysis.

c. Downgraded by 1 increment if the confidence interval crossed one MID or by 2 increments if the confidence interval crossed both MIDs. The MIDs were 0.8 to 1.25 for dichotomous outcomes or 0.5 x median baseline SD (or 0.5 x SMD where no baseline values given) for continuous outcomes.

d. Downgraded by 1 increment for risk of bias due to participants and people delivering the intervention being aware of the assigned intervention.

e. Downgraded by 1 increment for risk of bias due to participants and people delivering the intervention were aware of the assigned intervention, unclear randomisation process, and unclear allocation concealment.

f. Downgraded by 1 increment for risk of bias due to participants and people delivering the intervention being aware of the assigned intervention and limited information regarding outcome assessment.

g. Downgraded by 1 increment due to serious inconsistency unexplained by subgroup analysis.

h. Downgraded by 1 increment for high risk of bias due to incomplete outcome data.

i. Downgraded by 1 increment for risk of bias due to participants and people delivering the intervention being aware of the assigned intervention, issues with adherence, and missing outcome data.

j. Downgraded by 1 increment for risk of bias due to participants and people delivering the intervention being aware of the assigned intervention, no pre-specified protocol, and the self-reported nature of the outcome

k. Downgraded by 2 increments for risk of bias due to participants and people delivering the intervention being aware of the assigned intervention, unclear method of ascertaining falls, incomplete outcome data, issues regarding analysis related to clustering, and issues regarding blinding of the outcome assessment.

l. Downgraded by 1 increment for risk of bias due to participants and people delivering the intervention being aware of the assigned intervention, and unclear method of ascertaining falls.

m. Downgraded by 1 increment for risk of bias due to participants and people delivering the intervention, issues regarding outcome assessment, incomplete outcome data, and selective reporting.

n. Downgraded by 2 increments for risk of bias due to unclear method of ascertaining falls, self-reported nature of the outcome, participants and people delivering the intervention were aware of the assigned intervention, incomplete outcome data, and incorrect analysis related to clustering.

o. Downgraded by 1 increment for risk of bias due to lack of blinding regarding the outcome assessment.

p. Downgraded by 1 increment for risk of bias due to participants and people delivering the intervention were aware of the assigned intervention and unclear impact of missing outcome data.

q. Downgraded by 2 increments for risk of bias due to participants and people delivering the intervention being aware of the assigned intervention, unclear method how fractures were reported, unclear method of ascertaining falls, and incomplete outcome data.

r. Downgraded by 1 increment for risk of bias due to participants and people delivering the intervention being aware of the assigned intervention, unclear method of how fractures were reported, and unclear method of ascertaining falls

s. Downgraded by 1 increment for risk of bias due to participants and people delivering the intervention being aware of the assigned intervention and outcome assessors not being blinded.

t. Downgraded by 1 increment for risk of bias due to attrition bias

Table 43: Clinical evidence profile: Multicomponent interventions vs. exercise

Certainty assessment							№ of patients		Effect		Certainty	Importance
№ of studies	Study design	Risk of bias	Inconsistency	Indirectness	Imprecision	Other considerations	Multiple intervention	exercise	Relative (95% CI)	Absolute (95% CI)		
Rate of falls (falls per person years)												
1	randomised trials	serious[a]	not serious	not serious	serious[b]	none	96	95	**Rate ratio 0.92** (0.77 to 1.10)	-	⨁⨁◯◯ Low	
Rate of falls (falls per person years) - Exercise and nutrition												

Certainty assessment							№ of patients		Effect		Certainty	Importance
№ of studies	Study design	Risk of bias	Inconsistency	Indirectness	Imprecision	Other considerations	Multiple intervention	exercise	Relative (95% CI)	Absolute (95% CI)		
1	randomised trials	serious[a]	not serious	not serious	serious[b]	none	96	95	**Rate ratio 0.92** (0.77 to 1.10)	-	⨁⨁◯◯ Low	
Number of people sustaining one or more falls												
5	randomised trials	very serious[c]	not serious	not serious	serious[b]	none	736	293	**RR 1.00** (0.85 to 1.17)	-	⨁◯◯◯ Very low	
Number of people sustaining one or more falls - Education and exercise												
1	randomised trials	very serious[d]	not serious	not serious	very serious[b]	none	56	31	**RR 2.23** (0.11 to 46.43)	-	⨁◯◯◯ Very low	
Number of people sustaining one or more falls - Education, nutrition and psychological component												
1	randomised trials	serious[e]	not serious	not serious	very serious[b]	none	49	48	**RR 0.65** (0.11 to 3.72)	-	⨁◯◯◯ Very low	
Number of people sustaining one or more falls - Exercise and vision												
1	randomised trials	serious[f]	not serious	not serious	serious[b]	none	136	34	**RR 0.87** (0.61 to 1.24)	-	⨁⨁◯◯ Low	
Number of people sustaining one or more falls - Exercise and home safety												
1	randomised trials	serious[f]	not serious	not serious	very serious[b]	none	135	34	**RR 0.95** (0.68 to 1.33)	-	⨁◯◯◯ Very low	
Number of people sustaining one or more falls - Home safety and vision												
1	randomised trials	serious[f]	not serious	not serious	very serious[b]	none	137	34	**RR 1.02** (0.73 to 1.42)	-	⨁◯◯◯ Very low	

Certainty assessment							№ of patients		Effect		Certainty	Importance
№ of studies	Study design	Risk of bias	Inconsistency	Indirectness	Imprecision	Other considerations	Multiple intervention	exercise	Relative (95% CI)	Absolute (95% CI)		
Number of people sustaining one or more falls - Exercise, home safety and vision												
1	randomised trials	serious[f]	not serious	not serious	serious[b]	none	135	34	**RR 0.86** (0.60 to 1.22)	-	⊕⊕◯◯ Low	
Number of people sustaining one or more falls - Exercise and psychological component												
1	randomised trials	serious[g]	not serious	not serious	very serious[b]	none	58	60	**RR 1.44** (0.97 to 2.14)	-	⊕◯◯◯ Very low	
Number of people sustaining one or more falls - Exercise and Vitamin D and calcium												
1	randomised trials	serious[h]	not serious	not serious	very serious[b]	none	30	18	**RR 2.99** (0.37 to 24.42)	-	⊕◯◯◯ Very low	
Number of people sustaining one or more fall-related fractures - Exercise and Vitamin D and calcium												
1	randomised trials	serious[h]	not serious	not serious	very serious[b]	none	30	9	**RR 1.97** (0.41 to 9.42)	**2 fewer per 1,000** (from 9 fewer to 0 fewer)	⊕◯◯◯ Very low	

CI: confidence interval; **RR:** risk ratio

Explanations

a. Downgraded by 1 increment for risk of bias due to participants and people delivering the intervention were aware of the assigned intervention, unclear randomisation process, and unclear allocation concealment.

b. Downgraded by 1 increment if the confidence interval crossed one MID or by 2 increments if the confidence interval crossed both MIDs. The MIDs were 0.8 to 1.25 for dichotomous outcomes or 0.5 x median baseline SD (or 0.5 x SMD where no baseline values given) for continuous outcomes.

c. Downgraded by 2 increments for risk of bias due to participants and people delivering the intervention being aware of the assigned intervention, incorrect analysis, incomplete outcome data, unclear randomisation process, unclear allocation concealment., and no pre-specified protocol.

d. Downgraded by 2 increments for risk of bias due to participants and people delivering the intervention being aware of the assigned intervention, incorrect analysis, incomplete outcome data, unclear randomisation process, and unclear allocation concealment.

e. Downgraded by 1 increment for risk of bias due to self-reported outcome.

f. Downgraded by 1 increment for risk of bias due to participants and people delivering the intervention being aware of the assigned intervention.

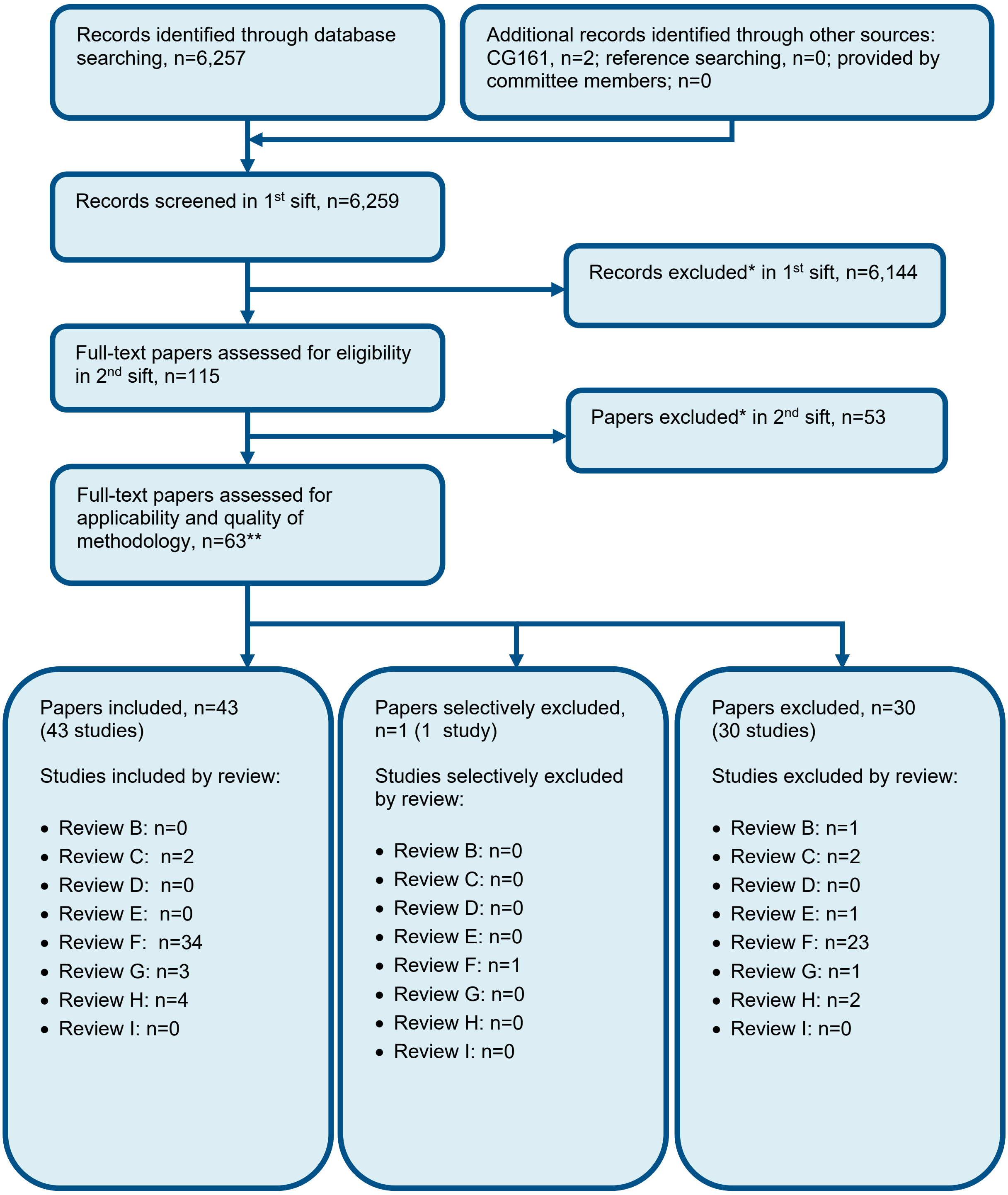
g. Downgraded by 1 increment for risk of bias due to intervention did not adhere to protocol and no information provided regarding missing data.

h. Downgraded by 1 increment for risk of bias due to participants and people delivering the intervention being aware of the assigned intervention and no pre-specified protocol

F.3 Environmental interventions

See Clemson 2023[41] Cochrane review for GRADE tables.

Appendix G Economic evidence study selection



* Non-relevant population, intervention, comparison, design or setting; non-English language
**One paper included in two reviews

Appendix H Economic evidence tables

H.1 Exercise Interventions

Study	Davis 2020 (Action seniors' trial)[54]			
Study details	**Population & interventions**	**Costs**	**Health outcomes**	**Cost effectiveness**
Economic analysis: CUA (health outcome: QALYs) **Study design:** Within trial analysis (Action seniors RCT) **Approach to analysis:** Within trial analysis – area under the curve method, adjusted for baseline utility. **Perspective:** Canadian healthcare **Follow-up:** 12 months **Treatment effect duration:**[(a)] NR **Discounting:** Costs: n/a Outcomes: n/a	**Population:** Community dwelling adults with a history of falls. **Cohort settings:** Mean age: 81.6 years. Male: 33% **Intervention 1:** Usual care **Intervention 2:** Home-based exercise intervention (Otago exercise programme) for falls prevention. Included 6 physiotherapist visits over 6 months	**Total costs (mean per patient):** Intervention 1: £2,351 Intervention 2: £2,217 Incremental (2−1): saves £120 (95% CI: NR; p=NR) **Currency & cost year:** 2019 Canadian dollars (presented here as 2019 UK pounds[(b)]) **Cost components incorporated:** Cost of delivering OEP, cost of 'usual care', healthcare professional costs, admission to hospital, laboratory costs.	**QALYs[(c)] (mean per patient):** Intervention 1: 0.854 Intervention 2: 0.847 Incremental (2−1): 0.007 fewer QALYs (95% CI: NR; p=NR)	**ICER (Intervention 2 versus Intervention 1):** £17,479 per QALY lost (pa)[(d)] 95% CI: (£1,785 to £36,414 per QALY lost) **Analysis of uncertainty:** Bootstrapping undertaken but probability cost effective at NICE thresholds not reported. They do report that 100% of bootstrapped cycles are in south west quadrant of the cost effectiveness plane (less costly and less effective). Complete-case analysis to test the impact of excluding participants with missing data on the results: ICER (2 vs 1): £16,006 per QALY lost (with 88% of the bootstrapped cycles lying in the southwest quadrant). QALY using SF-6D also used The incremental QALY was 0.003. In this scenario intervention Otego exercise programme dominates usual care (less costly and more effective.)

				Using both EQ-5D-3L and SF-6D to estimate QALYs resulted in very small incremental QALYs, below the MID of 0.03. Various additional one-way sensitivity analyses were undertaken, the results remained relatively robust.
Data sources				
Health outcomes: Baseline and effectiveness data (falls, EQ-5D) based on Action seniors! trial a Canadian randomised controlled trial (same paper). Basecase presented using imputed data. **Quality-of-life weights:** EQ-5D-3L taken from RCT participants. Assume Canadian tariff applied. **Cost sources:** The authors relied on self-reported questionnaire of personal costs as well as deriving unit costs of visits to healthcare professionals. Unit costs were specific to each professional or procedure. Inflated or deflated where appropriate costs to 2019 Canadian dollars.				
Comments				
Source of funding: Canadian institute of health research, **Limitations:** Canadian healthcare perspective. Older adult cohort (82 years) may not be applicable for all older people to whom this guideline applies to. Study is based on a single RCT and may not reflect full body of clinical evidence for this intervention. Source of resource use is not from the best estimated source as the author derived resource use from medical price list fee for services from insurance plan or one hospital (Vancouver General). Canadian unit costs (2019) may not reflect current UK NHS. Short time horizon may not fully capture differences between interventions and impact of falls. **Other:**				
Overall applicability:(d) Partially Applicable **Overall quality:**(e) Potentially serious limitations				

Abbreviations: 95% CI= 95% confidence interval; CUA= cost–utility analysis; EQ-5D-3L= Euroqol 3 dimensions (scale: 0.0 [death] to 1.0 [full health], negative values mean worse than death); ICER= incremental cost-effectiveness ratio; NR= not reported; pa= probabilistic analysis; QALYs= quality-adjusted life years. CEP = cost-effectiveness plane, SF-6 = short form 6.

(a) For studies where the time horizon is longer than the treatment duration, an assumption needs to be made about the continuation of the study effect. For example, does a difference in utility between groups during treatment continue beyond the end of treatment and if so for how long.
(b) Converted using 2019 purchasing power parities [185]
(c) Using EQ-5D-3L
(d) When the ICER is over £20,000 per QALY lost, intervention 2 is considered the cost-effective option.
(e) Directly applicable / Partially applicable / Not applicable
(f) Minor limitations / Potentially serious limitations / Very serious limitations

Study	Deverall 2019[62]			
Study details	**Population & interventions**	**Costs**	**Health outcomes**	**Cost effectiveness**
Economic analysis: CUA (health outcome: QALYs) **Study design:** Decision analytical model **Approach to analysis:** Adaptation of the Pega et al (2016) falls model. Including 'low risk' (no previous injurious fall) and 'high risk' (previous injurious fall) health states. At each cycle people could have or not have an injurious fall event with fallers either injured requiring hospitalisation or non-hospitalisation. Death included as absorbing state. Injurious fall risk reduction from intervention applied. Transition to residential care incorporated where they would no longer benefit from community intervention. QALYs cumulatively tallied until death, transition to long-term care or 90 years of age.	**Population:** Community-dwelling older adults **Cohort settings:** Start age: 65 Male: NR **Intervention 1:** No intervention **Intervention 2:** Peer-led group-based exercise programme **Intervention 3:** Commercial delivery of the group-based exercise programmes **Intervention 4:** Home based individual exercise programme.	**Total costs (mean per patient):** Only available at cohort level, not reported at per patient level. **Currency & cost year:** 2011 New Zealand dollars (presented here as 2011 UK pounds[(b)]) **Cost components incorporated:** Intervention costs. Health system costs: primary healthcare and hospitalisation after fall, however residential/care after hospitalisation not captured.	**QALYs (mean per patient):** Only available at cohort level, not reported at per patient level.	**ICER (Intervention 2 versus Intervention 1):** £6,700 per QALY gained (pa) **ICER (Intervention 3 versus Intervention 1):** £24,328 per QALY gained (pa) **ICER (Intervention 4 versus Intervention 1):** £3,279 per QALY gained (pa) Probability interventions cost effective compared to no intervention(£20K/£30K): NR **Analysis of uncertainty:** Sensitivity analysis adjusting discount rates and targeted scenario analysis explored for Peer-led group exercise. <u>Sensitivity analysis:</u> Setting the discount rate to 0% and 6% did not substantially alter the ICER for the peer-led group exercise, reflecting the similar timing of costs and QALYs gained. 0%: £6,795 per QALY gained 6%: £6,747 per QALY gained <u>Scenario Analysis</u>

Annual cycles. **Perspective:** New Zealand health care **Time horizon:** lifetime/25 years **Treatment effect duration:**[(a)] NR **Discounting:** Costs: 3% Outcomes: 3%				Targeted to adults aged 65–74 years: £6,557 per QALY gained. Targeted to adults aged 75–84 years: £7,508 per QALY gained.
Data sources				
Health outcomes: Impact and effectiveness of the group-exercise and home-exercise interventions on reducing falling from the Gillespie (2012) Cochrane review meta-analysis. Baseline outcomes based on prior model by Pega et al (2016) and New Zealand falls registry data and life tables **Quality-of-life weights:** QALYs used but based on Global burden of disease study which provides disability weights as opposed to EQ-5D utility values. **Cost sources:** Health system costs derived from administrative sources with values adjusted to 2011 New Zealand costs. Intervention costs derived from the Otego exercise programme that have been used in a New Zealand setting. Cost of an average New Zealand gym enrolment used for commercial programme.				
Comments				
Source of funding: Health Research Council of New Zealand **Limitations** New Zealand healthcare perspective may not be reflective of current UK context. QoL assessed using disease weights rather than EQ-5D. Discounting at 3% rather than 3.5% as required by NICE reference case. NZ baseline data and resource use may not be applicable to the current NHS context. Assumption in results that the impact of reducing falls was the same as its impact on reducing injurious falls. Relative treatment affect based on older Cochrane (Gillespie 2012) and may not represent full body of clinical evidence. **Other:**				
Overall applicability:[(d)] Partially Applicable **Overall quality:**[(e)] Potentially serious limitations				

Abbreviations: 95% CI= 95% confidence interval; CUA= cost–utility analysis; EQ-5D-3L= Euroqol 3 dimensions (scale: 0.0 [death] to 1.0 [full health], negative values mean worse than death); ICER= incremental cost-effectiveness ratio; NR= not reported; pa= probabilistic analysis; QALYs= quality-adjusted life years.
(a) For studies where the time horizon is longer than the treatment duration, an assumption needs to be made about the continuation of the study effect. For example, does a difference in utility between groups during treatment continue beyond the end of treatment and if so for how long.
(b) Converted using 2011 purchasing power parities [185]
(c) Directly applicable / Partially applicable / Not applicable
(d) Minor limitations / Potentially serious limitations / Very serious limitations

Study	**Farag 2015**[73]			
Study details	**Population & interventions**	**Costs**	**Health outcomes**	**Cost effectiveness**

Economic analysis: CUA (health outcome:QALYs) **Study design:** Within trial analysis **Approach to analysis:** Within trial analysis – based on RCT by Sherrington et al (2014). ICER calculated with three outcome measure: • SPPB score improvement. • Self-rated heath status • Mean QALYs over 12 months. Cost per QALY presented here. **Perspective:** Australian Care and Health **Follow-up:** 12 months **Treatment effect duration:**[(a)] NR **Discounting:** Costs: n/a Outcomes: n/a	**Population:** Community dwelling older participants recently discharged from public hospital wards in Sydney. **Cohort settings:** Mean age: 82 years. Male: (Int1%=24%, Int2% = 28%) **Intervention 1:** Usual care from health and community service providers **Intervention 2:** 12-month home exercise programme consisting of 10 home visits and 5 phone calls by PT, based on WEBB program and 20–30-minute programme of exercise alone 6 times a week.	**Total costs (mean per patient):** Intervention 1: £4,705 Intervention 2: £5,822 Incremental (2−1): £1,117 (95% CI: NR; p=NR) **Currency & cost year:** 2012 Australian Dollars (presented here as 2012 UK pounds)[(b)] **Cost components incorporated:** Health service (including social support) and programme costs reported	**QALYs (mean per patient):** Intervention 1: 0.66 Intervention 2: 0.69 Incremental (2−1): 0.03 (95% CI: NR; p=NR)	**ICER (Intervention 2 versus Intervention 1):** £35,263 per QALY gained (pa) 95% CI: Probability Intervention 2 cost effective (£20K/30K threshold): no threshold value where intervention 2 had 80% probability of being cost effective. **Analysis of uncertainty:** Bootstrapping undertaken. Subgroup analysis of participants with higher cognitive status (MMSE>28), these patients demonstrated a better cost-effectiveness for all outcome measures, with an ICER of £9,629 per QALY gained. Sensitivity analyses varying total costs in base case analysis by excluding hostel (residential care) costs. ICER = £32,464 per QALY gained Exclusion of participants who are hostel (residential care) residents. ICER = £20,271 per QALY gained
Data sources				
Health outcomes: Baseline events and effectiveness data sourced from based on separate study conducted by the author for this RCT (Sherrington et al, 2014). **Quality-of-life weights:** EQ-5D-3L UK tariff. **Cost sources:** Resource use for 12 months reported by participants (18 did not reported accurately), for this within trial analysis. Unit costs obtained from Medicare benefits schedule or medical and Australian refined diagnosis related group costs for health services costs (hospital stays).				
Comments				

Source of funding: Australian national health and medical research council. **Limitations:** Australian healthcare perspective may not be reflective of current UK context. Older adult cohort (82 years) may not be applicable for all older people to whom this guideline applies to. Short time horizon, based on single study and may not reflect the full body of evidence. Based on Australian 2012-unit costs which may not reflect current NHS context. **Other:**	
Overall applicability:[(c)] Partially applicable **Overall quality:**[(d)] Potentially serious limitations	

Abbreviations: 95% CI= 95% confidence interval; CUA= cost–utility analysis; EQ-5D= Euroqol 5 dimensions (scale: 0.0 [death] to 1.0 [full health], negative values mean worse than death); ICER= incremental cost-effectiveness ratio; NR= not reported; pa= probabilistic analysis; QALYs= quality-adjusted life years. SPPB = Short physical performance battery. PT = Physical Therapist. WEBB = Weight bearing exercise for better balance

(a) For studies where the time horizon is longer than the treatment duration, an assumption needs to be made about the continuation of the study effect. For example, does a difference in utility between groups during treatment continue beyond the end of treatment and if so for how long.

(b) Converted using 2012 purchasing power parities [185]

(c) Directly applicable / Partially applicable / Not applicable

(d) Minor limitations / Potentially serious limitations / Very serious limitations

Study	**Franklin 2019[76]**			
Study details	**Population & interventions**	**Costs**	**Health outcomes**	**Cost effectiveness**
Economic analysis: CUA (health outcome: QALYs) **Study design:** Decision analytic model **Approach to analysis:** Adaptation of the Poole (2015) falls model. An initial decision tree models the accuracy of the fall-risk assessment (QTUG vs TUG) to inform fall-prevention intervention referral and longer-term fall-related events are captured using a state transition, cohort-based Markov model with five event	**Population:** The model includes 5 stratified age groups ranging from 65 to 89 years old, community dwelling adults. **Cohort settings:** Start age: 65 years. Male: NR **Intervention 1:** No assessment followed by no care pathway	Both 'Healthcare' and 'Health and Social care' perspectives are both presented. Former excludes care home costs. Latter includes some self, local authority, and NHS funded care home costs. **Total costs (mean per patient):**	**QALYs (mean per patient):** Only available at cohort level, not reported at per patient level. Cohort level presented in cost-effectiveness column.	**Base case analysis – Healthcare costs (age group: 65-89 years)** Comparison | Incr. HC costs | Incr. QALYs | ICERs HC costs | % CE at £20K: | % CE at £30K: 2 vs 1 | £43,971 | 1.21 | £36,396 | 37% | 41% 3 vs 1 | -£26,134 | 0.92 | Dominates | 66% | 71% 4 vs 1 | £56,662 | 1.13 | £50,363 | 29% | 34% 5 vs 1 | £24,017 | 0.79 | £30,287 | 38% | 43% *Dominates (less costly and more effective)* *Incremental costs and QALYs are presented at per cohort level not patient level.*

Nested table (Cost effectiveness column):

Comparison	Incr. HC costs	Incr. QALYs	ICERs HC costs	% CE at £20K:	% CE at £30K:
2 vs 1	£43,971	1.21	£36,396	37%	41%
3 vs 1	-£26,134	0.92	Dominates	66%	71%
4 vs 1	£56,662	1.13	£50,363	29%	34%
5 vs 1	£24,017	0.79	£30,287	38%	43%

<table>
<tr>
<td>states. (1) ‘well,/insignificant fall’ (2) ‘minor fall: requiring ED visit (3) ‘major fall: hospitalisation’ (4) ‘long-term care’—care home admission; (5) ‘dead’—due to a fall, 1-year care-home-related or age-related mortality. 1 year cycle duration
Perspective: UK NHS
Time horizon: 2 years
Treatment effect duration:[a]n/a
Discounting: Costs: None; Outcomes: None</td>
<td>Intervention 2:
QTUG followed by Otago home-based exercise pathway.

Intervention 3:
QTUG followed by Falls Management group Exercise programme (FaME) pathway.

Intervention 4:
QTUG followed by Tai Chi pathway.

Intervention 5:
QTUG followed by home safety assessment and modification (HAM) pathway.

TUG-based pathways were included interventions but as these were dominated (more costly and less effective) by QTUG-based pathways in all cohorts these were not reported</td>
<td>Only available at cohort level, not reported at per patient level.

Cohort level presented in cost-effectiveness column.

Currency & cost year:
2017 UK pounds
Cost components incorporated:
Intervention costs and falls related visits to primary care, community care and hospitalisations</td>
<td></td>
<td>Base case analysis – Healthcare and social costs (age group: 65-89 years)

<table>
<tr><th>Comparison</th><th>Incr. HSC costs</th><th>Incr. QALYs</th><th>ICERs HSC costs</th><th>% CE at £20K:</th><th>% CE at £30K:</th></tr>
<tr><td>2 vs 1</td><td>£2,302</td><td>1.21</td><td>£1,906</td><td>53%</td><td>58%</td></tr>
<tr><td>3 vs 1</td><td>-£67,803</td><td>0.92</td><td>Dominates</td><td>88%</td><td>91%</td></tr>
<tr><td>4 vs 1</td><td>£14,994</td><td>1.13</td><td>£13,327</td><td>48%</td><td>54%</td></tr>
<tr><td>5 vs 1</td><td>-£17,651</td><td>0.79</td><td>Dominates</td><td>64%</td><td>69%</td></tr>
</table>
Dominates (less costly and more effective)
Incremental costs and QALYs are presented at per cohort level not patient level.

The cost-effectiveness of the QTUG-based care pathways relative to no care pathway is also dependent on the age of the cohort. Results found those aged 75-89 had a higher probability of cost-effectiveness in the fall prevention interventions.

Analysis of uncertainty: Probabilistic sensitivity analysis.
Univariate and bivariate sensitivity analysis:
- Uptake on fall-prevention intervention screening varied from 100% to 75,50,25,10 and 1%. At 10% uptake of intervention post referral in those aged 75-89 years, only FaME was cost effective at £20K threshold (FaME dominated no care pathway,less costly and more effective)..
- QTUG sensitivity and specificity were independently or jointly varied from 0.05 to 0.95 in 0.05 increments. If QTUG and TUG sensitivity are equivalent (i.e. both 0.31), QTUG compared to TUG produces lower costs (equivalent QALYs) due to its higher specificity (0.81 versus 0.74), thus better ability to avoid additional cost of providing fall-preventions intervention to non-fallers albeit with no</td>
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</table>

	in the paper. Appendices were unavailable and so results cannot be extracted here.			QALY gain; if QTUG and TUG specificity are equivalent (i.e. both 0.74), QTUG still dominates TUG at a sensitivity rate ~0.35 (QTUG base-case sensitivity = 0.67). At a sensitivity rate ~0.45, QTUG dominates no care pathway irrespective of specificity rate. - If the base case utility decrements were increased to 200%, the QTUG based care pathways in those aged 65–74 would still not be considered cost-effective (i.e. ICER > £30,000)
Data sources				
Health outcomes: Baseline and effectiveness data (falls, EQ-5D and mortality) for Tai Chi intervention based on 2019 Cochrane review by Sherrington et al. Otago, HAM and FaME effectiveness sourced from 2011 Cochrane review by Gillespie et al. Meta-analysis by Barry et al (2019) used for TUG effectiveness. **Quality-of-life weights:** EQ-5D UK tariff **Cost sources:** Sourced from PSSRU and NHS reference costs and for the falls prevention care pathway costs were based on the PPP study implementation costs or sourced from Public Health England.				
Comments				
Source of funding: Kinesis Health Technologies Ltd. **Limitations:** 2-year time horizon may not sufficiently long assess the full costs and benefits. One potential conflict of interest, Kinesis Health Technologies Ltd who developed the QTUG technology was a part of the Perfect Patient Pathway Test Bed, for which the model was developed, and representatives of Kinesis provided their thoughts on the initial design of the model however, they did not inform the overall development and analysis of the model and subsequent results in this manuscript **Other:**				
Overall applicability:(b) Directly Applicable **Overall quality:**(c) Minor Limitations				

Abbreviations: CCA= cost–consequences analysis; CEA= cost-effectiveness analysis; 95% CI= 95% confidence interval; CUA= cost–utility analysis; da= deterministic analysis; EQ-5D= Euroqol 5 dimensions (scale: 0.0 [death] to 1.0 [full health], negative values mean worse than death); ICER= incremental cost-effectiveness ratio; NR= not reported; pa= probabilistic analysis; QALYs= quality-adjusted life years. FaME = Falls Management group Exercise programme; HAM = Home safety assessment and modification; Otago = Otago home-based exercise; QTUG = Quantitative Timed Up and Go device; TUG = Timed Up and Go test

(a) For studies where the time horizon is longer than the treatment duration, an assumption needs to be made about the continuation of the study effect. For example, does a difference in utility between groups during treatment continue beyond the end of treatment and if so for how long.

(b) Directly applicable / Partially applicable / Not applicable

(c) Minor limitations / Potentially serious limitations / Very serious limitations

Study	**Gottschalk 2021**[87]			
Study details	**Population & interventions**	**Costs**	**Health outcomes**	**Cost effectiveness**
Economic analysis: CUA (health outcome: QALYs)	**Population:** German speaking people aged 70 years or older at risk of falling, who were able to	**Total costs (mean per patient):** Intervention 1: £1,942 Intervention 2: £1,602	**QALYs (mean per patient):** Intervention 1: 0.421 Intervention 2: 0.415	**ICER (Intervention 2 versus Intervention 1):** £51,801 per QALY lost (pa)(c) 95% CI: NR

Study design: Within trial economic analysis. **Approach to analysis:** Within trial analysis capturing the mean costs and QALYs for the intervention and comparator group at baseline and 6 months follow up. Based on a RCT with randomisation undertaken at an individual level. **Perspective:** German Payer perspective **Follow-up**: 6 months. **Treatment effect duration:**[(a)] 11 weeks **Discounting:** Costs: N/A; Outcomes: N/A	walk 200m without personal assistance **Setting:** Community **Cohort settings:** Start age: 78.7 years. Male: 26.5% **Intervention 1:** Individual exercise therapy, 7 one-hour home visits over 11 weeks. Activities for balance, strength and physical activity **Intervention 2:** Group exercise therapy, 2 trainers teaching 8 to 12 participants in 7 two-hour sessions. Both groups received 2 additional booster phone calls 4 and 10 weeks after last intervention session.	Incremental (2−1): -£340 (95% CI: NR; p>0.05) **Currency & cost year:** 2018 Euros (presented here as 2016 UK pounds[(b)]) **Cost components incorporated:** Staff costs, outpatient and inpatient services (including stays in hospitals, rehabilitation clinics, psychiatric clinics), medication costs	Incremental (2−1): -0.007 (95% CI: NR; p>0.05)	Probability Intervention 2 cost effective (£20K/30K threshold): 78%/77% **Analysis of uncertainty:** The cost effectiveness acceptability curves based on adjusted total costs and QALYs indicated that the cost effectiveness of the group program was uncertain over a large range of willingness to pay thresholds.
Data sources				
Health outcomes: Clinical trial (Jansen 2018), the primary outcome was the fall incidence which was recorded using a diary completed by participants on a monthly basis for 12 months, but the analysis only used the first 6 months. Physical activity was assessed using accelerometers. Fear of falling, motor function, balance and hand grip strength were captured as secondary outcomes. Multiple imputation was used to account for missing data. **Quality-of-life weights:** EQ-5D-5L, German tariff **Cost sources:** Adapted version of the questionnaire for the use of medical and nonmedical services in old age and combined with standardized unit costs. German official pharmaceutical index was used to calculate medication prices.				
Comments				

Source of funding: German Federal Ministry of Education and Research, Germany **Limitations:** Short time horizon may not capture all downstream effects of intervention. Based on single study and may not reflect the full body of evidence). Based on German 2018-unit costs which may not reflect current NHS context. **Other:**
Overall applicability: Partially applicable[(c)] **Overall quality: Potentially serious limitations[(d)]**

Abbreviations: 95% CI= 95% confidence interval; CUA= cost–utility analysis; EQ-5D= Euroqol 5 dimensions (scale: 0.0 [death] to 1.0 [full health], negative values mean worse than death); ICER= incremental cost-effectiveness ratio; NR= not reported; pa= probabilistic analysis; QALYs= quality-adjusted life years

(a) For studies where the time horizon is longer than the treatment duration, an assumption needs to be made about the continuation of the study effect. For example, does a difference in utility between groups during treatment continue beyond the end of treatment and if so for how long.

(b) Converted using 2018 purchasing power parities [185]

(c) When the ICER is over £20,000 per QALY lost, intervention 2 (Group Therapy) is considered the cost-effective option.

(d) Directly applicable/Partially applicable/not applicable

(e) Minor limitations/Potentially serious limitations/very serious limitations

Study	Jansen 2023			
Study details	**Population & interventions**	**Costs**	**Health outcomes**	**Cost effectiveness**
Economic analysis: CUA (health outcome: EQ-5D-5L) **Study design:** Decision analytic model **Approach to analysis:** Within trial analysis **Perspective:** German health care **Time horizon:** 12 months **Discounting:** Costs: N/A; Outcomes: N/A	**Population:** People over 70 who are designated as high risk (>12 seconds for TUG) or have had a fall in the past 12 months. **Cohort settings:** Mean age: 78.6 years (5.2) Male: 23.8% **Intervention 1:** LiFE is a program to work small exercises into daily life. It is given to people in their homes, seven sessions in 11 weeks plus a booster phone call in weeks 4 and 10.	**Total costs (mean per patient):** Intervention 1: £4,324 Intervention 2: £4,796 Incremental (2−1): £470 (SE=£731; p=NR) **Currency & cost year:** 2018 Euros **Cost components incorporated:** GP appointments, medication use, cost of intervention, inpatient services	**QALYs (mean per patient):** Intervention 1: 0.841 Intervention 2: 0.820 Incremental (2−1): -0.022 (SE: 0.015 NR; p=NR)	**ICER (Intervention 2 versus Intervention 1):** LiFE dominates gLiFE Probability gLiFE cost effective (£20/£30K threshold): NR/NR **Analysis of uncertainty:** Cost effectiveness of gLiFE versus LiFE was unlikely.

	Intervention 2: gLiFE is a program to work small exercises into daily life. It is given to people in a group, seven sessions in 11 weeks plus a booster phone call in weeks 4 and 10.			
Data sources				
Health outcomes: Primary outcome was EQ-5D-5L. The secondary outcome was the number of falls and an increased number of steps. **Quality-of-life weights:** EQ-5D-5L German tariff. **Cost sources:** Medication costs were from the German official pharmaceutical index. Data on resource use was based off a questionnaire given to the participants. The resource unit costs were from Bock 2015.				
Comments				
Source of funding: German Federal Ministry of Education and Research **Limitations:** 2018 costs were used when there are more recent available data. Based on a single RCT **Other:**				
Overall applicability: Directly(b) **Overall quality: Potentially serious**(c)				

Abbreviations: CCA= cost–consequences analysis; CEA= cost-effectiveness analysis; 95% CI= 95% confidence interval; CUA= cost–utility analysis; da= deterministic analysis; EQ-5D= Euroqol 5 dimensions (scale: 0.0 [death] to 1.0 [full health], negative values mean worse than death); ICER= incremental cost-effectiveness ratio; N/A=Not applicable NR= not reported; pa= probabilistic analysis; QALYs= quality-adjusted life years
(a) =Directly applicable / Partially applicable / Not applicable
(b) Minor limitations / Potentially serious limitations / Very serious limitations

Study	**McLean 2015**[164]			
Study details	**Population & interventions**	**Costs**	**Health outcomes**	**Cost effectiveness**
Economic analysis: CUA (health outcome: QALYs) **Study design:** Decision analytic model (Decision Tree)	**Population:** People aged 70 years or older at risk of falling. **Setting:** Community **Cohort settings:**	**Total costs (mean per patient):** Intervention 1: NR Intervention 2: NR Incremental (2−1): £45.87 (95% CI: NR; p=NR)	**QALYs (mean per patient):** Intervention 1: NR Intervention 2: NR Incremental (2−1): 0.0009 (95% CI: NR; p=NR)	**ICER (Intervention 2 versus Intervention 1):** £51,483 per QALY gained (pa) 95% CI: NR £22,986 per QALY gained (pa) (women only) 95% CI: NR

Approach to analysis: Decision tree divided into No injury, Fracture, Cut/Scrape/Head Injury/Other. **Perspective:** Australian Payer perspective **Time horizon**: 18 months **Treatment effect duration:**[(a)] 15 weeks **Discounting:** Costs: 3%; Outcomes: 3%	Mean age: 76.1 years Male: 40.2% **Intervention 1:** Routine activity **Intervention 2:** "No Falls" exercise program, weekly hour-long group-based exercise class for 15 weeks, supplemented by daily home exercises	Women only: Intervention 1: NR Intervention 2: NR Incremental (2−1): £43.31 (95% CI: NR; p=NR) **Currency & cost year:** 2010 UK pounds **Cost components incorporated:** Staff costs, equipment cost, venue hire, cost of an injury	Women only: Intervention 1: NR Intervention 2: NR Incremental (2−1): 0.0019 (95% CI: NR; p=NR)	Probability Intervention 2 cost effective (£20K/30K threshold): <5%/8.8% (43.43%/76.77%, women only) **Analysis of uncertainty:** In the mixed gender cohort, adding advertising costs or increasing cost of ambulatory care had little impact on the cost effectiveness conclusion. The use of a fitness instructor (lower cost) as opposed to an Allied Health Assistant for the group instructor and no venue or equipment cost, reduced the ICER. In the mixed gender group however, it remained over the £20K threshold. In women, the ICERs fell below £20K, suggesting intervention 2 may be cost effective. Threshold analysis found that generate an ICER within the £20K to £30K threshold in the overall base case, the exercise program required a falls rate reduction of between 32% and 42%, assuming injury distribution remains constant.
Data sources				
Health outcomes: Based on RCT data from Day 2002 and Fitzharris 2010. A negative binomial regression model was used to calculate the rate of falls in each group. The number of people who received an injury with a fall was a dependent variable. **Quality-of-life weights:** EQ-5D, from the literature including Iglesias 2009, Murphy 2002, Peasgood 2009 and the National Osteoporosis Foundation. Utilities included were No fall, Fear of falling, Fall, Fall including a proportion fear of falling, Hip fracture year 1, Hip fracture year 2, Shoulder fracture, Wrist fracture, other fracture. The model assumed that utility of no fall was 1. **Cost sources:** Cost of instruction was defined as an Allied Health Assistant which was valued as an hourly wage plus 50% on-costs, cost of a fall was obtained from Commonwealth Medicare Benefits Schedule, Private Health Insurance Administration Council, Australian				

Ambulatory Classes, Australian Refined Diagnostic-Related Group and Victorian Casemix Rehabilitation and Funding Tree. It was estimated that a fracture would need 3 visits with a general practitioner and 2 visits for other injuries relating to a fall.
Comments
Source of funding: the National Health and Medical Research Council, Victorian Department of Human Services (Aged Care), City of Whitehorse, Victorian Health Promotion Foundation, Rotary, and the National Safety Council **Limitations:** Australian healthcare perspective, with 2010 costs, may not be reflective of current UK context. Discounting at 3% rather than 3.5% as required by NICE reference case. Based on two studies and may not reflect the full body of evidence . 18 month time horizon which may not fully capture downstream effects of intervention, Utility of a 70+ year old that has no fall is 1 which is unrealistic as they are likely to have other health conditions that would lower their utility, resource uses based on phone calls to the participants to ask but only managed to capture 93% of falls resource use **Other:** N/A
Overall applicability: Partially applicable[(b)] **Overall quality: Potentially serious limitations**[(c)]

Abbreviations: 95% CI= 95% confidence interval; CUA= cost–utility analysis; EQ-5D= Euroqol 5 dimensions (scale: 0.0 [death] to 1.0 [full health], negative values mean worse than death); ICER= incremental cost-effectiveness ratio; NR= not reported; pa= probabilistic analysis; QALYs= quality-adjusted life years

(a) For studies where the time horizon is longer than the treatment duration, an assumption needs to be made about the continuation of the study effect. For example, does a difference in utility between groups during treatment continue beyond the end of treatment and if so for how long.

(b) Directly applicable/Partially applicable/not applicable

(c) Minor limitations/Potentially serious limitations/very serious limitations

Study	**Stanmore 2019[219]#140**			
Study details	**Population & interventions**	**Costs**	**Health outcomes**	**Cost effectiveness**
Economic analysis: CUA (health outcome: QALYs) **Study design:** Complete case within trial analysis (Stanmore, 2019) **Approach to analysis:** Complete case within trial analysis – QALYs estimated based on EQ-5D-5L using the area under the curve method	**Population:** Adults aged 55 years and older dwelling in assisted living facilities. **Cohort settings:** Mean age: 78 years Male: Int 1: 24%/Int 2: 19.6% **Intervention 1:** Standard care (physiotherapist visit to explain Otago exercise programme (OEP) and	**Total costs (mean per patient):** Intervention 1: NR Intervention 2: NR Incremental (2−1): £101.84 (95% CI: − 7.42 to 211.11; p=NR) **Currency & cost year:** 2015-2016 UK pounds[(c)] **Cost components incorporated:**	**QALYs (mean per patient):** Intervention 1: NR Intervention 2: NR Incremental (2−1): 0.007 (95% CI: − 0.003 to 0.016; p=NR)	**ICER (Intervention 2 versus Intervention 1):** £15,209.80[(d)] per QALY gained (pa) 95% CI: Probability Intervention 2 cost effective (£20K/30K threshold): 61%/73% **Analysis of uncertainty:** Results were robust to controlling for baseline characteristics using multiple imputation or complete case analysis, and choice of methodology to derive utility values from the EQ-5D-5L instrument.

assuming linear extrapolation of utility between time points, adjusting for baseline differences in QoL, age and gender. **Perspective:** UK NHS **Follow-up**: 12 weeks **Treatment effect duration:**[(a)] n/a **Discounting:** Costs: n/a; Outcomes: n/a	leaflet on falls prevention and OEP recommended exercise). Recommended exercise 3 times a week. **Intervention 2:** Tailored 12-week strength and balance Exergame (active video games which combine gameplay with physical exercise and may also incorporate types of virtual reality simulations) programme, supported by physiotherapists or trained assistant[(b)], in addition to standard care.	Cost of intervention, cost of standard care and health care utilisation over study period		
Data sources				
Health outcomes: Within trial analysis with outcomes taken from Stanmore 2019, an RCT with randomisation at the ‘assisted living facility’ level (cluster RCT). Base-case analysis was conducted on the dataset generated by multiple imputation methods. **Quality-of-life weights:** EQ-5D-5L at individual level. Unclear if mapped to 3L using van Hout 2012 in accordance with NICE’s position statement, however choice of methodology to derive utility values from the EQ-5D-5L instrument explored in sensitivity analyses. **Cost sources:** Health care services resource-use data were collected during the study. Unit costs: PSSRU.				
Comments				
Source of funding: Innovate UK through their SBRI programme. **Limitations:** Short time horizon may not capture all downstream effects of intervention and consequences of falls, based on single study and may not reflect the full body of evidence. Based on 2015-16-unit costs which may not reflect current NHS context. Specific resource use collected, and unit costs are not reported in study. Funded by manufacturer of Exergame. **Other:**				
Overall applicability:[(e)] Directly Applicable **Overall quality:**[(f)] Potentially serious limitations				

Abbreviations: CCA= cost–consequences analysis; CEA= cost-effectiveness analysis; 95% CI= 95% confidence interval; CUA= cost–utility analysis; EQ-5D-5L= Euroqol 5 dimensions (scale: 0.0 [death] to 1.0 [full health], negative values mean worse than death) OEP= Otago exercise programme,; ICER= incremental cost-effectiveness ratio; NR= not reported; pa= probabilistic analysis; QALYs= quality-adjusted life years, RCT = Randomised controlled trial, PSSRU= Personal social services research unit, SBRI = Small Business Research Initiative

(a) For studies where the time horizon is longer than the treatment duration, an assumption needs to be made about the continuation of the study effect. For example, does a difference in utility between groups during treatment continue beyond the end of treatment and if so for how long.

(b) Physiotherapist / Assistant support includes setting up exergame programmes, tailoring programmes according to participants needs, offering Exergames to participants under supervision three times a week and saving games under a schedule that can be replayed or adjusted as required.
(c) Converted using 2015-2016 purchasing power parities [185]
(d) ICER is not exactly equal to the ratio due to rounding.
(e) Directly applicable / Partially applicable / Not applicable
(f) Minor limitations / Potentially serious limitations / Very serious limitations

Study	**Bruce et al 2021 (Also reported in Lamb 2020)**			
Study details	**Population & interventions**	**Costs**	**Health outcomes**	**Cost effectiveness**
Economic analysis: Cost utility analysis, CUA (health outcome: QALYs) **Study design:** Within trial economic evaluation including multiple imputation. **Approach to analysis:** Within trial analysis with health care resource use and QoL measured at 0, 4,8,12 and 18 months from questionnaires. Area under the curve method, adjusted for baseline utility. Based on RCT with randomisation undertaken at the GP level.	**Population:** People over 70 years of age living in the community. **Cohort settings:** Start age: 77.9 years. Male: 47.5% N=9803 **Intervention 1:** Usual care, patients received Age UK "Staying Steady" booklet. **Intervention 2:** Exercise, patients received Age UK "Staying Steady" booklet. Individual or group exercise sessions: Week 1: 1 hour face to face baseline, week 3: 30 minutes face to face appointment or 10-minute	**Total costs (mean per patient):** Intervention 1: £3,740 Intervention 2: £3,713 Intervention 3: £3,943 Incremental (2−1): -£27 (95% CI: NR; p=NR) Incremental (3−2): £230 (95% CI: NR; p=NR) **Currency & cost year:** 2015/16 UK pounds **Cost components incorporated:** Staff cost, Postage, exercise booklet, ankle weights, day centre, nursing home, equipment	**QALYs (mean per patient):** Intervention 1: 1.1136 Intervention 2: 1.1193 Intervention 3: 1.1063 Incremental (2−1): 0.0057 (95% CI: NR; p=NR) Incremental (3−2): -0.013 (95% CI: NR; p=NR)	**ICER:** Exercise dominates (less costly and more effective) usual care and multifactorial interventions. Probability Intervention 2 cost effective (£20K/30K threshold): 64.5%/68.5% **Analysis of uncertainty:** Probabilistic sensitivity analysis undertaken as well as complete case analysis where the cost effectiveness conclusions remain unchanged. The uncertainty around which intervention is cost effective is between exercise or usual care, when the willingness-to-pay threshold is £20,000 the likelihood that multifactorial fall prevention is cost effective is only 1%.

Perspective: UK NHS **Follow-up:** 18 months **Treatment effect duration:**[(a)] N/A **Discounting:** Costs: 3.5%; Outcomes: 3.5%	telephone call, week 6: 30 minutes face to face appointment or telephone call, month 3: 10 minute telephone call, month 4: 10 minute telephone call, month 5: 10 minute telephone call, month 6: 1 hour face to face appointment **Intervention 3:** Multifactorial falls prevention. 1-hour face-to-face appointment for detailed falls assessment and screening of multiple risk factors**.** They were then referred to other relevant health care professionals			
Data sources				
Health outcomes: Within trial analysis using Bruce 2021 (PreFIT cluster RCT), the primary outcome in the trial was fracture rate over the 18 months, the secondary outcome was the falls rate expressed as falls per person per 100 years. The participants were asked to keep a monthly prospective falls diary for a random four months during the trial (given the sample size it was felt that keeping the diary throughout the trial was not practical). Mortality data was obtained from family members, primary care or searches of practice medical records. Multiple imputation was used to calculate the missing data, it was assumed that the data was missing at random, 100 imputations were calculated. **Quality-of-life weights:** EQ-5D-3L, UK tariff **Cost sources:** The intervention was adapted from a free exercise manual and therefore the costs included were staff time from University of Warwick 2011 prices and PSSRU 2015. Hospital Episode Statistics 2011/12 to 2015/16 were used for hospital spells, A&E attendances, and outpatient visits. Other hospital costs were calculated using NHS reference costs 2015/16. Health care resource use was collected using the participants self-report questionnaires and then the costs were calculated using PSSRU 2015				
Comments				
Source of funding: NIHR. **Limitations** 18-month time horizon, it is based on a single RCT and so may not reflect full body of evidence identified in clinical review (TBC until clinical review complete and checked) **Other:** N/A				
Overall applicability: Directly applicable[(b)] **Overall quality: Minor limitations**[(c)]				

Abbreviations: 95% CI= 95% confidence interval; CUA= cost–utility analysis; da= deterministic analysis; EQ-5D-3L= Euroqol 5 dimensions 3 levels (scale: 0.0 [death] to 1.0 [full health], negative values mean worse than death); ICER= incremental cost-effectiveness ratio; NR= not reported; pa= probabilistic analysis; QoL = quality of life; QALYs= quality-adjusted life years
(a) For studies where the time horizon is longer than the treatment duration, an assumption needs to be made about the continuation of the study effect. For example, does a difference in utility between groups during treatment continue beyond the end of treatment and if so for how long.
(b) Directly applicable/partially applicable/not applicable
(c) Minor Limitations/Potentially serious limitations/Very serious limitations

Study	**Church et al 2012**			
Study details	**Population & interventions**	**Costs**	**Health outcomes**	**Cost effectiveness**
Economic analysis: Cost utility analysis, CUA (health outcome: QALYs) **Study design:** Decision analytic model. **Approach to analysis:** Decision tree and Markov model. Five health states were included: Low risk (never fallen), Medium risk (fallen, no injury), high risk (fallen with injury), residential care, death. Individuals moved between health states following a multiple event decision tree. Cycle length 1 year. Comparators were split into those relevant to general population (Intervention 1 to 7),	**Population:** People over 65 years of age living in the community. **Cohort settings:** Start age: 65 years Male: NR **Intervention 1:** No treatment General population interventions: **Intervention 2:** Group based exercise (two group classes and one home exercise session per week for 26 weeks) **Intervention 3:** Tai Chi (6-month instructed classes twice a week for	**Total costs (mean per patient):** NR Incremental versus 1: **General population** 2: £230 3: £240 4: £322 5: £387 6: £465 7: £550 **High risk population** 8: £208 9: £355 10: £417 **Specific population** 11: £162 12: £4,753 13: saves £30	**QALYs (mean per patient):** NR Incremental versus 1: **General population** 2: 0.007 3: 0.011 4: 0.009 5: 0.005 6: 0.010 7: 0.009 **High risk population** 8: 0.008 9: 0.008 10: 0.015 **Specific population** 11: 0.019 12: 0.172 13: 0.010	**ICER:** General population(c): 2: Ex. Dom 3 vs 1: £21,770 4: Dominated 5: Dominated 6: Dominated 7: Dominated High risk population(c): 8 vs 1: £25,086 9: Dominated 10 vs 8: £32,997 Specific population (d): 11 vs 1: £8,474 12 vs 1: £27,634 13 vs 1: Dominates (less costly and more effective) **Analysis of uncertainty:** One way sensitivity analysis shows that removing

those for high risk population (interventions 8 to 10) and interventions for specific populations (11-13) **Perspective:** Australian healthcare system **Time horizon:** Lifetime **Treatment effect duration:**[(a)] 1 year (except for int. 12 and 13) **Discounting:** Costs: 5%; Outcomes: 5%	12 participants) **Intervention 4:** Multiple interventions (exercise and falls advice, Two-hour weekly group information sessions on falls prevention run by an occupational therapist for 7 weeks with a follow-up home visit and a 3-month booster) **Intervention 5:** Multifactorial (referral): Assessment and referral, falls risk assessment and follow-up by a physician, 1-hour occupational therapy home visit and a 2-hour nurse interview **Intervention 6:** Home-based exercise (five district nurse home visits in the first week, followed by home visits at week 2, 4 and 8 weeks with a booster at 6 months. Costs include nurse and physiotherapist time)	**Currency & cost year:** 2009 AUD (presented here as 2009 UK pounds[(b)]) **Cost components incorporated:** Staff cost, classes, surgery, medication, hazard modifications		“fear of falling” from the model, none of the interventions were cost effective. Intervention effectiveness, intervention cost and cohort start age are all drivers in the model. Using probabilistic sensitivity analysis for the general population interventions, at low willingness to pay thresholds ‘no intervention’ dominates however, above £29,549 threshold Tai Chi dominates.

	Intervention 7: Multifactorial (active): Assessment and active intervention, falls risk assessment plus an exercise program once a week, home hazard modification by an occupational therapist, a vision assessment, a medication review and counselling High risk population: **Intervention 8:** Group based exercise. **Intervention 9:** Multifactorial (high risk) **Intervention 10:** Home hazard modification Specific population **Intervention 11:** Psychotropic medication withdrawal (reduction of medication over 14 weeks with six GP visits and nurse time)			

	Intervention 12: Cardiac pacing (screening by carotid sinus massage, cardiovascular assessment, insertion of a pacemaker and post-pacemaker visit) **Intervention 13:** Expedited cataract surgery (patients receive the cataract procedure within 4 weeks versus the usual 12-month waiting period. Costs include a general practitioner (GP) visit, surgery and two specialist visits)			
Data sources				
Health outcomes: Effectiveness data based on a systematic review by Cochrane, Gillespie 2012. This included 159 trials with 79,193 participants. Distribution between risk groups and baseline transition probabilities of falling were derived from Lord 1993 and expert opinion (Professor Lord). The transition probabilities to the emergency department, other medical services, hospital, residential care, respite care or death were obtained from Watson 2009. All-cause mortality was obtained from the Australian Bureau of Statistics life tables and the probability of entering a residential care facility for all causes was estimated using Wang 2001. **Quality-of-life weights:** EQ-5D-3L, UK tariff **Cost sources:** Most healthcare costs were taken from Watson et al (2009). The majority of intervention costs were taken from Day et al (2009), other intervention costs were obtained from the studies in the meta-analysis. All costs were applied on a per fall basis in the cycle in which they occurred.				
Comments				
Source of funding: NSW Health and the Cancer Institute NSW. **Limitations:** Australian health care system, discounting at 5% rather than 3.5% as required by NICE reference case. Outcomes, intervention effectiveness and costs came from 2009 which may not reflect full body of clinical evidence and may not reflect current UK NHS context. **Other:** N/A				
Overall applicability: Partially applicable[c] **Overall quality: Potentially serious limitations**[d]				

Abbreviations: 95% CI= 95% confidence interval; CUA= cost–utility analysis; da= deterministic analysis; Dom=Dominated, one option is less costly and more effective than another option; Ex.Dom= Extendedly dominated, a combination of two interventions is less costly and more effective than the extendedly dominated option EQ-5D-3L= Euroqol 5 dimensions 3 levels (scale: 0.0 [death] to 1.0 [full health], negative values mean worse than death); ICER= incremental cost-effectiveness ratio; NR= not reported; pa= probabilistic analysis; QoL = quality of life; QALYs= quality-adjusted life years

(a) For studies where the time horizon is longer than the treatment duration, an assumption needs to be made about the continuation of the study effect. For example, does a difference in utility between groups during treatment continue beyond the end of treatment and if so for how long.
(b) 2009 costs AUD converted to GDP 2009 using PPP.
(c) Estimates are all ranked against the next best option in this group to determine cost-effectiveness. Full incremental analysis of available strategies: first strategies are ruled out that are dominated (another strategy is more effective and has lower costs) or subject to extended dominance (the strategy is more effective and more costly but the incremental cost effectiveness ratio is higher than the next most effective option and so it would never be the most cost effective option); incremental costs, incremental effects and incremental cost effectiveness ratios are calculated for the remaining strategies by comparing each to the next most effective option.
(d) Estimates are all compared to the 'no intervention' option as each intervention applies to a different population.
(e) Directly applicable/partially applicable/not applicable
(f) Minor Limitations/Potentially serious limitations/Very serious limitations

H.2 Multifactorial

Study	**Bruce et al 2021 (Also reported in Lamb 2020)**			
Study details	**Population & interventions**	**Costs**	**Health outcomes**	**Cost effectiveness**
Economic analysis: Cost utility analysis, CUA (health outcome: QALYs) **Study design:** Within trial economic evaluation including multiple imputation. **Approach to analysis:** Within trial analysis with health care resource use and QoL measured at 0, 4,8,12 and 18 months from questionnaires. Area under the curve method,	**Population:** People over 70 years of age living in the community. **Cohort settings:** Start age: 77.9 years Male: 47.5% N=9803 **Intervention 1:** Usual care, patients received Age UK "Staying Steady" booklet. **Intervention 2:** Exercise, patients received Age UK "Staying Steady" booklet.	**Total costs (mean per patient):** Intervention 1: £3,740 Intervention 2: £3,713 Intervention 3: £3,943 Incremental (2−1): -£27 (95% CI: NR; p=NR) Incremental (3−2): £230 (95% CI: NR; p=NR) **Currency & cost year:** 2015/16 UK pounds **Cost components incorporated:** Staff cost, Postage, exercise booklet, ankle	**QALYs (mean per patient):** Intervention 1: 1.1136 Intervention 2: 1.1193 Intervention 3: 1.1063 Incremental (2−1): 0.0057 (95% CI: NR; p=NR) Incremental (3−2): -0.013 (95% CI: NR; p=NR)	**ICER:** Exercise dominates (less costly and more effective) usual care and multifactorial interventions. Probability Intervention 2 cost effective (£20K/30K threshold): 64.5%/68.5% **Analysis of uncertainty:** Probabilistic sensitivity analysis undertaken as well as complete case analysis where the cost effectiveness conclusions remain unchanged. The uncertainty around which intervention is cost effective is between exercise or usual care, when the willingness-to-pay threshold is £20,000 the likelihood that multifactorial fall prevention is cost effective is only 1%.

adjusted for baseline utility. Based on RCT with randomisation undertaken at the GP level. **Perspective:** UK NHS **Follow-up:** 18 months **Treatment effect duration:**[(a)] N/A **Discounting:** Costs: 3.5%; Outcomes: 3.5%	Individual or group exercise sessions: Week 1: 1 hour face to face baseline, week 3: 30 minutes face to face appointment or 10-minute telephone call, week 6: 30 minutes face to face appointment or telephone call, month 3: 10 minute telephone call, month 4: 10 minute telephone call, month 5: 10 minute telephone call, month 6: 1 hour face to face appointment **Intervention 3:** Multifactorial falls prevention. 1-hour face-to-face appointment for detailed falls assessment and screening of multiple risk factors**.** They were then referred to other relevant health care professionals	weights, day centre, nursing home, equipment		
Data sources				
Health outcomes: Within trial analysis using Bruce 2021 (PreFIT cluster RCT), the primary outcome in the trial was fracture rate over the 18 months, the secondary outcome was the falls rate expressed as falls per person per 100 years. The participants were asked to keep a monthly prospective falls diary for a random four months during the trial (given the sample size it was felt that keeping the diary throughout the trial was not practical). Mortality data was obtained from family members, primary care or searches of practice medical records. Multiple imputation was used to calculate the missing data, it was assumed that the data was missing at random, 100 imputations were calculated. **Quality-of-life weights:** EQ-5D-3L, UK tariff **Cost sources:** The intervention was adapted from a free exercise manual and therefore the costs included were staff time from University of Warwick 2011 prices and PSSRU 2015. Hospital Episode Statistics 2011/12 to 2015/16 were used for hospital spells, A&E attendances, and outpatient visits. Other hospital costs were calculated using NHS reference costs 2015/16. Health care resource use was collected using the participants self-report questionnaires and then the costs were calculated using PSSRU 2015				

Comments
Source of funding: NIHR. **Limitations** 18-month time horizon, it is based on a single RCT and so may not reflect full body of evidence identified in clinical review, relative risk in clinical review is in a different direction to the one used her. **Other:** N/A
Overall applicability: Directly applicable[(b)] **Overall quality: Potentially Serious limitations**[(c)]

Abbreviations: 95% CI= 95% confidence interval; CUA= cost–utility analysis; da= deterministic analysis; EQ-5D-3L= Euroqol 5 dimensions 3 levels (scale: 0.0 [death] to 1.0 [full health], negative values mean worse than death); ICER= incremental cost-effectiveness ratio; NR= not reported; pa= probabilistic analysis; QoL = quality of life; QALYs= quality-adjusted life years

(a) For studies where the time horizon is longer than the treatment duration, an assumption needs to be made about the continuation of the study effect. For example, does a difference in utility between groups during treatment continue beyond the end of treatment and if so for how long.

(b) Directly applicable/partially applicable/not applicable

(c) Minor Limitations/Potentially serious limitations/Very serious limitations

Study	Church et al 2012			
Study details	**Population & interventions**	**Costs**	**Health outcomes**	**Cost effectiveness**
Economic analysis: Cost utility analysis, CUA (health outcome: QALYs) **Study design:** Decision analytic model **Approach to analysis:** Decision tree and Markov model. Five health states were included: Low risk (never fallen), Medium risk (fallen, no injury), high risk (fallen with injury), residential care, death. Individuals moved between health states following a	**Population:** People over 65 years of age living in the community. **Cohort settings:** Start age: 65 years Male: NR **Intervention 1:** No treatment General population interventions: **Intervention 2:** Group based exercise (two group classes and one	**Total costs (mean per patient):** NR Incremental versus 1: **General population** 2: £230 3: £240 4: £322 5: £387 6: £465 7: £550 **High risk population** 8: £208 9: £355 10: £417	**QALYs (mean per patient):** NR Incremental versus 1: **General population** 2: 0.007 3: 0.011 4: 0.009 5: 0.005 6: 0.010 7: 0.009 **High risk population** 8: 0.008 9: 0.008 10: 0.015	**ICER:** General population[(c)]: 2: Ex. Dom 3 vs 1: £21,770 4: Dominated 5: Dominated 6: Dominated 7: Dominated High risk population[(c)]: 8 vs 1: £25,086 9: Dominated 10 vs 8: £32,997 Specific population [(d)]: 11 vs 1: £8,474 12 vs 1: £27,634

multiple event decision tree. Cycle length 1 year. Comparators were split into those relevant to general population (Intervention 1 to 7), those for high risk population (interventions 8 to 10) and interventions for specific populations (11-13) **Perspective:** Australian healthcare system **Time horizon:** Lifetime **Treatment effect duration:**[(a)] 1 year (except for int. 12 and 13) **Discounting:** Costs: 5%; Outcomes: 5%	home exercise session per week for 26 weeks) **Intervention 3:** Tai Chi (6-month instructed classes twice a week for 12 participants) **Intervention 4:** Multiple interventions (exercise and falls advice, Two-hour weekly group information sessions on falls prevention run by an occupational therapist for 7 weeks with a follow-up home visit and a 3-month booster) **Intervention 5:** Multifactorial (referral): Assessment and referral, falls risk assessment and follow-up by a physician, 1-hour occupational therapy home visit and a 2-hour nurse interview **Intervention 6:** Home-based exercise (five district nurse home visits in the first week, followed by home visits at week 2, 4 and	**Specific population** 11: £162 12: £4,753 13: saves £30 **Currency & cost year:** 2009 AUD (presented here as 2009 UK pounds[(b)]) **Cost components incorporated:** Staff cost, classes, surgery, medication, hazard modifications	**Specific population** 11: 0.019 12: 0.172 13: 0.010	13 vs 1: Dominates (less costly and more effective) **Analysis of uncertainty:** One way sensitivity analysis shows that removing “fear of falling” from the model, none of the interventions were cost effective. Intervention effectiveness, intervention cost and cohort start age are all drivers in the model. Using probabilistic sensitivity analysis for the general population interventions, at low willingness to pay thresholds ‘no intervention’ dominates however, above £29,549 threshold Tai Chi dominates.

	8 weeks with a booster at 6 months. Costs include nurse and physiotherapist time) **Intervention 7:** Multifactorial (active): Assessment and active intervention, falls risk assessment plus an exercise program once a week, home hazard modification by an occupational therapist, a vision assessment, a medication review and counselling High risk population: **Intervention 8:** Group based exercise **Intervention 9:** Multifactorial (high risk) **Intervention 10:** Home hazard modification Specific population **Intervention 11:** Psychotropic medication withdrawal (reduction of			

	medication over 14 weeks with six GP visits and nurse time) **Intervention 12:** Cardiac pacing (screening by carotid sinus massage, cardiovascular assessment, insertion of a pacemaker and post-pacemaker visit) **Intervention 13:** Expedited cataract surgery (patients receive the cataract procedure within 4 weeks versus the usual 12-month waiting period. Costs include a general practitioner (GP) visit, surgery and two specialist visits)			
Data sources				
Health outcomes: Effectiveness data based on a systematic review by Cochrane, Gillespie 2012. This included 159 trials with 79,193 participants. Distribution between risk groups and baseline transition probabilities of falling were derived from Lord 1993 and expert opinion (Professor Lord). The transition probabilities to the emergency department, other medical services, hospital, residential care, respite care or death were obtained from Watson 2009. All cause mortality was obtained from the Australian Bureau of Statistics life tables and the probability of entering a residential care facility for all causes was estimated using Wang 2001. **Quality-of-life weights:** EQ-5D-3L, UK tariff **Cost sources:** Most healthcare costs were taken from Watson et al (2009). The majority of intervention costs were taken from Day et al (2009), other intervention costs were obtained from the studies in the meta-analysis. All costs were applied on a per fall basis in the cycle in which they occurred.				
Comments				

Source of funding: NSW Health and the Cancer Institute NSW. **Limitations:** Australian health care system, discounting at 5% rather than 3.5% as required by NICE reference case. Outcomes, intervention effectiveness and costs came from 2009 which may not reflect full body of clinical evidence and may not reflect current UK NHS context. **Other:** N/A
Overall applicability: Partially applicable(c) **Overall quality: Potentially serious limitations**(d)

Abbreviations: 95% CI= 95% confidence interval; CUA= cost–utility analysis; da= deterministic analysis; Dom=Dominated, one option is less costly and more effective than another option; Ex.Dom= Extendedly dominated, a combination of two interventions is less costly and more effective than the extendedly dominated option EQ-5D-3L= Euroqol 5 dimensions 3 levels (scale: 0.0 [death] to 1.0 [full health], negative values mean worse than death); ICER= incremental cost-effectiveness ratio; NR= not reported; pa= probabilistic analysis; QoL = quality of life; QALYs= quality-adjusted life years

(a) For studies where the time horizon is longer than the treatment duration, an assumption needs to be made about the continuation of the study effect. For example, does a difference in utility between groups during treatment continue beyond the end of treatment and if so for how long.

(b) 2009 costs AUD converted to GDP 2009 using PPP

(c) Estimates are all ranked against the next best option in this group to determine cost-effectiveness. Full incremental analysis of available strategies: first strategies are ruled out that are dominated (another strategy is more effective and has lower costs) or subject to extended dominance (the strategy is more effective and more costly but the incremental cost effectiveness ratio is higher than the next most effective option and so it would never be the most cost effective option); incremental costs, incremental effects and incremental cost effectiveness ratios are calculated for the remaining strategies by comparing each to the next most effective option.

(d) Estimates are all compared to the 'no intervention' option as each intervention applies to a different population.

(e) Directly applicable/partially applicable/not applicable

(f) Minor Limitations/Potentially serious limitations/Very serious limitations

Study	**Konnopka 2022**			
Study details	**Population & interventions**	**Costs**	**Health outcomes**	**Cost effectiveness**
Economic analysis: CEA (health outcome: fracture free year) **Study design:** Decision analytic model **Approach to analysis:** Within trial analysis **Perspective:** German health care **Time horizon:** 12 months	**Population:** People aged 70 -85 with a fragility fracture in the past 5 years **Cohort settings:** Mean age: 78.8 Male: 10.2% **Intervention 1:** Usual care	**Total costs (mean per patient):** Intervention 1: £807 Intervention 2: £943 Incremental (2−1): £136 (SE=NR; p=NR) **Currency & cost year:** 2017 EUR **Cost components incorporated:**	**QALYs (mean per patient):** Intervention 1: N/A Intervention 2: N/A Incremental (2−1): N/A (SE:NR; p=NR)	**ICER (Intervention 2 versus Intervention 1):** ICER= £60,566 per fracture free year Probability falls prevention program cost effective (£20/£30K threshold): NR/NR **Analysis of uncertainty:** The probability that the intervention is cost effective was 50% at a willingness to pay threshold of £82,472 and 85% at a willingness to pay threshold of £439,852

Discounting: Costs: N/A; Outcomes: N/A	**Intervention 2:** Osteoporotic fracture prevention program, consisting of mobility and fall prevention classes (six 90 minute sessions in six weeks), DEXA scan with treatment where indicated, and consultation on safety in their living environment.	Staff costs, materials for classes, education of trainers, administration costs		
Data sources				
Health outcomes: Primary outcome was a fracture free year **Quality-of-life weights:** N/A. **Cost sources:** Health insurance company in Germany (Sozialversicherung für Landwirtschaft, Forsten und Gartenbau) and the Robert Bosch Institute for medical research				
Comments				
Source of funding: Bundesministerium für Bildung und Forschung. **Limitations:** time horizon was only 1 year and based on a single RCT so may not be representative of the full body of evidence **Other:**				
Overall applicability: Partly[(a)] **Overall quality: Potentially serious**[(b)]				

Abbreviations: CCA= cost–consequences analysis; CEA= cost-effectiveness analysis; 95% CI= 95% confidence interval; CUA= cost–utility analysis; da= deterministic analysis; EQ-5D= Euroqol 5 dimensions (scale: 0.0 [death] to 1.0 [full health], negative values mean worse than death); ICER= incremental cost-effectiveness ratio; N/A=Not applicable NR= not reported; pa= probabilistic analysis; QALYs= quality-adjusted life years
(a) =Directly applicable / Partially applicable / Not applicable
(b) Minor limitations / Potentially serious limitations / Very serious limitations

Study	**Kwon 2023**			
Study details	**Population & interventions**	**Costs**	**Health outcomes**	**Cost effectiveness**
Economic analysis: Cost utility analysis, CUA **Study design:** Patient level simulation	**Population:** People in the community over 60 years of age **Cohort settings:** Start age: 60 years	**Total costs (as reported):** Intervention 1: £10,060,099,947 Intervention 2: £9,936,609,337	**Total QALYs (as reported):** Intervention 1: 2,091,707 Intervention 2: 2,110,652	**ICER:** Multifactorial interventions dominated usual care (less costly and more effective).

Approach to analysis: Individuals are grouped into four different frailty categories. Then dependent on eligibility patients enter one of the reactive, proactive or self-referral falls prevention pathway. **Perspective:** UK NHS **Time horizon:** 40 years **Treatment effect duration:**[a] NR **Discounting:** Costs: 3.5%; Outcomes: 3.5%	Male: 46.5% **Intervention 1:** Usual care: Reactive: Home assessment and modification for hospital fallers (around 28% of fallers requiring medical attention) Proactive: Multifactorial intervention for high falls risk individuals who are cognitively intact, not received the reactive intervention that year or the proactive intervention screened at a routine GP appointment. Self-referral: Self-financed exercise intervention for 0.1% of people who don't receive reactive or proactive intervention that year. **Intervention 2:** Recommended care: Reactive: Multifactorial intervention for all fallers that required medical attention. Proactive: Multifactorial intervention for all high-risk fallers who have not received the reactive intervention that year	Incremental (2−1): saves £123,490,610 **Total costs (mean per patient):** Intervention 1: £26,117.11 Intervention 2: £25,796.51 Incremental (2−1): saves £320.60 **Currency & cost year:** 2021/22 UK pounds (costs uprated from 2013/14 by authors) **Cost components incorporated:** GP consultations, emergency admission, elective hospital admission	Incremental (2−1): 18,946 **Total QALYs (mean per patient):** Intervention 1: 5.43 Intervention 2: 5.48 Incremental (2−1): 0.05	**Analysis of uncertainty:** All the sensitivity analyses (probabilistic and deterministic) were done from a societal perspective not a healthcare perspective.

	Self-referral: Publicly funded exercise intervention who don't receive the reactive or proactive intervention that year.			
Data sources				
Health outcomes: Office for National Statistics (ONS) was used for mortality, demographic and migration data, NHS Digital was used for institutionalisation data, (ELSA) was used for history of falls, baseline fragility, high physical activity, cognitive impairment, fear of falling, abnormal gait and balance data, intervention effects were from Lockwood 2019, Close 1999, Shaw 2003, Spice 2009, Nyman 2019, Iliffe 2014 and Skelton 2005. **Quality-of-life weights:** EQ-5D, UK tariff **Cost sources:** Annual primary and secondary care costs were obtained from Han et al. and uprated to 2021/22 prices				
Comments				
Source of funding: Wellcome Trust. **Limitations:** Costs used were 2013/14 that were inflated to 2021/22, Sensitivity analyses from a healthcare perspective were not completed (it was completed from a societal perspective), included people all people aged 60 and over **Other:** N/A				
Overall applicability:[(b)] Partially applicable **Overall quality:**[(c)] Potentially serious limitations				

Abbreviations: 95% CI= 95% confidence interval; CUA= cost–utility analysis; da= deterministic analysis; EQ-5D-3L= Euroqol 5 dimensions 3 levels (scale: 0.0 [death] to 1.0 [full health], negative values mean worse than death); ICER= incremental cost-effectiveness ratio; NPSA = National Patient Safety Agency; NR= not reported; pa= probabilistic analysis; QoL = quality of life; QALYs= quality-adjusted life years

(a) For studies where the time horizon is longer than the treatment duration, an assumption needs to be made about the continuation of the study effect. For example, does a difference in utility between groups during treatment continue beyond the end of treatment and if so for how long.

(b) Directly applicable/partially applicable/not applicable

(c) Minor Limitations/Potentially serious limitations/Very serious limitations

Study	**Peeters et al 2011**			
Study details	**Population & interventions**	**Costs**[(a)]	**Health outcomes**	**Cost effectiveness**
Economic analysis: Cost utility analysis, CUA (health outcome: QALYs) **Study design:** Within trial economic	**Population:** People over 65 years of age and contacted their GP or A&E living in the community at high risk of recurrent falls LASA fall risk profile ≥8).	**Total costs (mean per patient):** Intervention 1: £4,005 Intervention 2: £4,943 Incremental (2−1): £937 (95% CI: NR; p=NR)	**QALYs (mean per patient):** Intervention 1: 0.76 Intervention 2: 0.76 Incremental (2−1): -0.004	**ICER:** Usual care dominated multifactorial intervention (less costly and more effective) Probability Intervention 2 cost effective (£20K/30K threshold): NR/NR

evaluation including multiple imputation. **Approach to analysis:** Within trial analysis using area under the curve method with straight-line interpolation between utility at baseline and 1-year follow-up. Health care resource use came from questionnaires at 3, 6 and 12 months. **Perspective:** The Netherlands, societal but healthcare can be extracted **Follow-up** 12 months **Treatment effect duration:**[(b)] N/A **Discounting:** Costs: N/A; Outcomes: N/A	**Cohort settings:** Start age: Intervention 1: 80.6 years; intervention 2: 79 years Male: Intervention 1 26.1%, Intervention 2 33% **Intervention 1:** Usual care **Intervention 2:** Multifactorial falls prevention. A falls prevention assessment consisting of medical history, physical examination and additional diagnostic tests if needed carried out by geriatrician**.** Then treatment which may include withdrawal of psychotropic medication, balance and strength training, home hazard reduction, referral to ophthalmologist or cardiologist.	**Currency & cost year:** 2007 Euros (presented here as 2007 UK pounds [(c)]) **Cost components incorporated:** Staff cost, hospital cost, formal care, medication, paramedic care	(95% CI: -0.021 to 0.029; p=NR)	**Analysis of uncertainty:** Sensitivity analyses were performed on the societal perspective, but none were performed on the healthcare related costs alone. When bootstrapping was undertaken from a societal perspective the probability of multifactorial intervention being cost effective compared to usual care was zero at any threshold. Of note: multifactorial intervention did not reduce fall risk compared to usual care.
Data sources				
Health outcomes: Within trial analysis using Peeters 2007, the main outcomes were the prevalence of fallers and recurrent fallers and utility. The participants completed weekly fall record which was returned every 3 months. Recurrent falling was defined by having fallen twice or more within a 6-month period. Multiple imputation was done to account for missing data. **Quality-of-life weights:** EQ-5D-3L, Dutch tariff. No adjustment for baseline utility required as these were the same in both groups. **Cost sources:** A questionnaire was filled out by participants at 3-, 6- and 12-months then costed				

according to the Dutch guidelines prices published in the "Handbook for cost studies, methods and guidelines for economic evaluation in health care". Costs of healthcare devises, aids and adaptations were estimated by asking retail prices of three suppliers in the Netherlands.
Comments
Source of funding: NR. **Limitations**: Dutch tariff used for EQ-5D-3L used. Dutch healthcare system with 2007 costs which may not reflect current UK NHS context. Study conducted from a societal perspective but healthcare costs could be extracted however no sensitivity analysis was done on healthcare costs alone. Based on a single RCT and so may not reflect full body of evidence identified in clinical. Short follow-up (1 year) may not capture all downstream effects of intervention, although given age of participants may be less of a concern. Authors report poor adherence to the recommended multifactorial interventions recommended and note that increased adherence may have resulted in fewer falls but also greater costs and therefore impact on ICER of adherence uncertain. **Other:** N/A
Overall applicability: Partially applicable(c) **Overall quality: Potentially serious limitations(d)**

Abbreviations: 95% CI= 95% confidence interval; A&E= Accident and Emergency; CUA= cost–utility analysis; EQ-5D-3L= Euroqol 5 dimensions 3 levels (scale: 0.0 [death] to 1.0 [full health], negative values mean worse than death); GP=General Practitioner; ICER= incremental cost-effectiveness ratio; NR= not reported; pa= probabilistic analysis; QoL = quality of life; QALYs= quality-adjusted life years

(a) 2007 costs Euros converted to GDP 2007 using PPP[185]

(b) For studies where the time horizon is longer than the treatment duration, an assumption needs to be made about the continuation of the study effect. For example, does a difference in utility between groups during treatment continue beyond the end of treatment and if so for how long.

(c) Directly applicable/partially applicable/not applicable

(d) Minor Limitations/Potentially serious limitations/Very serious limitations

Study	**Sach et al 2012**			
Study details	**Population & interventions**	**Costs**	**Health outcomes**	**Cost effectiveness**
Economic analysis: Cost utility analysis, CUA (health outcome: QALYs) **Study design:** Within trial economic evaluation (Logan 2010), using complete cases only.	**Population:** People over 60 years of age who had contacted an ambulance due to a fall but not been taken to hospital. Living in the community. **Cohort settings:** Median age: 82 (usual care), 83 (multifactorial)	**Total costs (mean per patient):** Intervention 1: £16,818 Intervention 2: £15,266 Incremental (2−1): saves £1,551 (95% CI: -£5,932 to £2,829; p=NR)	**QALYs (mean per patient):** Intervention 1: lost 0.059 Intervention 2: lost 0.129 Incremental (2−1): 0.07 (95% CI: -0.010 to 0.150; p=0.086)	**ICER:** Multifactorial intervention dominated usual care (less costly and more effective) Probability Intervention 2 cost effective (£20K/30K threshold): 89%/92.3%

Approach to analysis: Within trial analysis using area under the curve method using linear interpolation with adjustment for baseline utilities. QoL data came from questionnaires at 0, 6 and 12 months. Health care resource use came from questionnaires at 6 and 12 months. **Perspective:** UK NHS **Follow-up** 12 months **Treatment effect duration:**[(a)] N/A **Discounting:** Costs: N/A; Outcomes: N/A	Male: 36% (usual care), 34% (multifactorial) **Intervention 1:** Usual care, including existing social and medical services. (n=75) **Intervention 2:** Community multifactorial falls prevention. This included occupational therapists, physiotherapists and nurses, Interventions primarily delivered at home, but also included group sessions in community centres. (n=82)	**Currency & cost year:** 2008/09 UK pounds **Cost components incorporated:** Staff cost, ambulance call out, outpatient visits, residential care, NHS funded travel		**Analysis of uncertainty:** Increasing the cost of the intervention, taking a wider perspective, only considering the costs of the intervention all resulted in multifactorial interventions still being cost effective compared to usual care.
Data sources				
Health outcomes: Within trial analysis using Logan 2010. Diaries filled out by participants were used to calculate the numbers of falls, participants were called to chase up any diaries not returned. **Quality-of-life weights:** EQ-5D-3L, UK tariff **Cost sources:** Contact with health and social services were collected using the individual patient questionnaires done at baseline, 6 months and 12 months, this included care home admissions, equipment provided and home modifications. Secondary care and ambulance use data taken from patient records. Resource data was collected by a researcher that was blind to the allocation. Unit costs of items of equipment were taken from Logan 2007. Other unit cost sources include: PSSRU and NHS reference costs.				
Comments				
Source of funding: Post doctorial training scholarship. **Limitations:** Based on a single RCT and so may not reflect full body of evidence identified in clinical review. Short follow-up (1 year) may not capture all downstream effects of intervention. 2008/9 unit costs may not reflect current NHS context. **Other:** N/A				
Overall applicability: Directly applicable[(b)] **Overall quality: Potentially serious limitations**[(c)]				

Abbreviations: 95% CI= 95% confidence interval; CUA= cost–utility analysis; da= deterministic analysis; EQ-5D-3L= Euroqol 5 dimensions 3 levels (scale: 0.0 [death] to 1.0 [full health], negative values mean worse than death); ICER= incremental cost-effectiveness ratio; NR= not reported; pa= probabilistic analysis; QoL = quality of life; QALYs= quality-adjusted life years

(a) For studies where the time horizon is longer than the treatment duration, an assumption needs to be made about the continuation of the study effect. For example, does a difference in utility between groups during treatment continue beyond the end of treatment and if so for how long.

(b) Directly applicable/partially applicable/not applicable
(c) Minor Limitations/Potentially serious limitations/Very serious limitations

H.3 Environmental interventions

Study	Cockayne 2021[43], OTIS trial			
Study details	**Population & interventions**	**Costs**	**Health outcomes**	**Cost effectiveness**
Economic analysis: CUA (health outcome: QALYs) **Study design:** Within trial analysis (OTIS RCT) **Approach to analysis:** Within trial analysis – area under the curve method, adjusted for baseline utility. **Perspective:** UK NHS **Follow-up:** 1 year **Treatment effect duration:**(a) n/a **Discounting:** Costs: n/a; Outcomes: n/a	**Population:** Community-dwelling people aged ≥ 65 years who are at risk of falling in England (NHS) **Cohort settings:** Start age: 80.1 years Male: 34.5% **Intervention 1:** Usual care **Intervention 2:** Home hazard assessment and environmental modification delivered by occupational therapists (OT)	**Total costs (mean per patient):** Intervention 1: NR Intervention 2: NR Incremental (2−1): £18.78 (95% CI: £16.33 to £21.24 NR; p=NR) **Currency & cost year:** 2017/2018 UK pounds **Cost components incorporated:** Intervention costs and falls related visits to primary care, community care and hospitalisations.	**QALYs (mean per patient):** Intervention 1: Intervention 2: Incremental (2−1): 0.0042 fewer QALYs (95% CI: -0.0043 to -0.0041; p=NR)	**ICER (Intervention 2 versus Intervention 1):** Usual care dominates home hazard assessment (less costly and more effective) Probability Intervention 2 cost effective (£20K/30K threshold): 29%/27% **Analysis of uncertainty:** Bootstrapping undertaken. Sensitivity analyses included: 1. Complete-case analysis as an alternative to the use of multiple imputation for dealing with missing data - ICER (2 versus 1): Home hazard assessment dominates usual care (less costly and more effective). 2. Inclusion of non-falls-related health-care resource use in addition to the falls-related resource use - ICER (2 versus 1): £53,900 per QALY lost (b) 3. Inpatient stay data from falls data sheets, rather than from participant-completed questionnaires - ICER (2 versus 1): Usual care dominates home hazard assessment (less costly and more effective)

				4. Exploration of the assumption that all equipment provided as part of the intervention is funded by the NHS and PSS (rather than in the base case, which attaches costs only to the items that were paid for by the NHS and PSS in the study and not to the items that were reported as funded by participants themselves, i.e. out-of-pocket expenditure) - ICER (2 versus 1): Usual care dominates home hazard assessment (less costly and more effective) 5. Paid care worker visits being paid for by the NHS and PSS (rather than by the participant/relative as in the base case) - ICER (2 versus 1): £14,859 per QALY lost.
Data sources				
Health outcomes: Baseline and effectiveness data (falls, EQ-5D and mortality) based on OTIS trial a UK randomised controlled trial (same paper) This is 1 of 12 RCTs reported in clinical review for this comparison. Base-case analysis was conducted on the dataset generated by multiple imputation methods, intention-to-treat basis. **Quality-of-life weights:** EQ-5D-5L using UK tariff, mapped to 3L using van Hout 2012 in accordance with NICE's position statement. **Cost sources:** Resource use based on within trial using participant reported questionnaires at baseline, 4, 8 and 12 months (separating falls and non-falls related). Equipment recommended by OT documented at home visit and confirmation of use at 4-6 week follow up call. Intervention cost based on OT home assessment visit and cost of training OTs. Unit costs: PSSRU and NHS reference costs.				
Comments				
Source of funding: NIHR. **Limitations:** Based on a single trial which is not representative of full body of clinical evidence, fall rate ratio 1.17 versus 0.74 in meta analysis and health related QoL mean difference (intervention versus usual care) -0.04 versus 0.09. High level of missing data (~55% complete case), so complete case analysis came to different conclusion to multiple imputation (dominant versus dominated). Short time horizon (1 year) may not capture all downstream effects of intervention. **Other:**				
Overall applicability:[c] Directly applicable **Overall quality:**[d] Potentially serious limitations				

Abbreviations: 95% CI= 95% confidence interval; CUA= cost–utility analysis; da= deterministic analysis; EQ-5D= Euroqol 5 dimensions (scale: 0.0 [death] to 1.0 [full health], negative values mean worse than death); ICER= incremental cost-effectiveness ratio; NR= not reported; OT= occupational therapists; pa= probabilistic analysis; QALYs= quality-adjusted life years

(a) For studies where the time horizon is longer than the treatment duration, an assumption needs to be made about the continuation of the study effect. For example, does a difference in utility between groups during treatment continue beyond the end of treatment and if so for how long.

(b) When the ICER is over £20,000 per QALY lost, intervention 2 is considered the cost-effective option.

(c) Directly applicable / Partially applicable / Not applicable

(d) Minor limitations / Potentially serious limitations / Very serious limitations

Study	**Pega 2016[190]**			
Study details	**Population & interventions**	**Costs**	**Health outcomes**	**Cost effectiveness**
Economic analysis: CUA (health outcome: QALYs) **Study design:** Decision analytic model **Approach to analysis:** Adaptation of BODE falls Markov model. Including 'low risk' (no previous injurious fall) and 'high risk' (previous injurious fall) health states. At each cycle people could have or not have an injurious fall event with fallers either injured requiring hospitalisation or non-hospitalisation or have no injurious fall. Death included as absorbing state. Injurious fall risk reduction from intervention applied. Transition to residential care where they would no longer benefit from HSAM intervention. To account for considerable social mobility in the NZ	**Population:** Community dwelling older people aged 65 years and above in New Zealand **Cohort settings:** Start age: 65 years Male: NR **Intervention 1:** No intervention **Intervention 2:** Home safety assessment and modification (targeted)	**Total costs (mean per patient):** Intervention 1: NR Intervention 2: NR Incremental (2−1): NR (95% CI: NR; p=NR) **Currency & cost year:** 2011 New Zealand dollars (presented here as 2011 UK pounds[(b)]) **Cost components incorporated:** Intervention costs, falls related costs: hospitalisation and non-hospital healthcare.	**QALYs (mean per patient):** Intervention 1: NR Intervention 2: NR Incremental (2−1): NR (95% CI: NR; p=NR)	**ICER (Intervention 2 versus Intervention 1):** £4,276 per QALY gained (da) No probabilistic analysis. **Analysis of uncertainty:** Scenario analyses included targeting the intervention only to: - Older people with previous injurious falls (ICER £950 per QALY gained) - Older people aged 75 years and above (ICER £4,276 per QALY gained) - 'At risk' older people (≥65 years and one or more previous injurious falls) with declining intervention effectiveness over 10 years (linear decrease to nil) (ICER £9,503 per QALY gained). - 'At risk' older people (≥65 years and one or more previous injurious falls) and intervention costs reduced by a third (ICER £2,851per QALY gained). Setting discount rate to 0% and 6% resulted in ICERs of £3,801 per QALY and £5,227 per QALY gained respectively. ICER comparable for both genders and all ethnic groups.

population, inflows and outflows from houses with and without HSAM over time were modelled. This may not be applicable to UK setting. Annual cycles. **Perspective:** New Zealand health care **Time horizon**: lifetime **Treatment effect duration:**[(a)] n/a **Discounting:** Costs: 3%; Outcomes: 3%				
Data sources				
Health outcomes: New Zealand falls registry and national life tables. Risk reduction from home safety assessment and modification for falls taken from meta-analysis of RCTs (Cochrane by Gillespie 2012, fall rate ratio: 0.81, 95% CI 0.68 to 0.97). **Quality-of-life weights:** QALYs used but based on Global burden of disease study which provides disability weights as opposed to EQ-5D utility values. **Cost sources:** Resource use and unit costs taken from New Zealand national sources and audits as well as expert opinion. Resource use for intervention taken from 2015 New Zealand-based RCT of home assessment and modification in the general population.				
Comments				
Source of funding: Health Research Council of New Zealand. **Limitations:** New Zealand healthcare perspective, with 2011 costs, may not be reflective of current UK context. QoL assessed using disease weights rather than EQ-5D. Discounting at 3% rather than 3.5% as required by NICE reference case. New Zealand baseline data and resource use may not be applicable to current NHS context. No probabilistic sensitivity analysis conducted. Potential concern with double counting: New Zealand Health Tracker and the Accident Compensation Corporation injury claims registry were not individually linked, in combining counts for injurious falls from these registries, they may have slightly overestimated the number of injured fallers each year. Relative treatment effect based on old Cochrane, which is less favourable than that reported in clinical review (0.81 vs 0.74). **Other:**				
Overall applicability:[(c)] Partially applicable **Overall quality:**[(d)] Potentially serious limitations				

Abbreviations: 95% CI= 95% confidence interval; CUA= cost–utility analysis; da= deterministic analysis; EQ-5D= Euroqol 5 dimensions (scale: 0.0 [death] to 1.0 [full health], negative values mean worse than death); ICER= incremental cost-effectiveness ratio; NR= not reported; NZ= New Zealand; QALYs= quality-adjusted life years

(a) For studies where the time horizon is longer than the treatment duration, an assumption needs to be made about the continuation of the study effect. For example, does a difference in utility between groups during treatment continue beyond the end of treatment and if so for how long.

(b) Converted using 2011 purchasing power parities[185]

(c) Directly applicable / Partially applicable / Not applicable

(d) Minor limitations / Potentially serious limitations / Very serious limitations

Appendix I Health economic model

I.1 Exercise interventions

Whilst this review question was prioritised for de novo health economic modelling, this intervention was not prioritised.

I.2 Multicomponent/Multifactorial interventions

Whilst this review question was prioritised for de novo health economic modelling, this intervention was not prioritised

I.3 Environmental interventions

This review question was prioritised for de novo health economic modelling, details can be found in section 1.1.29 in this review.

Appendix J Excluded studies

J.1 Clinical studies

J.1.1 Multifactorial

Table 44: Studies excluded from the clinical review

Study	Code [Reason]
Achison, Marcus, Adamson, Simon, Akpan, Asangaedem et al. (2022) Effect of perindopril or leucine on physical performance in older people with sarcopenia: the LACE randomized controlled trial. Journal of cachexia, sarcopenia and muscle 13(2): 858-871	- Study does not contain an intervention relevant to this review protocol
Allin, Leigh J, Brolinson, P Gunnar, Beach, Briana M et al. (2020) Perturbation-based balance training targeting both slip- and trip-induced falls among older adults: a randomized controlled trial. BMC geriatrics 20(1): 205	- Study does not contain an intervention relevant to this review protocol
Amatachaya, Sugalya, Promkeaw, Donlaya, Arayawichanon, Preeda et al. (2021) Various Surfaces Benefited Functional Outcomes and Fall Incidence in Individuals With Spinal Cord Injury: A Randomized Controlled Trial With Prospective Data Follow-up. Archives of physical medicine and rehabilitation 102(1): 19-26	- Population not relevant to this review protocol
Anonymous (2020) Safety and efficacy of fluoxetine on functional outcome after acute stroke (AFFINITY): a randomised, double-blind, placebo-controlled trial. The Lancet. Neurology 19(8): 651-660	- Study does not contain an intervention relevant to this review protocol
Areeudomwong, Pattanasin, Saysalum, Saranrat, Phuttanurattana, Nopchaluk et al. (2019) Balance and functional fitness benefits of a Thai boxing dance program among community-dwelling older adults at risk of falling: A randomized controlled study. Archives of gerontology and geriatrics 83: 231-238	- No relevant outcomes
Arkkukangas, Marina, Stromqvist Baathe, Karin, Ekholm, Anna et al. (2022) High Challenge Exercise and Learning Safe Landing Strategies among Community-Dwelling Older Adults: A Randomized Controlled Trial. International journal of environmental research and public health 19(12)	- Study does not contain an intervention relevant to this review protocol
Arrieta, Haritz, Astrugue, Cyril, Regueme, Sophie et al. (2019) Effects of a physical activity programme to prevent physical performance decline in onco-geriatric patients: a randomized multicentre trial. Journal of cachexia, sarcopenia and muscle 10(2): 287-297	- Data not reported in an extractable format or a format that can be analysed
Bhasin, Shalender, Ellenberg, Susan S, Storer, Thomas W et al. (2018) Effect of testosterone replacement on measures of mobility in older men with mobility limitation and low testosterone concentrations: secondary analyses of the Testosterone Trials. The lancet. Diabetes & endocrinology 6(11): 879-890	- Study does not contain an intervention relevant to this review protocol

Study	Code [Reason]
Bhasin, Shalender, Gill, Thomas M, Reuben, David B et al. (2018) Strategies to Reduce Injuries and Develop Confidence in Elders (STRIDE): A Cluster-Randomized Pragmatic Trial of a Multifactorial Fall Injury Prevention Strategy: Design and Methods. The journals of gerontology. Series A, Biological sciences and medical sciences 73(8): 1053-1061	- Data not reported in an extractable format or a format that can be analysed
Bhatt, Tanvi, Wang, Yiru, Wang, Shuaijie et al. (2021) Perturbation Training for Fall-Risk Reduction in Healthy Older Adults: Interference and Generalization to Opposing Novel Perturbations Post Intervention. Frontiers in sports and active living 3: 697169	- Study does not contain an intervention relevant to this review protocol
Bischoff-Ferrari, HA, Dawson-Hughes, B, Platz, A et al. (2010) Effect of high-dosage cholecalciferol and extended physiotherapy on complications after hip fracture: a randomized controlled trial. Archives of internal medicine 170(9): 813-820	- Data not reported in an extractable format or a format that can be analysed
Bischoff-Ferrari, Heike A, de Godoi Rezende Costa Molino, Caroline, Rival, Sandrine et al. (2021) DO-HEALTH: Vitamin D3 - Omega-3 - Home exercise - Healthy aging and longevity trial - Design of a multinational clinical trial on healthy aging among European seniors. Contemporary clinical trials 100: 106124	- Data not reported in an extractable format or a format that can be analysed
Bjerk, Maria, Brovold, Therese, Davis, Jennifer C et al. (2019) Evaluating a falls prevention intervention in older home care recipients: a comparison of SF-6D and EQ-5D. Quality of life research : an international journal of quality of life aspects of treatment, care and rehabilitation 28(12): 3187-3195	- Study does not contain an intervention relevant to this review protocol
Bjerk, Maria, Brovold, Therese, Skelton, Dawn A et al. (2019) Effects of a falls prevention exercise programme on health-related quality of life in older home care recipients: a randomised controlled trial. Age and ageing 48(2): 213-219	- Comparator in study does not match that specified in this review protocol
Blalock, SJ, Casteel, C, Roth, MT et al. (2010) Impact of enhanced pharmacologic care on the prevention of falls: a randomized controlled trial. American journal of geriatric pharmacotherapy 8(5): 428-440	- Duplicate reference
Brown, Joshua D, Smith, Steven M, Strotmeyer, Elsa S et al. (2020) Comparative Effects of Angiotensin-Converting Enzyme Inhibitors and Angiotensin Receptor Blockers on Response to a Physical Activity Intervention in Older Adults: Results From the Lifestyle Interventions and Independence for Elders Study. The journals of gerontology. Series A, Biological sciences and medical sciences 75(5): 1010-1016	- Secondary publication of an included study that does not provide any additional relevant information
Cameron, Michelle H, Hildebrand, Andrea, Hugos, Cinda L et al. (2022) Free From Falls education and exercise program for reducing falls in people with multiple sclerosis: A randomized controlled trial. Multiple sclerosis (Houndmills, Basingstoke, England) 28(6): 980-988	- Population not relevant to this review protocol

Study	Code [Reason]
Campbell, AJ, Robertson, MC, Gardner, MM et al. (1999) Psychotropic medication withdrawal and a home-based exercise program to prevent falls: a randomized, controlled trial. Journal of the American Geriatrics Society 47(7): 850-853	- Duplicate reference
Cao, Yu-Ting, Wang, Jian-Jie, Yang, Yi-Ting et al. (2022) Effect of home-based exercise programs with e-devices on falls among community-dwelling older adults: a meta-analysis. Journal of comparative effectiveness research 11(16): 1201-1217	- Systematic review used as source of primary studies
Chakhtoura, Marlene, Chamoun, Nariman, Rahme, Maya et al. (2020) Impact of vitamin D supplementation on falls and fractures-A critical appraisal of the quality of the evidence and an overview of the available guidelines. Bone 131: 115112	- Systematic review used as source of primary studies
Cheng, Meichao, Wang, Ya, Wang, Shun et al. (2022) Network meta-analysis of the efficacy of four traditional Chinese physical exercise therapies on the prevention of falls in the elderly. Frontiers in public health 10: 1096599	- No relevant outcomes
Chiu, Huei-Ling, Yeh, Ting-Ting, Lo, Yun-Ting et al. (2021) The effects of the Otago Exercise Programme on actual and perceived balance in older adults: A meta-analysis. PloS one 16(8): e0255780	- Systematic review used as source of primary studies
Daly, Robin M, Gianoudis, Jenny, Kersh, Mariana E et al. (2020) Effects of a 12-Month Supervised, Community-Based, Multimodal Exercise Program Followed by a 6-Month Research-to-Practice Transition on Bone Mineral Density, Trabecular Microarchitecture, and Physical Function in Older Adults: A Randomized Controlled Trial. Journal of bone and mineral research : the official journal of the American Society for Bone and Mineral Research 35(3): 419-429	- Duplicate reference
Davis, Jennifer C, Hsu, Chun Liang, Ghag, Cheyenne et al. (2022) Baseline health-related quality of life predicts falls: a secondary analysis of a randomized controlled trial. Quality of life research : an international journal of quality of life aspects of treatment, care and rehabilitation 31(11): 3211-3220	- Data not reported in an extractable format or a format that can be analysed
de Rooij, Ilona J M, van de Port, Ingrid G L, Punt, Michiel et al. (2021) Effect of Virtual Reality Gait Training on Participation in Survivors of Subacute Stroke: A Randomized Controlled Trial. Physical therapy 101(5)	- Population not relevant to this review protocol
Deems-Dluhy, Susan, Hoppe-Ludwig, Shenan, Mummidisetty, Chaithanya K et al. (2021) Microprocessor Controlled Knee Ankle Foot Orthosis (KAFO) vs Stance Control vs Locked KAFO: A Randomized Controlled Trial. Archives of physical medicine and rehabilitation 102(2): 233-244	- Population not relevant to this review protocol
Denissen, S, Staring, W, Kunkel, D et al. (2019) Interventions for preventing falls in people after stroke. Cochrane Database of Systematic Reviews	- Population not relevant to this review protocol

Study	Code [Reason]
Dukas, L, Bischoff, HA, Lindpaintner, LS et al. (2003) Alfacalcidol reduces the number of fallers and falls in community-dwelling elderly provided a mainimum total daily intake of 500mg calcium. Calcified tissue international 72: 371	- Duplicate reference
Ferreira, Daniela Lemes, Christofoletti, Gustavo, Campos, Dayane Melo et al. (2022) Effects of Aquatic Physical Exercise on Motor Risk Factors for Falls in Older People During the COVID-19 Pandemic: A Randomized Controlled Trial. Journal of manipulative and physiological therapeutics	- No relevant outcomes
Gallo, Estelle, Stelmach, Maria, Frigeri, Fernanda et al. (2018) Determining Whether a Dosage-Specific and Individualized Home Exercise Program With Consults Reduces Fall Risk and Falls in Community-Dwelling Older Adults With Difficulty Walking: A Randomized Control Trial. Journal of geriatric physical therapy (2001) 41(3): 161-172	- Data not reported in an extractable format or a format that can be analysed
Gill, Thomas M, McGloin, Joanne M, Shelton, Amy et al. (2020) Optimizing Retention in a Pragmatic Trial of Community-Living Older Persons: The STRIDE Study. Journal of the American Geriatrics Society 68(6): 1242-1249	- Study does not contain an intervention relevant to this review protocol
Griffin, James, Lall, Ranjit, Bruce, Julie et al. (2019) Comparison of alternative falls data collection methods in the Prevention of Falls Injury Trial (PreFIT). Journal of clinical epidemiology 106: 32-40	- Study design not relevant to this review protocol
Hansen, Karen E, Johnson, R Erin, Chambers, Kaitlin R et al. (2015) Treatment of Vitamin D Insufficiency in Postmenopausal Women: A Randomized Clinical Trial. JAMA internal medicine 175(10): 1612-21	- Population not relevant to this review protocol *Mean age of population is less than 65 years*
Harris, Tess, Limb, Elizabeth S, Hosking, Fay et al. (2019) Effect of pedometer-based walking interventions on long-term health outcomes: Prospective 4-year follow-up of two randomised controlled trials using routine primary care data. PLoS medicine 16(6): e1002836	- Population not relevant to this review protocol
Hayes, S, Galvin, R, Kennedy, C et al. (2019) Interventions for preventing falls in people with multiple sclerosis. Cochrane Database of Systematic Reviews	- Population not relevant to this review protocol
Hofbauer, Lorenz C, Witvrouw, Richard, Varga, Zsuzsanna et al. (2021) Bimagrumab to improve recovery after hip fracture in older adults: a multicentre, double-blind, randomised, parallel-group, placebo-controlled, phase 2a/b trial. The Lancet. Healthy longevity 2(5): e263-e274	- Study does not contain an intervention relevant to this review protocol
Huang, HC, Liu, CY, Huang, YT et al. (2010) Community-based interventions to reduce falls among older adults in Taiwan - long time follow-up randomised controlled study. Journal of clinical nursing 19(78): 959-968	- Duplicate reference

Study	Code [Reason]
Huang, TT; Yang, LH; Liu, CY (2011) Reducing the fear of falling among community-dwelling elderly adults through cognitive-behavioural strategies and intense Tai Chi exercise: a randomized controlled trial. Journal of advanced nursing 67(5): 961-971	- Duplicate reference
Jang, I.-Y., Jung, H.-W., Park, H. et al. (2018) A multicomponent frailty intervention for socioeconomically vulnerable older adults: A designed-delay study. Clinical Interventions in Aging 13: 1799-1814	- Study design not relevant to this review protocol
Jansen, Carl-Philipp, Nerz, Corinna, Labudek, Sarah et al. (2021) Lifestyle-integrated functional exercise to prevent falls and promote physical activity: Results from the LiFE-is-LiFE randomized non-inferiority trial. The international journal of behavioral nutrition and physical activity 18(1): 115	- Secondary publication of an included study that does not provide any additional relevant information
Juraschek, Stephen P, Taylor, Addison A, Wright, Jackson T Jr et al. (2020) Orthostatic Hypotension, Cardiovascular Outcomes, and Adverse Events: Results From SPRINT. Hypertension (Dallas, Tex. : 1979) 75(3): 660-667	- Study does not contain an intervention relevant to this review protocol
Kannan, Meena, Hildebrand, Andrea, Hugos, Cinda L et al. (2019) Evaluation of a web-based fall prevention program among people with multiple sclerosis. Multiple sclerosis and related disorders 31: 151-156	- Population not relevant to this review protocol
Khaw, Kay-Tee, Stewart, Alistair W, Waayer, Debbie et al. (2017) Effect of monthly high-dose vitamin D supplementation on falls and non-vertebral fractures: secondary and post-hoc outcomes from the randomised, double-blind, placebo-controlled ViDA trial. The lancet. Diabetes & endocrinology 5(6): 438-447	- Study design not relevant to this review protocol
Klima, D.W., Rabel, M., Mandelblatt, A. et al. (2021) Community-Based Fall Prevention and Exercise Programs for Older Adults. Current Geriatrics Reports 10(2): 58-65	- Review article but not a systematic review
Ko, F. (2019) Long-term exercise training in older adults is associated with reduced injurious falls and fractures. Journal of Clinical Outcomes Management 26(4): 155-157	- Study design not relevant to this review protocol
Kornholt, Jonatan, Feizi, Shafika Tapia, Hansen, Alexandra Storm et al. (2022) Effects of a comprehensive medication review intervention on health-related quality of life and other clinical outcomes in geriatric outpatients with polypharmacy: A pragmatic randomized clinical trial. British journal of clinical pharmacology 88(7): 3360-3369	- Study does not contain an intervention relevant to this review protocol
Kovacic, T, Kovacic, M, Ovsenik, R et al. (2020) The impact of multicomponent programmes on balance and fall reduction in adults with intellectual disabilities: a randomised trial. Journal of intellectual disability research : JIDR 64(5): 381-394	- Population not relevant to this review protocol
Kraiwong, Ratchanok, Vongsirinavarat, Mantana, Rueankam, Maliwan et al. (2021) Effects of physical-cognitive training on physical and psychological functions among older adults with type 2	- Data not reported in an extractable format or a format that can be analysed

Study	Code [Reason]
diabetes and balance impairment: a randomized controlled trial. Journal of exercise rehabilitation 17(2): 120-130	
Kulkarni, Snehal and Nagarkar, Aarti (2023) Effect of a video-assisted fall prevention program on fall incidence in community-dwelling older adults during COVID. Geriatric nursing (New York, N.Y.) 50: 31-37	- Study design not relevant to this review protocol
Lauriks, Steve, Meiland, Franka, Oste, Johan P et al. (2020) Effects of Assistive Home Technology on quality of life and falls of people with dementia and job satisfaction of caregivers: Results from a pilot randomized controlled trial. Assistive technology : the official journal of RESNA 32(5): 243-250	- Population not relevant to this review protocol
Law, Waiyan and Kwok, Timothy C Y (2019) Impacts of a multicomponent intervention programme on neuropsychiatric symptoms in people with dementia and psychological health of caregivers: A feasibility pilot study. International journal of geriatric psychiatry 34(12): 1765-1775	- No relevant outcomes
Le Boff, M., Chou, S., Murata, E. et al. (2019) Effects of vitamin D on the risk of falls in the Vitamin D and OmegA-3 TriaL (VITAL). Journal of Bone and Mineral Research 34(supplement1): 19	- Conference abstract
LeBoff, Meryl S, Murata, Elle M, Cook, Nancy R et al. (2020) VITamin D and OmegA-3 TriaL (VITAL): Effects of Vitamin D Supplements on Risk of Falls in the US Population. The Journal of clinical endocrinology and metabolism 105(9)	- Population not relevant to this review protocol
Lee, P.G.; Pokhrel, K.P.; Herman, W.H. (2019) Fall risk in individuals with type 2 diabetes: The look ahead study. Diabetes 68(supplement1)	- Conference abstract
Levis, Silvina and Gomez-Marin, Orlando (2017) Vitamin D and Physical Function in Sedentary Older Men. Journal of the American Geriatrics Society 65(2): 323-331	- No relevant outcomes
Li, Fuzhong; Harmer, Peter; Chou, Li-Shan (2019) Dual-Task Walking Capacity Mediates Tai Ji Quan Impact on Physical and Cognitive Function. Medicine and science in sports and exercise 51(11): 2318-2324	- Study does not contain an intervention relevant to this review protocol
Li, Fuzhong, Harmer, Peter, Eckstrom, Elizabeth et al. (2019) Effectiveness of Tai Ji Quan vs Multimodal and Stretching Exercise Interventions for Reducing Injurious Falls in Older Adults at High Risk of Falling: Follow-up Analysis of a Randomized Clinical Trial. JAMA network open 2(2): e188280	- Data not reported in an extractable format or a format that can be analysed
Li, Liangtao, Cheng, Shihuan, Wang, Guodong et al. (2019) Tai chi chuan exercises improve functional outcomes and quality of life in patients with primary total knee arthroplasty due to knee osteoarthritis. Complementary therapies in clinical practice 35: 121-125	- Study does not contain an intervention relevant to this review protocol

Study	Code [Reason]
Ling, Yali, Xu, Feng, Xia, Xuedi et al. (2021) Vitamin D supplementation reduces the risk of fall in the vitamin D deficient elderly: An updated meta-analysis. Clinical nutrition (Edinburgh, Scotland) 40(11): 5531-5537	- More recent systematic review included that covers the same topic
Lipsitz, Lewis A, Macklin, Eric A, Travison, Thomas G et al. (2019) A Cluster Randomized Trial of Tai Chi vs Health Education in Subsidized Housing: The MI-WiSH Study. Journal of the American Geriatrics Society 67(9): 1812-1819	- Study does not contain an intervention relevant to this review protocol
Liu, Minhui, Xue, Qian-Li, Gitlin, Laura N et al. (2021) Disability Prevention Program Improves Life-Space and Falls Efficacy: A Randomized Controlled Trial. Journal of the American Geriatrics Society 69(1): 85-90	- Conference abstract
Liu-Ambrose, Teresa, Davis, Jennifer C, Falck, Ryan S et al. (2021) Exercise, Processing Speed, and Subsequent Falls: A Secondary Analysis of a 12-Month Randomized Controlled Trial. The journals of gerontology. Series A, Biological sciences and medical sciences 76(4): 675-682	- Secondary publication of an included study that does not provide any additional relevant information
Magaziner, Jay, Mangione, Kathleen K, Orwig, Denise et al. (2019) Effect of a Multicomponent Home-Based Physical Therapy Intervention on Ambulation After Hip Fracture in Older Adults: The CAP Randomized Clinical Trial. JAMA 322(10): 946-956	- No relevant outcomes
Mahlknecht, Angelika, Wiedermann, Christian J, Sandri, Marco et al. (2021) Expert-based medication reviews to reduce polypharmacy in older patients in primary care: a northern-Italian cluster-randomised controlled trial. BMC geriatrics 21(1): 659	- Study does not contain an intervention relevant to this review protocol
Mahmoudi, Elham, Basu, Tanima, Langa, Kenneth et al. (2019) Can Hearing Aids Delay Time to Diagnosis of Dementia, Depression, or Falls in Older Adults?. Journal of the American Geriatrics Society 67(11): 2362-2369	- Study design not relevant to this review protocol
Malihi, Zarintaj, Lawes, Carlene M M, Wu, Zhenqiang et al. (2019) Monthly high-dose vitamin D supplementation does not increase kidney stone risk or serum calcium: results from a randomized controlled trial. The American journal of clinical nutrition 109(6): 1578-1587	- Data not reported in an extractable format or a format that can be analysed
McGuire, Rita, Honaker, Julie, Pozehl, Bunny et al. (2020) BASIC Training: A Pilot Study of Balance/Strengthening Exercises in Heart Failure. Rehabilitation nursing : the official journal of the Association of Rehabilitation Nurses 45(1): 30-38	- Data not reported in an extractable format or a format that can be analysed
Merchant, R.A., Tsoi, C.T., Tan, W.M. et al. (2021) Community-Based Peer-Led Intervention for Healthy Ageing and Evaluation of the 'HAPPY' Program. Journal of Nutrition, Health and Aging 25(4): 520-527	- Study does not contain an intervention relevant to this review protocol

Study	Code [Reason]
Meredith, S, Feldman, P, Frey, D et al. (2002) Improving medication use in newly admitted home healthcare patients: a randomized controlled trial. Journal of the American Geriatrics Society 50(9): 1484-1491	- Study does not contain an intervention relevant to this review protocol
Meziere, A. (2019) Exercise inerventions with trained carers for preventing loss of autonomy and falls in elderly people at home (T4H): A cluster randomized controlled pilot trial. European Geriatric Medicine 10(supplement1): 177-s178	- Conference abstract
Meziere, Anthony, Oubaya, Nadia, Michel-Pellegrino, Valerie et al. (2021) Exercise Interventions With Trained Home Helpers for Preventing Loss of Autonomy and Falls in Community-Dwelling Older Adults Receiving Home Heath Physical Therapy T4H: A Randomized Controlled Pilot Study. Journal of geriatric physical therapy (2001) 44(3): e138-e149	- No relevant outcomes
Michos, Erin D, Mitchell, Christine M, Miller, Edgar R 3rd et al. (2018) Rationale and design of the Study To Understand Fall Reduction and Vitamin D in You (STURDY): A randomized clinical trial of Vitamin D supplement doses for the prevention of falls in older adults. Contemporary clinical trials 73: 111-122	- Data not reported in an extractable format or a format that can be analysed
Millan-Domingo, Fernando, Tarazona-Santabalbina, Francisco Jose, Carretero, Aitor et al. (2022) Real-Life Outcomes of a Multicomponent Exercise Intervention in Community-Dwelling Frail Older Adults and Its Association with Nutritional-Related Factors. Nutrients 14(23)	- Study design not relevant to this review protocol
Montero-Alia, Pilar, Miralles-Basseda, Ramon, Lopez-Jimenez, Tomas et al. (2019) Controlled trial of balance training using a video game console in community-dwelling older adults. Age and ageing 48(4): 506-512	- Study design not relevant to this review protocol
Mora Pinzon, Maria, Myers, Shannon, Jacobs, Elizabeth A et al. (2019) "Pisando Fuerte": an evidence-based falls prevention program for Hispanic/Latinos older adults: results of an implementation trial. BMC geriatrics 19(1): 258	- Study design not relevant to this review protocol
Morrison, Steven, Simmons, Rachel, Colberg, Sheri R et al. (2018) Supervised Balance Training and Wii Fit-Based Exercises Lower Falls Risk in Older Adults With Type 2 Diabetes. Journal of the American Medical Directors Association 19(2): 185e7-185e13	- No relevant outcomes
Nikamp, Corien D M, Hobbelink, Marte S H, van der Palen, Job et al. (2019) The effect of ankle-foot orthoses on fall/near fall incidence in patients with (sub-)acute stroke: A randomized controlled trial. PloS one 14(3): e0213538	- Population not relevant to this review protocol
Nouredanesh, Mina, Godfrey, Alan, Howcroft, Jennifer et al. (2021) Fall risk assessment in the wild: A critical examination of wearable sensor use in free-living conditions. Gait & posture 85: 178-190	- Review article but not a systematic review

Study	Code [Reason]
Oh, Se Jun and Lee, Sang Heon (2021) Comparing durability of water- and land-based exercise benefits among older adults in South Korea: A randomized controlled trial with 1-year follow-up. Journal of back and musculoskeletal rehabilitation 34(5): 745-755	- Study does not contain an intervention relevant to this review protocol
Okkersen, Kees, Jimenez-Moreno, Cecilia, Wenninger, Stephan et al. (2018) Cognitive behavioural therapy with optional graded exercise therapy in patients with severe fatigue with myotonic dystrophy type 1: a multicentre, single-blind, randomised trial. The Lancet. Neurology 17(8): 671-680	- Population not relevant to this review protocol
Okubo, Yoshiro, Sturnieks, Daina L, Brodie, Matthew A et al. (2019) Effect of Reactive Balance Training Involving Repeated Slips and Trips on Balance Recovery Among Older Adults: A Blinded Randomized Controlled Trial. The journals of gerontology. Series A, Biological sciences and medical sciences 74(9): 1489-1496	- Study does not contain an intervention relevant to this review protocol
Osuka, Yosuke, Nofuji, Yu, Seino, Satoshi et al. (2022) The effect of a multicomponent intervention on occupational fall-related factors in older workers: A pilot randomized controlled trial. Journal of occupational health 64(1): e12374	- Data not reported in an extractable format or a format that can be analysed
Pajewski, Nicholas M, Berlowitz, Dan R, Bress, Adam P et al. (2020) Intensive vs Standard Blood Pressure Control in Adults 80Years or Older: A Secondary Analysis of the Systolic Blood Pressure Intervention Trial. Journal of the American Geriatrics Society 68(3): 496-504	- Study does not contain an intervention relevant to this review protocol
Perttila, Niko M, Ohman, Hanna, Strandberg, Timo E et al. (2018) Effect of Exercise on Drug-Related Falls Among Persons with Alzheimer's Disease: A Secondary Analysis of the FINALEX Study. Drugs & aging 35(11): 1017-1023	- Study does not contain an intervention relevant to this review protocol
Potter, Patricia, Pion, Sarah, Klinkenberg, Dean et al. (2014) An instructional DVD fall-prevention program for patients with cancer and family caregivers. Oncology nursing forum 41(5): 486-94	- Population not relevant to this review protocol
Reeve, Emily, Jordan, Vanessa, Thompson, Wade et al. (2020) Withdrawal of antihypertensive drugs in older people. The Cochrane database of systematic reviews 6: cd012572	- No relevant outcomes
Reilmann, Ralf, McGarry, Andrew, Grachev, Igor D et al. (2019) Safety and efficacy of pridopidine in patients with Huntington's disease (PRIDE-HD): a phase 2, randomised, placebo-controlled, multicentre, dose-ranging study. The Lancet. Neurology 18(2): 165-176	- Study does not contain an intervention relevant to this review protocol
Reinsch, S, MacRae, P, Lachenbruch, PA et al. (1992) Attempts to prevent falls and injury: a prospective community study. Gerontologist 32(4): 450-456	- Duplicate reference
Robson, E, Edwards, J, Gallagher, E et al. (2003) Steady as you go (SAYGO): a falls-prevention program for seniors living in the community. Canadian journal on aging 22(2): 207-216	- Duplicate reference

Study	Code [Reason]
Rooijackers, Teuni H, Kempen, Gertrudis I J M, Zijlstra, G A Rixt et al. (2021) Effectiveness of a reablement training program for homecare staff on older adults' sedentary behavior: A cluster randomized controlled trial. Journal of the American Geriatrics Society 69(9): 2566-2578	- Study does not contain an intervention relevant to this review protocol
Rosado, Hugo, Bravo, Jorge, Raimundo, Armando et al. (2022) Can two multimodal psychomotor exercise programs improve attention, affordance perception, and balance in community dwellings at risk of falling? A randomized controlled trial. BMC public health 21(suppl2): 2336	- Secondary publication of an included study that does not provide any additional relevant information
Satoh, Atsuko, Kudoh, Yukoh, Lee, Sangun et al. (2021) Toe Clearance Rehabilitative Slippers for Older Adults With Fall Risk: A Randomized Controlled Trial. Geriatric orthopaedic surgery & rehabilitation 12: 21514593211029102	- No relevant outcomes
Schafer, Zoe A; Perry, John L; Vanicek, Natalie (2018) A personalised exercise programme for individuals with lower limb amputation reduces falls and improves gait biomechanics: A block randomised controlled trial. Gait & posture 63: 282-289	- Population not relevant to this review protocol
Schwenk, Michael, Bergquist, Ronny, Boulton, Elisabeth et al. (2019) The Adapted Lifestyle-Integrated Functional Exercise Program for Preventing Functional Decline in Young Seniors: Development and Initial Evaluation. Gerontology 65(4): 362-374	- Study design not relevant to this review protocol
Scragg, R K R (2019) Overview of results from the Vitamin D Assessment (ViDA) study. Journal of endocrinological investigation 42(12): 1391-1399	- Population not relevant to this review protocol
Squires, Patrick J, Pahor, Marco, Manini, Todd M et al. (2019) Effect of Gastric Acid Suppressants on Response to a Physical Activity Intervention and Major Mobility Disability in Older Adults: Results from the Lifestyle Interventions for Elders (LIFE) Study. Pharmacotherapy 39(8): 816-826	- Data not reported in an extractable format or a format that can be analysed
Squires, Patrick, Pahor, Marco, Manini, Todd M et al. (2020) Impact of Anticholinergic Medication Burden on Mobility and Falls in the Lifestyle Interventions for Elders (LIFE) Study. Journal of clinical medicine 9(9)	- Study design not relevant to this review protocol
Stahl, J. and Belisle, S. (2019) Medical qigong intervention for improved balance & stability. Journal of Alternative and Complementary Medicine 25(10): a26	- Population not relevant to this review protocol
Stasi, Sophia, Tsekoura, Maria, Gliatis, John et al. (2021) Motor Control and Ergonomic Intervention Home-Based Program: A Pilot Trial Performed in the Framework of the Motor Control Home Ergonomics Elderlies' Prevention of Falls (McHeELP) Project. Cureus 13(4): e14336	- No relevant outcomes
Sun, Mingyu, Min, Leizi, Xu, Na et al. (2021) The Effect of Exercise Intervention on Reducing the Fall Risk in Older Adults: A Meta-	- Systematic review used as source of primary studies

Study	Code [Reason]
Analysis of Randomized Controlled Trials. International journal of environmental research and public health 18(23)	
Szanton, Sarah L, Clemson, Lindy, Liu, Minhui et al. (2021) Pilot Outcomes of a Multicomponent Fall Risk Program Integrated Into Daily Lives of Community-Dwelling Older Adults. Journal of applied gerontology : the official journal of the Southern Gerontological Society 40(3): 320-327	- No relevant outcomes
Thomas, E., Battaglia, G., Patti, A. et al. (2019) Physical activity programs for balance and fall prevention in elderly. Medicine (United States) 98(27): 1-9	- Systematic review used as source of primary studies
Tomita, Machiko R, Fisher, Nadine M, Ramsey, Dan et al. (2019) Follow-Up of a Virtual-Group-Exercise at Home Program to Reduce Fall Risks. Journal of the American Geriatrics Society 67(9): 1981-1983	- Secondary publication of an included study that does not provide any additional relevant information
Tousignant, Michel, Corriveau, Helene, Roy, Pierre-Michel et al. (2013) Efficacy of supervised Tai Chi exercises versus conventional physical therapy exercises in fall prevention for frail older adults: a randomized controlled trial. Disability and rehabilitation 35(17): 1429-35	- No relevant outcomes
Tsekoura, Maria, Stasi, Sophia, Gliatis, John et al. (2021) Methodology of a home-based motor control exercise and ergonomic intervention programme for community-dwelling older people: The McHeELP study. Journal of frailty, sarcopenia and falls 6(3): 153-162	- Study design not relevant to this review protocol
Uusi-Rasi, K, Patil, R, Karinkanta, S et al. (2019) Serum 25-hydroxyvitamin D levels and incident falls in older women. Osteoporosis international : a journal established as result of cooperation between the European Foundation for Osteoporosis and the National Osteoporosis Foundation of the USA 30(1): 93-101	- Study design not relevant to this review protocol
Uusi-Rasi, Kirsti, Patil, Radhika, Karinkanta, Saija et al. (2015) Exercise and vitamin D in fall prevention among older women: a randomized clinical trial. JAMA internal medicine 175(5): 703-11	- Secondary publication of an included study that does not provide any additional relevant information
Wang, Yiru, Bhatt, Tanvi, Liu, Xuan et al. (2019) Can treadmill-slip perturbation training reduce immediate risk of over-ground-slip induced fall among community-dwelling older adults?. Journal of biomechanics 84: 58-66	- Data not reported in an extractable format or a format that can be analysed
Watanabe, Kumi, Kamijo, Yuka, Yanagi, Mai et al. (2021) Home-based exercise and bone mineral density in peritoneal dialysis patients: a randomized pilot study. BMC nephrology 22(1): 98	- No relevant outcomes
Waters, Debra L, Popp, Janet, Herman, Carla et al. (2022) The Otago Exercise Program compared to falls prevention education in Zuni elders: a randomized controlled trial. BMC geriatrics 22(1): 652	- Data not reported in an extractable format or a format that can be analysed

Study	Code [Reason]
Wei, Fei-Long, Li, Tian, Gao, Quan-You et al. (2022) Association Between Vitamin D Supplementation and Fall Prevention. Frontiers in endocrinology 13: 919839	- Population not relevant to this review protocol
White, William B, Wakefield, Dorothy B, Moscufo, Nicola et al. (2019) Effects of Intensive Versus Standard Ambulatory Blood Pressure Control on Cerebrovascular Outcomes in Older People (INFINITY). Circulation 140(20): 1626-1635	- Study does not contain an intervention relevant to this review protocol
Williamson, Esther, Boniface, Graham, Marian, Ioana R et al. (2022) The Clinical Effectiveness of a Physiotherapy Delivered Physical and Psychological Group Intervention for Older Adults With Neurogenic Claudication: The BOOST Randomized Controlled Trial. The journals of gerontology. Series A, Biological sciences and medical sciences 77(8): 1654-1664	- Duplicate reference
Witham, M.D., Price, R.J.G., Band, M.M. et al. (2019) Effect of oral vitamin K2 supplementation on postural sway and physical function in older people with a history of falls: A pilot randomised controlled trial. Age and Ageing 48(supplement2)	- Conference abstract
Wong, R.M.Y., Ho, W.T., Tso, C.Y. et al. (2019) Vibration therapyas an intervention for postural training and fall prevention after distal radius fracture in elderly patients: A randomized controlled trial. Osteoporosis International 30(suppl2): 766	- Conference abstract
Wood, A D, Secombes, K R, Thies, F et al. (2014) A parallel group double-blind RCT of vitamin D3 assessing physical function: is the biochemical response to treatment affected by overweight and obesity?. Osteoporosis international : a journal established as result of cooperation between the European Foundation for Osteoporosis and the National Osteoporosis Foundation of the USA 25(1): 305-15	- Population not relevant to this review protocol *Mean age of population is less than 65 years*
Yadav, A. and Jain, A. (2022) Effect of Strength Training and Fall Prevention Guide on Balance in Community Dwelling Elderly Population. NeuroQuantology 20(7): 269-274	- Data not reported in an extractable format or a format that can be analysed
Yang, Feng, Su, Xiaogang, Sanchez, Maria Cristal et al. (2023) Vibration training reducing falls in community-living older adults: a pilot randomized controlled trial. Aging clinical and experimental research	- Data not reported in an extractable format or a format that can be analysed
Zadro, Joshua R, Shirley, Debra, Simic, Milena et al. (2019) Video-Game-Based Exercises for Older People With Chronic Low Back Pain: A Randomized Controlledtable Trial (GAMEBACK). Physical therapy 99(1): 14-27	- No relevant outcomes
Zheng, Yuxin, Wang, Xuezong, Zhang, Zong-Kang et al. (2019) Bushen Yijing Fang Reduces Fall Risk in Late Postmenopausal Women with Osteopenia: A Randomized Double-blind and Placebo-controlled Trial. Scientific reports 9(1): 2089	- Study does not contain an intervention relevant to this review protocol

J.2 Health Economic studies

J.2.1 Exercise Interventions

Published health economic studies that met the inclusion criteria (relevant population, comparators, economic study design, published 2005 or later and not from non-OECD country or USA) but that were excluded following appraisal of applicability and methodological quality are listed below. See the health economic protocol for more details.

Table 45: Studies excluded from the health economic review

Reference	Reason for exclusion
Alhambra-Borras 2019[1]	Exercise intervention in community setting. Excluded as rated partially applicable with very serious limitations. Study based on a non-randomised trial excluded from clinical review. Unbalanced sample sizes between intervention and control group. Unlikely to be representative of full body of clinical evidence. Very limited sensitivity analyses undertaken. Sources of costs and resource use poorly reported. Spanish setting may not reflect current NHS context.
Bays-Moneo 2023	Wrong study design [Cost consequence study which does not include costs of hospital stay]
Brusco 2023	Societal perspective
Church 2011[35]	Study comparing multiple interventions in community setting (including exercise, surgery, medication review and multifactorial interventions). Selectively excluded as it used the same data as Church 2012 but with a shorter time horizon.
Dams 2024	Wrong study design [Budget impact model in Germany]
Day 2010[58]	Exercise intervention in community setting. Excluded as rated partially applicable with very serious limitations. Implementation analysis for the Australian healthcare context, as opposed to a cost-effectiveness analysis. No incremental analysis conducted.
Goldsmith 2012[86]	Exercise intervention in community setting. Excluded as rated very serious limitations. General poor reporting (unable to assess costs and resource use sources or utility sources, unclear what the time horizon was when model used) and importantly missing tables/figures, therefore incremental analysis cannot be fully reported. Study is based on a 'before and after' study, therefore no 'control' group which could lead to bias.
Iliffe S, Kendrick D, Morris R, et al. Multicentre cluster randomised trial comparing a community group exercise programme and home-based exercise with usual care for people aged 65 years and over in primary care. Southampton (UK): NIHR Journals Library; 2014 Aug	Excluded as rated as very serious limitations due to assessing the difference in QALYs but then stating that it was not significant and therefore not presenting QALYs or calculating an ICER. The study had data from 24 months after the intervention but only used the data up to 12 months after. It stated that the reason for using 12 months was that is where there was evidence for the greatest improvement.
Medical Advisory Secretariat. The Falls/Fractures	Excluded due to the model not using QALYs, instead using cost per fall avoided, also the costs are from 2008 or earlier in Canada and

Reference	Reason for exclusion
Economic Model in Ontario Residents Aged 65 Years and Over (FEMOR). Ontario Heath Technology Assessment Series 2008;8(6).	uprated therefore unlikely to be relevant to current UK practice. The paper uses a 5% discount rate which is higher than 3.5% used by NICE which over the lifetime is likely to have a significant effect.
Scheckel, B., Stock, S. & Müller, D. Cost-effectiveness of group-based exercise to prevent falls in elderly community-dwelling people. BMC Geriatr 21, 440 (2021). https://doi.org/10.1186/s12877-021-02329-0	Excluded as not applicable due to looking at hip fracture avoided rather than fall avoided therefore is missing a significant section of possible outcomes. The intervention was exercise for both arms but one arm received it in a group whereas the other received it at home on an individual basis. The model was based in Germany which has a different healthcare system. It was also a lifetime model (starting age 75) that did not include any discounting.
Tews 2023	Not full paper
Xin, Y., Ashburn, A., Pickering, R.M. et al. Cost-effectiveness of the PDSAFE personalised physiotherapy intervention for fall prevention in Parkinson's: an economic evaluation alongside a randomised controlled trial. BMC Neurol 20, 295 (2020). https://doi.org/10.1186/s12883-020-01852-8	Excluded as population is outside of scope. This is a condition specific intervention in people over 65 (people with Parkinson's disease mean age of 71/73 years).

J.2.2 Multifactorial interventions

Table 46: Studies excluded from the health economic review

Reference	Reason for exclusion
Bray Jenkyn, K.; Hoch, J. S.; Speechley, M. (2012) How much are we willing to pay to prevent a fall? Cost-effectiveness of a multifactorial falls prevention program for community-dwelling older adults. Canadian Journal on Aging 31(2): 121-137	Excluded as rated not applicable due to using a societal perspective with the healthcare costs not extractable.
CG161 Community	Excluded as rated as not applicable due to unit costs obtained from 2000, 2002 and 2003 which is past the 15 year cut off of relevant costs. Also the effectiveness data was taken from a meta analysis that was completed in 2004 and there are likely to be more recent relevant data.
Church, J., Goodall, S., Norman, R. et al. (2011) An economic evaluation of	Excluded as rated not applicable due to it using the same data as Church 2012 and uses a shorter time horizon.

Reference	Reason for exclusion
community and residential aged care falls prevention strategies in NSW. New South Wales Public Health Bulletin 22(34): 60-68	
Di Gennaro, Gianfranco, Chamitava, Liliya, Pertile, Paolo et al. (2024) A stepped-wedge randomised controlled trial to assess efficacy and cost-effectiveness of a care-bundle to prevent falls in older hospitalised patients. Age and ageing 53(1)	- Very serious limitations [No uncertainty analysis]

J.2.3 Environmental interventions

Table 47: Studies excluded from the health economic review

Reference	Reason for exclusion
Wilson 2017[259]	Home safety assessment and modifications in community setting. This study was assessed as partially applicable (New Zealand healthcare perspective, with 2011 costs, QoL assessed using disease weights rather than EQ-5D, discounting at 3% rather than 3.5% as required by NICE reference case) and judged to have potentially serious limitations (New Zealand baseline data and resource use may not be applicable to current NHS context, no probabilistic sensitivity analysis conducted relative treatment effect based on old Cochrane). This study was identical to Pega 2016[190] however rather than using national baseline data on fall risk it used data specific to a New Zealand district with high levels of deprivation and household crowding and therefore considered less applicable to the general older UK population. This study was selectively excluded.
Kunigkeit 2018[128],	Home safety assessment and modifications in community setting. This study was assessed as partially applicable (German healthcare perspective, with 2016-unit costs, may not reflect current NHS context. Discounting at 3% rather than 3.5% as required by NICE reference case. Older adult cohort (80 years) may not be applicable for all older people to whom this guideline applies to) and judged to have very serious limitations (rate of falls used as a proxy to calculate number of hip fractures, may overestimate cost-effectiveness. Population of RCTs informing model not the same as modelled cohort and representativeness uncertain – use of Cameron 2010 which was for residential care and hospitals and risk ratio of falls lower than that reported in clinical review). This study was excluded.